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Los Angeles

Maize, Quetzalcoatl, and Grass Imagery:

Science in the Central Mexican *Codex Borgia*

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy

in Art History

by

Helen Ellis

2015

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2015

ABSTRACT OF THE DISSERTATION

Maize, Quetzalcoatl, and Grass Imagery:

Science in the Central Mexican *Codex Borgia*

by

Helen Ellis

Doctor of Philosophy in Art History

University of California, Los Angeles, 2015

Professor Cecelia F. Klein, Chair

Before the Spanish-led defeat of the Aztecs in 1521, manuscripts were ubiquitous in Mesoamerica. Regrettably very few survive. One of them is the Aztec (Eastern Nahua) *Codex Borgia* painted in the Late Postclassic period (ca. 1250–1521 CE). Many of its 76 pages include maize imagery in polychrome. The plant appears amid gods of fertility hovering above naked females; associated with Quetzalcoatl, the god of wind; and rendered to look strikingly similar to grass. The questions I address in this dissertation relate to the significance of maize, Quetzalcoatl, and grass depictions. What does maize imagery convey? Why did the Nahua venerate a god of wind? How is maize related both wind and grass?

Until now, scholars of the *Codex Borgia* have generally assumed that it records information used in divination, astronomy, and farming. What has not been considered is the possibility that it reflects scientific information about plants. I contend that maize imagery

studied against the scientific record on plant domestication indicates that it does. Scientists have demonstrated that Central Mexicans were brilliant at manipulating plants, and had by approximately 6,000 BCE, through genetic selection, transformed a common grass into the maize plant. The result was a symbiotic relationship between maize and humans. Amerindians cared for the plant, continuing to manipulate it to become the modern crop, ultimately spread throughout the world, completely dependent on humans for reproduction.

Scholars have lamented that indigenous people failed to make a record of their scientific achievements. I argue that maize and related images in their extant artifacts reflect those accomplishments. My research strives to shed light on the *Codex Borgia*, its imagery, and the ways in which indigenous people of Mesoamerica recorded scientific information. Specifically, my dissertation shows with substantial scientific, ethnohistoric, and iconographic evidence that the Nahua understood plant sexuality, that wind was the primary means of plant reproduction, and that the common grass they held in great esteem was the progenitor of maize. My dissertation seeks to establish that the *Codex Borgia*'s imagery shows the cultural importance of maize to the Nahua and that it was rooted in scientific understanding.

The dissertation of Helen Ellis is approved.

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2015

Al pueblo de México con muchísimo cariño y agradecimiento

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PUBLICATIONS AND PRESENTATIONS

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"Transforming a Common Grass into Corn: A Scientific Achievement Recorded in Aztec Art." Paper to be presented at the session "Visual Representations of Plant Knowledge in Precolumbian, Early Colonial, and Early Modern European Art," Helen B. Ellis, Chair, forthcoming, February 2016.

California State University, Los Angeles, CA. *In the Realm of the Vision Serpent: A Symposium in Homage to Linda Schele*

"A Tale of Two Cities: Revelations from Pakal and the Warrior Priest's Tombs." Paper presented at the session "Body and Bones in the Ancient Americas," Martin Berger, Chair, April 10, 2015.

American Society for Ethnohistory Annual Meeting, Springfield, MO

"Sexual Reproduction of Maize on Page 28 of the *Codex Borgia*." Paper presented at the session "New Research on Mesoamerican Pictorial Manuscripts," Elizabeth Hill Boone, Chair, November 8, 2012.

Cornell University, Ithaca, NY. *Regional Identity in Times of Globalization and Diaspora Conference*

"How Globalization Has Affected Indigenous Life in El Salvador." Paper presented at the session "Frontiers of the Indigenous," April 2, 2009.

INTRODUCTION

Maize (corn)[1] imagery appears throughout the *Codex Borgia*, and in other screenfold[2] manuscripts painted by Central Mexican artists during the Late Postclassic period (ca. 1250–1521 CE).[3] The *Codex Borgia* is an Aztec (Eastern Nahua) manuscript painted in the Puebla-Tlaxcala region and currently conserved at the Biblioteca Apostolica Vaticana. In the Late Postclassic period, the Nahuatl-speaking Aztecs[4] were the dominant group in the Central Mexican basin. Their capital, Tenochtitlan, was located at the site of modern-day Mexico City. The Aztecs rose to power after approximately 1335, extending their influence eastward to Nahuatl speakers living to the east and south of Tenochtitlan in what are today the states of Puebla and Tlaxcala, as well as to the areas of modern-day Oaxaca, Guerrero, Veracruz, Campeche, Yucatán, and coastal Central America. Of the Aztec pervasive influence in Mesoamerica, the sixteenth-century chronicler Diego Muñoz Camargo, a noble Tlaxcalan mestizo (i.e., of indigenous and Spanish descent), said that Nahuatl was spoken as far away as Nicaragua.[5]

A staple of the Mesoamerican diet was maize. The Nahuas depicted maize in different media and honored it in the numerous feasts celebrated throughout the year. In the *Codex Borgia*, for example, maize is depicted: bearing a striking resemble to grass on page 20, where Tlaloc, the Aztec god of rain, pierces it with a *huictli* (*coa*,[6] or hoe); prominently amid gods of fertility and naked females on page 28; emerging from the buccal mask of Ehecatl-Quetzalcoatl, the god of wind, on page 36 and the mouth of Macuilxochitl, the god of games and pleasure, on page 48; on the roof of a building housing a copulating couple on page 51, and in Ehecatl-Quetzalcoatl's headdress on page 60.

What is the meaning of this and other maize images in this manuscript? In the *Codex Borgia*, maize is closely associated with themes of sexual reproduction. Maize is also linked to Ehecatl-Quetzalcoatl, the god of wind, one of the most important creator gods in Mesoamerica, who was associated with sustenance, sexual reproduction, and abundance. Ehecatl-Quetzalcoatl wore a duck's beak buccal mask, one of his most recognizable features from which, according to the Nahua, he blew wind. Why was wind so important, and what does it and sexual reproduction have to do with maize? Finally, why is it that in the *Codex Borgia*, the maize plant looks very much like a wild grass that the Nahua called *malinalli*[7]?

Scientists, particularly biologists and archaeologists, have demonstrated that the people of Central Mexico were brilliant plant experts. As will be explained in greater detail in Chapter 3, the consensus among scientists today is that over 8,000 years ago, indigenous people in the Balsas River Basin in southwest Mexico first began manipulating a wild grass currently known in the scientific literature as teosinte (*Zea mays* ssp. *parviglumis*), converting it into the modern-day maize (*Zea mays* L.) plant. The result was a symbiotic relationship between maize and humans. Maize changed humans forever, turning them into agriculturists and ultimately sustaining life in advanced civilizations with densely populated cities. Humans also changed maize forever, domesticating it to become the modern plant ultimately spread throughout the world, which produces far more nutrition than its wild progenitor but is completely dependent on humans for reproduction.

Consequently, maize was an important crop to the people of ancient Mexico, and their relationship to it was special. Maize is described as "precious, our flesh, our bones" in Book 11 of the *Florentine Codex*, the Franciscan Fray Bernardino de Sahagún's twelve-volume encyclopedic oeuvre, containing a treasure trove of ethnohistoric information on the Nahua

collected between 1547 and 1577.[8] Pre-Columbian[9] Mesoamericans, including the Nahua, routinely cultivated and manipulated the maize plant to produce cobs with a range of characteristics. The Nahua said of a strain of maize that they cultivated, and which yielded cobs with blue husks and white kernels with red interiors: "I honor it. I desire it. I venerate it, esteem it. I consider it with respect. I prize it."[10]

For the Nahua, the maize plant became a symbol with deep cultural meaning. When maize was depicted in a work of art, it communicated a number of complex, intertwined, and widely understood concepts. Thus maize imagery in Nahua art connotes far more than a crop, just as the image of a cross conveys far more in Christian art than the letter "T" (for which someone unfamiliar with Christianity might mistake it), and the image of Statute of Liberty conveys far more in the United States than a tall woman with stark features holding a book. Relating maize imagery in the *Codex Borgia* to the scientific and ethnohistoric record reveals that the manuscript contains empirical information pertaining to the plant's biology, sexual reproduction, and genetic origin. I contend that at their core, Nahua philosophy and religion are rooted in science and that images of maize, grass, and Ehecatl-Quetzalcoatl in the *Codex Borgia* reflect scientific principles.

My approach consists of an iconographic evaluation of maize and related imagery in the *Codex Borgia* combined with ethnohistory and science. Understanding the biology of the plant as well as the history of its origin and subsequent manipulation, I contend, is key to unlocking meaning in the *Codex Borgia*'s maize imagery. There are three scientific principles that are critical to my analysis. First, the maize plant has male and female parts and reproduces sexually. This, I argue, explains why maize imagery is linked to themes of reproduction and male-female coupling (Chapter 3). Second, wind plays a critical role in the pollination, and therefore, the

reproduction of plants, which I argue calls for a fundamental reexamination of the role of Ehecatl-Quetzalcoatl, the god of wind, in Nahua thought as well as an explanation for his associations with maize, agriculture, plenty, sustenance, reproduction, sexuality, and pregnancy (Chapter 4). Third, indigenous people domesticated a common grass converting it into the maize plant. This, I argue, explains why the images of maize and grass in the *Codex Borgia* are virtually indistinguishable, and why the Nahua venerated what to us appears to be a common grass (Chapter 5). In sum, I contend that images of maize, grass, and Ehecatl-Quetzalcoatl in the *Codex Borgia* convey scientific information.

I do not intend to suggest that processes such as the manipulation of a common grass and the reproduction of the maize plant are presented systematically in the *Codex Borgia*. Such is not the nature of Aztec historical recording, and that would be an anachronistic manner of presenting information. Instead, my dissertation seeks to demonstrate that beyond recording only cultural and religious information, the *Codex Borgia* also reflects scientific aspects of the plant's domestication, manipulation, and reproduction.

Before the Spanish-led defeat of the Aztecs in 1521, Mesoamerican artists painted screenfold manuscripts that are works of tremendous historical and cultural significance as well as superb artistic beauty. Regrettably, very few survived the destruction related to the conquest. The extant manuscripts are an invaluable resource for understanding pre-Columbian Mexican indigenous life, but the information contained in them is presented exclusively in the form of painted images and calendrical glyphs, without alphabetic writing to elucidate to modern-day scholars what the imagery represents (see Chapter 3 for discussion of calendrical glyphs). Father Toribio de Benavente, widely known since the sixteenth century as Motolinía, who was officially chosen in 1523 by the Spanish Order of the Franciscans to be one of the first twelve friars to

travel to Mexico and conduct missionary work, discusses the nature of Nahua writing and the type of information indigenous manuscripts recorded as follows:

> These books were written in symbols and pictures. This was their way of writing, supplying their lack of an alphabet by the use of symbols. . . . Some things, pertaining to ancient times and the fixing of the succession of the lords who took possession of and ruled over this great land, have been gathered and explained by their figures. . . . They related in figures the achievement of victory and the conduct of wars; the succession of chief lords, weather conditions and noteworthy signs in the heavens; and general epidemics; at what time and under which lord these things occurred.[11]

As Elizabeth Boone explains, in the Central Mexican manner of recording information, "The goal was not to fix a spoken text by providing phonetic details but to formulate and store complex information through conventional images."[12] In the early colonial period, indigenous painter scribes, European friars, and conquerors, compiled a particularly rich body of ethnohistoric documentation on the Nahua. This record includes extensive chronicles as well as manuscripts painted by indigenous artists that feature imagery accompanied with explanatory glosses in Spanish, Nahuatl, Latin, and/or Italian. These sources, which were painted and/or written from precedent (see Chapter 1), are very useful in elucidating the pictographic information in pre-Columbian manuscripts. Although the imagery in pre-Columbian manuscripts is initially confounding, generations of scholars have used a variety of sources, methodologies, and theories to analyze and interpret it. With this dissertation, I join that effort.

The body of scholarly work on the *Codex Borgia* is substantial and includes discussions of its materials; issues pertaining to its provenience; the cultural milieu that produced it; and interpretation of the iconography of specific figures, pages, or sections. Several facsimile editions, the first published in 1831 and the latest in 2008, most accompanied by commentary, make the *Codex Borgia* one of the most accessible and analyzed of all Mesoamerican manuscripts.[13] In addition, archaeological excavations undertaken throughout the twentieth

century unearthed material culture (e.g., polychrome pottery and mural painting) featuring imagery strikingly similar to that in pages of the *Codex Borgia*, stimulating studies on provenience that discuss the manuscript as being part of a group, genre, or style.[14] A seminar and conference sponsored by the pre-Columbian Studies Program at Dumbarton Oaks in 1982 expanded our understanding and encouraged additional work on these issues. More recently, scholars have begun to analyze the cultural milieu that produced screenfold painted manuscripts. Workshops held at Tulane University in 2001 and 2002, and a conference sponsored by the pre-Columbian Studies Program at Dumbarton Oaks in 2006, which produced in 2010 a volume edited by Gabrielle Vail and Christine Hernández, have animated discussions of the cultural exchange between Maya and Nahua societies during the Postclassic period.[15]

Until now, scholars of the *Codex Borgia* have generally assumed that it "records almanacs used in divination and astronomy."[16] What has not been considered is the possibility that the manuscript records scientific information on plants. This dissertation offers new insights into pre-Columbian art that challenge established paradigms and will hopefully drive scholars to pursue new sets of questions and avenues for further research. My research departs from the prevailing consensus regarding the manuscript's primary purpose. The opinion that the messages encoded in the *Codex Borgia* largely pertain to divination and astronomy has been advanced and accepted by generations of scholars, beginning with the pioneering commentary on the *Codex Borgia* by the Jesuit Father José Lino Fábrega in the 1790s.[17] It has continued unabated, for the most part, up to the present. This interpretation was inspired by early colonial accounts written mostly by sixteenth-century friars, who focused on the roles of divination and astronomy in Nahua society. The friars' accounts may well have been influenced by their own views—and the

prevailing views of Europeans at the time—regarding divination. As the historian Robert Westman explains:

> The burgeoning late-fifteenth and early-sixteenth-century heavenly print literature, directed to learned elites and ordinary people alike, was overwhelmingly preoccupied with astrologically driven anticipations of the future, sometimes coupled with powerful apocalyptic fantasies that the world would soon come to an end.[18]

I do not deny that some divinatory messages may be encoded in the *Codex Borgia* and other pre-Columbian Central Mexican manuscripts. However, studying the manuscripts solely from this perspective obscures additional meanings and messages contained in these documents. For example, one unintended consequence of this approach is an undue emphasis on calendrical symbols thought to encode divinatory messages, and a corresponding lack of attention to the accompanying images.

One notable exception is Eduard Seler's pioneering work conducted more than a century ago. Seler is himself a proponent of the view that the messages in the *Codex Borgia* largely pertain to divination and astronomy. However, he conducted an iconographic analysis of the *Codex Borgia* that has proved to be a cornerstone in the study of Mesoamerican manuscripts in general, and in this regard his influence remains to this day unparalleled and unabated. Nevertheless, Seler's work is flawed in certain respects. As Henry Nicholson points out, Seler held onto "some dubious pet theories," evident in his interpretations of Nahua myth, which show "his over-enthusiastic acceptance (after 1907) of the lunar school of mythological interpretation of Ernst Siecke."[19]

Indeed, part of the problem with Seler's conclusions regarding the imagery in the *Codex Borgia* is that they are heavily informed by Indo-European[20] religious studies and astral mythology.[21] "Indo-European" refers to the languages (e.g., Sanskrit, Latin, and Greek) and

cultures (e.g., Indian, Roman, Greek, Celtic, and Germanic) that began to develop from a common origin approximately six millennia ago. These cultures had remarkably similar pantheons (e.g., the Jupiter "Father Sky" in Rome was Zeus in Greece and Dyaus in India) and myths (e.g., the story of the flood). Linguists today concur that Indo-European "legends of the founding of cities or the origins of a people are often based on cosmogonic myths," and that the "basic wording of myth," the analysis of which helps in identifying common roots, is "often exceptionally stable."[22] So committed was Seler to the application of Indo-European culture for his analysis of Nahua art and myth that he believed that European civilization could have influenced Mesoamerica even before the conquest.[23]

More recently, Anthony Aveni, Elizabeth Boone, Christine Hernández, Susan Milbrath, Gabrielle Vail, and others have begun to venture out of the divinatory paradigm. For example, although Boone argues that the *Codex Borgia* and the rest of the Borgia Group screenfolds[24] are divinatory manuscripts, she concludes that the eighteen-page narrative section spanning pages 29 through 46 of the *Codex Borgia* presents a Nahua "cosmic narrative of creation."[25] In this dissertation, I build on the work of these scholars to offer a brand new interpretation of the images of maize, Ehecatl-Quetzalcoatl, and *malinalli* grass in the *Codex Borgia*.

The knowledge and skill of the people of ancient Mexico in the areas of botany, biology, chemistry, agriculture, and related sciences were extraordinary. There is, in both the scientific record and early sixteenth-century accounts, substantial and incontrovertible evidence that pre-Columbian indigenous peoples of Mesoamerica domesticated a large number of plants and achieved breakthrough discoveries from empirical observations of, and experimentations with, plants, trees, and other elements (e.g., minerals) from the natural world. By 1521, indigenous groups in Mesoamerica had successfully domesticated and routinely manipulated not only maize

(*centli* or *tlaolli*) but also chile (*chilli*), tomato (*tomatl*), beans (*etl*), squash (*aiotli*), vanilla (*tlilxochitl*), chocolate (*cacaoatl*), rubber (*olquauitl* to extract *ulli or olli*), and a host of other lesser known species of plants.[26] One—but only one—of their remarkable achievements pertains to the creation of maize from teosinte, a grass that produces miniscule spikes or cobs with two rows of six to twelve kernels, each of which is enclosed in stony fruitcases (similar to those in nuts). In contrast, the maize plant produces large cobs with about twenty rows of close to five hundred kernels enclosed in soft glumes. While the creation and subsequent genetic manipulation of maize is the best-known example of ancient Mexicans' understanding of plants, experimentations with a wide variety of other plants as well as trees endemic to this region led to quite remarkable discoveries and scientific advances, including, for example, the process of the vulcanization of rubber.

In 1999, Dorothy Hosler, Sandra Burkett, and Michael Tarkanian published a report of their chemical studies of rubber artifacts recovered from an archaeological Olmec site in lowland Veracruz called El Manatí, which contained material dating from ca. 1600–1000 BCE.[27] Using early colonial reports describing how indigenous chemists created rubber; modern-day observations of rubber processing in Escuintla, Chiapas; and chemical analyses of rubber balls (*ullamaloni*) recovered from archaeological Olmec sites, Hosler et al. have demonstrated the various manners in which pre-Columbian rubber was processed to achieve the properties desired (e.g., pliability).[28] Pre-Columbian Mesoamericans made rubber more pliable and elastic by heating the latex extracted from the *Castilla elastica* tree and mixing it with the juice of *Ipomoea alba*, the morning glory vine. In 2011, after further investigating the chemical properties of Mesoamerican rubber and analyzing early colonial sources that report of an extensive use of this

product in Aztec society, Michael Tarkanian and Dorothy Hosler, of the Department of Materials, Science, and Engineering at MIT, concluded:

> During a period of 3,500 years before Goodyear's discovery, the Olmec, Maya, Aztec (Mexica), and other Mesoamerican peoples were employing rubber and latex in medicines and rituals, for rubber balls . . . and for sandal soles. . . . The inhabitants of ancient Mesoamerica were . . . chemical engineers. Over time, the technology was perfected to produce rubber with specific mechanical properties through chemical manipulation.[29]

I bring attention to this example to show that Mesoamericans achieved a high level of sophisticated scientific knowledge regarding the uses and manipulation of plant material. María Portuondo explains that the term "science" may be used to describe the sixteenth-century work of Spanish cosmographers in the New World, with the caveat that "we are using the word anachronistically but also as an expedient way of referring to a group of quite distinct ways of producing knowledge."[30] But as Portuondo reports, sixteenth-century Spaniards used the term "*ciencia*" (science) to describe empirical practices in various fields. For example, Alonso de Santa Cruz (ca. 1505–67), a royal Spanish cosmographer, declared: "I dedicated myself to learning the sciences of astrology and cosmography."[31] In this dissertation, I follow Portuondo's use of the words "science" and/or "scientific" to describe the significant empirical advances achieved by pre-Columbian Mesoamericans.

My research and analysis reveal that pre-Columbian Central Mexicans had a profound understanding of the biological processes of a significant number of plants they manipulated, and that maize imagery in the *Codex Borgia* reflects this knowledge. Despite the scientific record and the known cultural significance of maize to the people of pre-Columbian Mesoamerica, to date no art historical study has focused on the maize imagery in indigenous artifacts. In contrast, scholars in other disciplines have examined pre-Columbian maize imagery not to discuss divination or religion, but to extract botanical and other scientific information. For example,

archaeologists have analyzed Classic period (ca. 300–900 CE) pottery decorated with stylized and naturalistic maize imagery by Zapotec and Moche artists working in pre-Columbian Mexico and Peru respectively. The biologist Paul Mangelsdorf proposed that studying the naturalistic impressions of maize in pottery would be useful in determining the most likely place of origin for the domestication of maize.[32] Some of the images are impressions created from molds made with real maize cobs, which as Mangelsdorf explains, "are almost as useful as actual prehistoric ears in showing us the size and shape of the ears and of their kernels."[33]

More recently, Mangelsdorf's student Mary Eubanks studied Zapotec and Moche pottery, using the representations of maize in relief, which she calls "ceramic facsimiles," to identify botanical races of the plant and to examine evidence of contact between those two contemporaneous civilizations.[34] She remarks that the reliefs "duplicate the external morphology of the botanical specimen in detail" and that "the external characters of the ear provide the basic data for identification of the races of maize depicted on the pottery."[35] Eubanks is a biologist, but her work represents a groundbreaking endeavor in the humanities as well because she analyzes maize impressions in clay to discuss scientific concerns regarding the plant's origin and evolution. Other scientists, among them George Beadle, Duccio Bonavia, Alexander Grobman, John Staller, and Paul Weatherwax, and Garrison Wilkes, in their quest to clarify certain aspects of the origin and process of domestication of maize, have also considered extant pre-Columbian and early colonial sources that shed light on the history of the plant in Mesoamerica.[36] Nevertheless, Eubanks's work stands alone in her analysis of material culture to reconstruct some aspects of the story of maize by virtually extracting, via her thorough analysis of maize impressions on pre-Columbian urns and effigy jars, the indigenous voices of Mesoamerican and Peruvian scientists who genetically manipulated the plant.

A comparison of the way scholars approach the study of the origin and development of agriculture in the New World to how their counterparts in the Old World approach it indicates that Amerindian artifacts bearing maize imagery have not been adequately studied. In the New World, with limited exceptions (including those discussed above), these artifacts have not been considered useful in reconstructing the history of the origin and development of maize. In contrast, as Terence Brown, an expert on the development of agriculture in the Old World observes, those studying the European case focus on social context, including a thorough examination of material culture.

Part of the reason for the difference is that in the Old World, scholars largely agreed from the beginning that each crop had a single origin and had been domesticated only once. In the absence of a significant debate regarding the origin and process of domestication, scholars turned to analyze the overall social context in which agricultural development occurred, and the social consequences of that development. Accordingly, discussions of the development of Old World agriculture have been dominated by debates regarding the material culture and human migrations that ensued in Europe as a result of agriculture during the so-called "Neolithic Revolution," a term coined by V. Gordon Childe in the 1930s.[37] Because of the perceived connection between technology and agriculture in Europe, Brown remarks, "it was, perhaps, inevitable that Old World agriculture would become looked on, conceptually, as part of a broader social transition, and that the inherent importance of this transition would become linked, at least in the mind of the layman, to the guns, germs, and steel of the modern day."[38]

In contrast, studies of New World agriculture, for much of the past century, have been dominated by issues regarding the origin and domestication of maize: where the wild grass was first domesticated and determining its exact identity, as well as whether domestication occurred

once or several times. As will be discussed in Chapter 2, throughout most of the twentieth century, scientists could not agree on which specific grass was the progenitor of maize or whether the plant was domesticated in Central Mexico or the Andes. Although for the most part this debate has now been resolved, scholars studying the development of agriculture in the New World continue to focus primarily, if not exclusively, on the biology and genetics of the plant itself. This has led to advanced knowledge and research on maize that far surpasses anything that has been conducted on wheat and other domesticated European crops. A negative consequence of this focus, however, is that study of the social context of agricultural development in the New World lags far behind that in the Old World. As Brown states, "The study of maize archaeology has . . . developed with an open picture of the origins of the crop and hence without any strong basis for placing those origins within the social and cultural context of communities living in the region at the appropriate time."[39]

My objective in discussing Brown's insights is not to criticize the work of prior generations of scholars but to point out that, particularly in comparison to the work that has been undertaken in regard to Old World agricultural development, there is in Mesoamerican studies a critical gap in the scholarship that must be addressed. The socio-cultural changes that occurred as a result of the development of maize agriculture have not been thoroughly studied and await closer examination. Indeed, a movement similar to the "Neolithic Revolution" in Europe almost certainly occurred in Mesoamerica. In this dissertation I follow the examples of Mangelsdorf and Eubanks and consider objects with maize and agricultural imagery in their social and scientific contexts. I seek to extract cultural and scientific references encoded in the imagery. Such focus will help to advance our understanding of the representations of plants and related imagery in the *Codex Borgia*, and in other Mesoamerican artifacts. This kind of knowledge—as the research of

Mangelsdorf and Eubanks demonstrates—can be relevant in both the humanities and the sciences.

Some scholars have lamented that indigenous people failed to make a record of their agricultural accomplishments, often insinuating that Amerindians did not understand the process of plant manipulation. For example, the botanist Paul Weatherwax, a leading researcher of maize domestication and development, notes:

> There is no avoiding the conclusion that, regardless of his other merits or faults, the Indian was a good corn breeder. He has, however, failed to pass on to the white man any details as to how he accomplished what he did. It is probable that he had no idea of how he did this or that he even realized what he was doing . . . He observed pollen as he worked in the cornfields, often made use of it in his mystic ceremonies, and probably had his own ideas about its significance to the plant, but if he knew anything about the part which it played in the development of a grain of corn, he kept the information to himself. Even the simplest of relationships between the seed and the plant which grew from it were ordinarily only vaguely understood.[40]

Wayne Smith, a leading researcher on maize's origin and development, explains: "It was the Amerindians that selected and developed *Z. mays*," but he adds, "they did not keep records of such accomplishments."[41] I argue, in contrast, that pre-Columbian Mesoamericans understood their ancestors' botanical accomplishments, and also recorded that information. My goal is to show that maize and related imagery in Nahua artifacts refers to the same historic events surrounding the maize plant as the record compiled by modern-day scientists.

Chapter 1 focuses on the *Codex Borgia* itself and the nature of the manuscript-making tradition that produced it. One of the chapter's main objectives is to show that early colonial textual sources support my argument that imagery in the *Codex Borgia* records scientific information on plants. The chapter summons questions that can broaden the discussion regarding the purpose of painted manuscripts in Nahua society. To bring attention to the fact that Central Mexican manuscripts contain botanical information, the chapter opens with my analysis of an

image in the *Florentine Codex* of a Nahua horticulturist studying a manuscript. It then proceeds with a discussion of the prevalence of painted manuscripts in Nahua society and their widespread destruction in the aftermath of the Aztec defeat in 1521. The chapter continues with a survey of the surviving corpus of pre-Columbian manuscripts. It also explains how the Nahua used manuscripts and introduces some of the most important aspects pertaining to their manufacture. Next, the chapter presents the *Codex Borgia*'s known historic record (i.e., its whereabouts in Europe after it left Mexico and before it became part of the Biblioteca Apostolica Vaticana), a thorough description of its physical aspects, and a discussion of issues pertaining to its style, provenience, and approximate date of manufacture.

Because understanding the biology and history of the domestication of maize is key to understanding the maize imagery in the *Codex Borgia*, Chapter 2 turns to the story of the origin and subsequent evolution of the maize plant as reconstructed in the scientific fields of biology and archaeology. The chapter opens with a discussion of maize imagery in the *Codex Borgia* and references in the ethnohistoric record indicating that the Nahuas deliberately manipulated the plant to yield cobs of specific colors. Next is an introduction to the biology of the maize plant, noting that the plant has male and female parts, reproduces sexually, and relies primarily on wind to spread pollen and produce cobs. In addition, Chapter 2 presents the scientific record demonstrating that indigenous groups working in Central Mexico around 6,000 BCE domesticated a common grass and, through their genetic selection and manipulation created the maize plant. The biology and history of the origin of maize, I conclude, were well known to the Nahua.

Chapter 2 introduces the scientific facts that provide a foundation for the remainder of my dissertation: that the maize plant has male and female parts and reproduces sexually (Chapter 3);

that wind is indispensible in the pollination and therefore reproduction of the maize plant (Chapter 4); and that the domestication of a wild grass into the maize plant was accomplished by the ancestors of the Nahua in early Mesoamerica (Chapter 5). In addition, Chapter 2 presents evidence from natural histories and other chronicles discussing plants, some of which were compiled starting immediately after Columbus's arrival in the Indies in 1492. Chronicles recording Central Mexican botanical accomplishments proliferated in the early colonial period because the Spanish Crown avidly sought as much information on plants as possible. These sources reveal that the Nahua had an advanced command of empirical knowledge about plants, including their origin, cultivation, and various uses. The discussion in this section of Chapter 2 therefore stresses that far from discovering it for themselves, Europeans collected and learned existing scientific information about these newly "discovered" plants from indigenous peoples.

Critical to my overall analysis of the maize imagery in the *Codex Borgia* is a close iconographic examination of page 28, which is the principal subject of Chapter 3. Page 28 is divided into five compartments, each featuring a male-female couple amid maize. In each compartment the male appears directly above the female figure. Each female wears an elaborate headdresses and jewels, but is otherwise naked. Her hair and femaleness thus emphasized evokes the silks, or female flowers, in the maize plant. Each of the male and female figures appears with costume elements of gods associated with sexuality, fertility, and maize reproduction. Significantly, Quetzalcoatl, the god of wind, the very means by which maize reproduces is prominently featured in the headdress of the female at the beginning of the page.

I argue that understanding the biology of the plant is key to decoding the relationship between maize and the rest of the iconography on this page. In each compartment fluid emanates from the male's hands flowing down to the earth and the maize plants, and from his groin

towards the female. Scholars have analyzed page 28 in some detail, but have not been able to explain the iconography. Previous studies have primarily focused on the calendrical symbols, and consequently largely ignore the imagery. The females, for example, are dismissed as "secondary" figures. However, I argue that the presence of the naked females is significant.

In sum, Chapter 3 evaluates iconographic elements (e.g., repeating themes of male-female couples amid maize plants) on page 28 that have remained unexplained in the literature. In nature, the maize plant has male (tassel) and female (silks) parts, and reproduces sexually. I contend that page 28's iconography represents the biology of the maize plant. Ethnohistoric evidence, I argue, further indicates that the Nahua understood plant sexuality. Indigenous scribes reported in early colonial chronicles that the sexual act between a male and a female produced maize. In sum, supported with iconographic, ethnographic, and scientific evidence I argue that page 28 represents the sexual reproduction of the maize plant. My observations and conclusions do not coincide with the prevailing scholarly consensus that contends that page 28 contains imagery recording astronomical cycles and/or predicting rain patterns in the Puebla and Tlaxcala region where the *Codex Borgia* is thought to have been painted.

The Nahua venerated wind. Although it is expected that agricultural societies would include gods of sun and rain in their pantheons, the inclusion of a god of wind is more difficult to comprehend. Chapter 4 addresses what may have been so significant about wind that the Nahua associated it with one of their most important gods. This chapter opens with a brief discussion of Quetzalcoatl, whose name, as we will see, indicates that he was part bird and part serpent, and presents ethnohistoric evidence that the Nahua simultaneously regarded him as a historic figure (Quetzalocoatl or Ce Acatl Topiltzin Quetzalcoatl) and as a creator god in command of wind (Quetzalcoatl or Ehecatl-Quetzalcoatl). Because the importance that the Nahua accorded to wind

in relation to pollination has not been considered in the literature, Chapter 4 calls for a wholesale reevaluation of Quetzalcoatl's significance.

Quetzalcoatl was associated with creation and featured prominently in Nahua history. Chapter 4 will address why images of Ehecatl-Quetzalcoatl appear prominently with plants in the *Codex Borgia*. I argue that Ehecatl-Quetzalcoatl was associated with themes of creation, sexuality, pregnancy, plenty, plant reproduction, sustenance, and the development of agriculture, precisely because of the role that wind plays in disseminating pollen, and thus in the reproduction of maize and other plants. Chapter 4 begins with an introduction of the scholarship to date on Quetzalcoatl. Although it is extensive, much of it focuses on the debate regarding whether he was an actual historic figure with little examination of his association with wind and agriculture. Scholars generally consider Quetzalcoatl's role in the creation and procreation of maize to be a mythological construction. Overemphasizing the importance of divination and myth within the Mesoamerican cultural milieu carries the risk of portraying Mesoamerican societies as overly concerned with what Westerners consider to be magic and superstition, rather than knowledge of real-world facts and science.

The chapter continues with a reevaluation of images and textual sources pertaining to Ehecatl-Quetzalcoatl's role in agricultural endeavors, particularly the reproduction of plants. For example, this chapter analyzes Ehecatl-Quetzalcoatl's associations with pollinating birds, feathers, flowers, and bones, which are iconographic elements in his headdress. It also addresses why, in the eighteen-page section spanning pages 29 through 46 of the *Codex Borgia*, he is depicted flying from page to page and in association with plants. I argue in Chapter 4 that the Nahua thought of Quetzalcoatl in his guise as the god of wind playing a much larger role in botanical and agricultural endeavors than is recognized in the existing scholarship.

Understanding the practical but significant role that wind plays in the reproduction of maize begins to explain why the Nahua held a god in the guise of wind in such great esteem. The chapter ends with a discussion about the frustration of the Spanish friars in their proselytizing efforts in Central Mexico. The friars could not understand how the Nahua were capable of grasping complex scientific concepts about nature but were so mistaken in believing that elements including wind and rain caused plants and nourishment to appear rather than recognizing the well-established fact, known throughout the Christian world, that God creates all sustenance.

In Chapter 5, I turn to the depictions of a grass that the Nahua called *malinalli* or broom (because they were made of grass), and argue that these convey scientific and historic information regarding the origin of maize. Some images of *malinalli* grass include bones and paper banners, both of which, I argue, connote ideas of ancestry. This chapter also points out the noteworthy similarities between the representations of maize and those of *malinalli* grass in the *Codex Borgia*, which have not yet been noted or analyzed. I contend that the Nahua understood that a common grass was the progenitor of the maize plant. This explains the grass's iconography and why in the *Codex Borgia* grass and maize bear a remarkable mutual resemblance. The etymology of the word *malinalli* further supports this contention. In this chapter, I show that in Nahuatl, the word *malinalli* is related to the word for rope. To the Nahuas, images and words related to rope evoked ideas of descent, lineage, or familial ties.

The biological, historical, and cultural links that the Nahua knew existed between *malinalli* grass and maize explain why they accorded a common grass a privileged status. Grass was a prominent accouterment of their earth and fertility gods, used in rituals and official celebrations, and the symbol of the twelfth day sign of their calendar. During the autumnal feast

Ochpaniztli (Sweeping), Toci, a goddess associated with motherhood, and whose most iconic accouterments included a broom and grass, was ritually sacrificed and the skin of her thigh made into a mask that was then worn by maize, her offspring. This feast essentially recounts through ritual performance how grass is the progenitor of maize, a plant with grass-like qualities. I further contend that the striking similarities in representations of *malinalli* grass and the maize plant, when analyzed against the scientific evidence of maize's origin and combined with references to grass in the ethnographic record, indicate that the Postclassic Nahua understood that their ancestors domesticated and manipulated a common grass, and that this is how they created the maize plant.

Chapter 5 also includes an examination of how the story of maize is interwoven with Nahua creation stories that were recorded in textual form in the early colonial period. Extant creation stories, for example those included in the *Historia de los mexicanos por sus pinturas* and the *Codex Vaticanus A*, explain how the Nahua conceptualized the creation of the world as an ongoing process; how the world was created in a series of stages (often denoted "suns" or "ages"); and how the source of nourishment for humans evolved over time. As will be discussed in greater detail in this chapter, in the first suns or ages the source of human sustenance came from wild grasses related to maize called *acicintli* and *cencocopi*. These grasses progressively evolved, so that in the present age, humans eat maize.[42] The Spaniard Fray Alonso de Molina, who in the 1550s began compiling a Nahuatl and Spanish dictionary in Mexico, translates the words *acicintli* and *acecentli* as "certain rough grasses," and *cencocopi* as "resembling the maize plant, but is not."[43] The early colonial *Codex Vaticanus A* is the only source that includes images of the "maize-like" grasses that the Nahua reported their ancestors ate, and this chapter will discuss those depictions. I conclude from an iconographic and ethnographic analysis that Nahua

creation stories are not simply myths but reflect scientific and historic information regarding the domestication of a wild grass and the development of maize as well.

In sum, I seek to show that imagery in the *Codex Borgia* reflects empirical information about the maize plant. I argue that maize was significant to the people of Mesoamerica in ways that went far beyond the economic value of the crop. In Nahua art, images of maize, Ehecatl-Quetzalcoatl, and *malinalli* grass reflect historic and scientific information about the origin, biology, and reproduction of the plant. This imagery, when studied against the ethnohistoric and scientific record of Central Mexicans' vast knowledge of plants, indicates that the Nahua in the sixteenth century understood plant sexuality and the process of pollination, and that a common grass was the progenitor of the maize plant. Therefore, the cultural significance of maize in Nahua society, as depicted in their artifacts, was rooted in scientific understanding.

Endnotes:

[1] The Spanish used the term *maíz* (maize) to refer to the plant that the Nahua called *tlaolli* or *centli* and English speakers, "corn."

[2] Screenfold is a Mesoamerican manuscript thus called because of its physical structure resembling a screen or accordion. See Chapter 1 for full discussion of this type of manuscript construction.

[3] Archaeologists have established chronological periods for Mesoamerica based on cultural development. Most scholars recognize the same periods—Archaic, Formative, and Classic—but not the exact same year ranges for each. The following chronology is adapted from Rosemary A. Joyce, "Mesoamerica: A Working Model," in *Mesoamerican Archaeology*, ed. Julia A. Hendon and Rosemary A. Joyce (Malden, MA: Blackwell, 2004), 15:

8000–1600 BCE Archaic
2400–1600 BCE Late Archaic
1600–900 BCE Early Formative (includes Initial and Late Formative)
900–300 BCE Middle Formative
400–200 CE Late Formative
100 BCE–200 CE Terminal Formative
250–1000 CE Classic (includes Early, Late, and Terminal Classic)
800–1521 Postclassic (includes Early, Middle, and Late Postclassic)

[4] The Mexican Jesuit Francesco Saverio Clavijero (1721–87) (also known by his Spanish name Francisco Javier Clavijero) is often credited with coining the term "Aztec," to refer to the people who called themselves Mexica, a Nahuatl name used to denote the tribe once it had settled in the Basin of Mexico in the fourteenth century. In the nineteenth century, the French explorer Alexander von Humboldt popularized the term. However, "Aztec" was used in the sixteenth century, and derives from the word "Aztlan," which in Nahuatl means "Place of the White Heron," and is the name of the fabled Seven Caves, known as Chicomoztoc. According to several early colonial sources including the *Codex Mendoza* (1542), the *Historia Tolteca Chichimeca* (ca. 1547), and the *Crónica Mexicana* (1598) (the first two are painted manuscripts by indigenous painter scribes that include images with glosses, and the latter one is a narrative written in Spanish by the Aztec chronicler D. Hernando Alvarado Tezozomoc), the Chichimecs—the immediate ancestors of the Aztecs—left Chicomoztoc and eventually settled the Basin of Mexico after seeing an eagle perched on a cactus growing out of a rock, which their god said would mark the place where they must settle and establish a nation. See Francesco Saverio Clavigero, *The History of Mexico. Collected from Spanish and Mexican Historians, from Manuscripts, and Ancient Paintings of the Indians*, trans. Charles Cullen (Philadelphia: Thomas Dobson, at the Stone House, 1817 [1780]), 110, 148–153; Hernando Alvarado Tezozómoc, *Crónica mexicana escrita por D. Hernando Alvarado Tezozómoc hacia el año MDXCVIII. Anotada por el Sr. Lic. D. Manuel Orozco y Berra y precedida del Códice Ramírez, manuscrito del siglo XVI intitulado, Relación del origen de los Indios que habitan esta Nueva España, según sus historias, y de un examen de ambas obras, al cual va anexo un estudio de cronología mexicana por el mismo Sr. Orozco y Berra* (Mexico City: Imprenta y Litografía de Ireneo Paz,

1878), 223; and Alexander von Humboldt, *Vue des cordillères et monumens des peoples indigènes de l'Amérique* (Paris: Librairie Grecque, Latine, Alemande, Rue des Fossés, Montmartre, 1816), 1:36–37. The historian James Lockhart explains that there are "decisive disadvantages" in using the term Aztec because, "it implies a kind of quasi-national unity that did not exist, it directs attention to an ephemeral imperial agglomeration, it is attached specifically to the preconquest period, and by the standards of the time, its use for anyone other than the Mexica (the inhabitants of the imperial capital, Tenochtitlan) would have been improper even if it had been the Mexica's primary designation, which it was not." James Lockhart, *The Nahuas After the Conquest: A Social and Cultural History of the Indians of Central Mexico, Sixteenth Through Eighteenth Centuries* (Stanford: Stanford University Press, 1992), 1.

[5] Unless otherwise noted, all translations (Nahuatl, Spanish, Italian, and Latin) are my own. Diego Muñoz Camargo writes: "En este tiempo estaba tan pujante el Imperio de los Mexicanos y señoría de Moctheuzoma, que no había otra cosa en este Nuevo Mundo, que ya su Imperio y monarquía llegaba más de trescientas leguas adelante de Quatimalla y de Nicarahua, donde el día de hoy la lengua Mexicana se trata corruptamente en las provincias" (During this time the Mexica empire and dominion were so forceful that there was nothing else in this New World. It reached more than a 300-league distance beyond Quatimalla and Nicaragua where today the broken Nahuatl [he calls it Mexican] is spoken in the provinces). Diego Muñoz Camargo, *Historia de Tlaxcala*, ed., Alfredo Chavero (Mexico City: Oficina Tipografía de la Secretaría de Fomento, 1892 [1585]), 119.

[6] *Huictli* is a Nahuatl word for "digging staff" or "hoe." According to the *Diccionario de la lengua española*, *coa*, which also means digging staff or hoe, comes from the Taino language. See "Coa," def. 1. *Diccionario de la lengua española*. 23rd ed., 2014, accessed January 25, 2014, http://www.rae.es/recursos/diccionarios/drae. In early colonial sources the word *coa* is more widely used than *huictli.* For example, Diego Durán uses the word *coa*: "todos los instrumentos de labrar las tierras, como son las coas y los palos agudos con que siembran" (all the instruments to till the lands, such as the *coas* and the sharp sticks with which they plant). Diego Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, ed. Ángel María Garibay Kintana, 3rd ed. (Mexico City: Editorial Porrúa, 2006), 1:260.

[7] The Nahuatl word *malinalli* literally means "twisted above the thigh," and denotes a type of grass that although common and wild, the Nahua held in great esteem. See Chapter 5 for full discussion.

[8] Bernardino de Sahagún, *Florentine Codex: The General History of the Things of New Spain*, trans. and ed. Charles E. Dibble and Arthur J. O. Anderson, 12 books in 13 vols. (Santa Fe: School of American Research and the University of Utah, 1953–82), bk. 11, ch. 13, 279. The *Florentine Codex*, as Kevin Terraciano explains, consists of "three texts in one, each the product of a colonial process that involved both Spaniards and Nahuas." One text is in Nahuatl, the other is in Spanish, and the third refers to images. Kevin Terraciano, "Three Texts in One: Book XII of the *Florentine Codex*," *Ethnohistory* 57 (2010): 51–72. Furthermore, Sahagún did not work alone. He collected the wealth of information in the *Florentine Codex* with abundant assistance

from some of the most learned Nahua sages, painter scribes, and informants of the sixteenth century who helped to write and paint it.

[9] Pre-Columbian means before the European explorer Christopher Columbus's arrival in the Indies in 1492, but it is usually used to refer to the time period before the Spanish conquests of Mexico and the Andes in the early sixteenth century.

[10] Sahagún, *Florentine Codex*, bk. 10, ch. 12, 42.

[11] Text from a letter to Count Antonio Pimentel in Toribio de Benavente Motolinía, *Motolinía's History of the Indians of New Spain*, ed. and trans. Francis Borgia Steck (Washington, DC: Academy of American Franciscan History, 1951), 74–75.

[12] Elizabeth Hill Boone, *Cycles of Time and Meaning in the Mexican Books of Fate* (Austin: University of Texas Press, 2006), 33. See also Charles E. Dibble, "Writing in Central Mexico," in *Handbook of Middle American Indians*, 14 vols., ed. Robert Wauchope, Gordon Ekholm, and Ignacio Bernal (Austin: University of Texas Press, 1971) 10:322–32; and Maarten Jansen, "The Art of Writing in Ancient Mexico: An Ethno-iconological Perspective," *Visible Religion: Annual for Religious Iconography* 6 (1988): 86–113.

[13] Lord Edward Kingsborough began a tradition of pre-Columbian and early colonial Mesoamerican facsimile production with his nine-volume series *Antiquities of Mexico* (see volume 3 for the *Codex Borgia*). The facsimiles featured lithograph reproductions of artist Agostino Aglio's hand-colored line paintings. Between 1896 and 1901, the American bibliophile and philanthropist Joseph Florimond, who held the papal title of the Duke of Loubat, financed a high-quality photographic facsimile reproduction, with commentaries, of eight Mesoamerican manuscripts, including the *Codex Borgia* (published in 1898). In 1976, the Akademische Druck- und Verlagsanstalt (ADEVA) in Graz, Austria, produced high-quality photographic facsimiles of the *Codex Borgia* and other Central Mexican manuscripts, each published in the screenfold format and with a commentary. Dover Publications issued in 1993 a hand-painted reproduction of the *Codex Borgia* by the artists Gisele Díaz and Alan Rodgers featuring a thorough restoration of much of the effaced imagery. In 2008, the Apostolic Library at the Vatican funded a facsimile reproduction of the *Codex Borgia*—an extraordinary edition of the highest quality that re-created the manuscript in the original indigenous screenfold format. It also featured physical aspects of the original that cannot be captured even with high-resolution photography (e.g., use of material that re-creates thickness of hide in the original, and details such as the stitching with twine to repair the tear on page 36/40). Juan José Batalla Rosado wrote the accompanying exhaustive commentary on the *Codex Borgia* and included the history, religion, and culture of pre-Columbian Mesoamericans and early colonial Mexicans, as well as their manuscript-making tradition. See Ferdinand Anders, Maarten Jansen, and Luis Reyes García, *Los templos del cielo y de la oscuridad, oráculos y liturgia: Libro explicativo del llamado Códice Borgia* (Graz, Austria: Akademische Druck- und Verlagsanstalt; Madrid: Sociedad Estatal Quinto Centenario; Mexico City: Fondo de Cultura Económica, 1993), 11–49; Juan José Batalla Rosado, *Codex Borgia*, *El Códice Borgia: Una guía para un viaje alucinante por el inframundo* (Madrid, España: Biblioteca Apostólica Vaticana, Testimonio Compañía Editorial, 2008); Boone, *Cycles of Time*

and Meaning in the Mexican Books of Fate, 1–11; and Anne Walke Cassidy, "Divination by Image: The Borgia Group of Pre-Hispanic Mexican Manuscripts," (PhD diss., Columbia University, 2004), 68.

[14] John Pohl, "Themes of Drunkenness, Violence, and Factionalism in Tlaxcalan Altar Paintings," *Res: Anthropology and Aesthetics* 33 (1998): 186–91. For discussion and bibliographical sources on the provenience of the *Codex Borgia* see Elizabeth Boone, "The Painting Styles of the Manuscripts of the Borgia Group," in *Circumpacifica: Festschrift für Thomas S. Barthel*, ed. Bruno Illius and Matthias Laubscher (Frankfurt am Main: Peter Lang, 1990), 1:35–54; and Chapter 1 of this dissertation.

[15] Gabrielle Vail and Christine Hernández, ed. *Astronomers, Scribes, and Priests: Intellectual Interchange Between the Northern Maya Lowlands and Highland Mexico in Late the Postclassic Period* (Washington, DC: Dumbarton Oaks, 2010a).

[16] Susan Milbrath, *Heaven and Earth in Ancient Mexico: Astronomy and Seasonal Cycles in the Codex Borgia* (Austin: University of Texas Press, 2013), xi. See also Susan Milbrath, "A Seasonal Calendar in the Codex Borgia," in *Cosmology, Calendars, and Horizon-Based Astronomy in Ancient Mesoamerica*, ed. Anne S. Dowd and Susan Milbrath (Boulder: University Press of Colorado, 2015).

[17] "Contiene un Calendario Histórico, ritual y astronómico lleno de ingeniosos repertorios conformes al sistema Mexicano." Abate José Lino Fábrega, *Códice Borgiano. Interpretación del Códice, Anales del Museo Nacional* (Mexico City: Museo Nacional, 1900 [ca. 1792–97]), 5:1.

[18] Robert Westman poses this as the central question guiding his book. He seeks to understand why in this cultural climate, a Polish astronomical practitioner like Nicolaus Copernicus would worry about the position of the planets. Regarding the European fixation with predicting the future, he adds: "Columbus was by no means the last discoverer to represent himself as a divine messenger heralding a new world, and he was far from the only one of Copernicus's contemporaries to be preoccupied with prophetic knowledge. Andreas Osiander, the influential Lutheran pastor who shepherded Copernicus's book through the press at Nuremburg, published in 1527 a prophecy 'not in words, but in pictures alone,' from materials appropriated from a much earlier prophecy—all meant to show the papacy's decline into tyranny, moral decay, and secular power as a powerful symptom of the end of times. And indeed, even as Galileo, Kepler, and others began to move the Coppernican arrangement into the modernizing currents of the seventeenth century's first decade, they and other heavenly practitioners retained an intense preoccupation with the future." Robert S. Westman, *The Copernican Question: Prognostication, Skepticism, and Celestial Order* (Berkeley: University of California Press, 2011), 1, 2–3.

[19] Henry Nicholson, "A Historical Review," in *Collected Works in Mesoamerican Linguistics and Archaeology*, ed. J. Eric Thompson and Francis B. Richardson (Culver City, CA: Labyrinthos, 1990), 1:xiii, xvi.

[20] Also "Indo-Aryan" and "Indo-Germanic." See Georges Dumézil, *Camillus: A Study of Indo-European Religion as Roman History*, ed. and trans. Udo Strutynski (Berkeley: University of California Press, 1980), 4.

[21] In an essay on Nahua myth, for example, Seler explains: "A large class of feminine divinities or mythological personages, who formerly were always considered earth goddesses, are to be explained more correctly from their origin as moon divinities." Seler saw this as an interpretation "afforded by a fact to which Siecke has recently directed attention in relation to Indo-Germanic mythology." Eduard Seler, "Some Remarks on the Natural Bases of Mexican Myths," in *Collected Works in Mesoamerican Linguistics and Archaeology*, ed. J. Eric Thompson and Francis B. Richardson (Culver City, CA: Labyrinthos, 1993), 4:154.

[22] Benjamin W. Fortson IV, *Indo-European Language and Culture: An Introduction*, 2nd ed. (Oxford: Blackwell Publishing, 2010), 29–30.

[23] See Eduard Seler, "The Old and New Worlds and Their Connections with Each Other," in *Collected Works in Mesoamerican Linguistics and Archaeology*, ed. J. Eric Thompson and Francis B. Richardson (Culver City, CA: Labyrinthos, 1996b), 5:151–58.

[24] See Chapter 1 for a fuller discussion.

[25] Boone, *Cycles of Time and Meaning in the Mexican Books of Fate*, 6, 11.

[26] In 1571 Fray Alonso de Molina had completed work on and published the dictionary that King Phillip commissioned him to compile to help better understand the Nahuatl language. It is a well-known and indispensable source in Mesoamerican scholarship. For the Nahuatl names and Spanish translations of these and other plants, consult the appropriate entries in Alonso de Molina, *Vocabulario de la lengua mexicana* (Leipzig, Germany: B. G. Teubner, 1880); and Sahagún, *Florentine Codex*, bk. 11.

[27] For a summary of material recovered from the Olmec site, see Ponciano Ortiz, María Del Carmen Rodríguez, Paul Schmidt, Alfredo Delgado, Lourdes Hernández, Luis Heredia, Ricardo Herrera, Eric Juárez, Jorge Bautista, César Corre, Julio Chan, Steve Nelson, and Ignacio Montes, *Proyecto Manatí. Informe final, temporada 1989* (Mexico City: Report in the Archivo Técnico del Centro Regional Veracruz, Instituto Nacional de Antropología e Historia, Veracruz, Mexico, 1989); Ponciano Ortiz and María Del Carmen Rodríguez, "Olmec Ritual Behavior at El Manatí: A Sacred Space," in *Social Patterns in Pre-Classic Mesoamerica*, ed. David C. Grove and Rosemary A. Joyce (Washington, DC: Dumbarton Oaks Research Library and Collection, 1999), 225–54; and Ponciano Ortiz and María Del Carmen Rodríguez, "The Sacred Hill of El Manatí: A Preliminary Discussion of the Site's Ritual Paraphernalia," in *Olmec Art and Archaeology in Mesoamerica*, ed. John E. Clark and Mary E. Pye (Washington, DC: Studies in the History of Art 58. National Gallery of Art, 2000), 75–94.

[28] Dorothy Hosler, Sandra Burkett, and Michael Tarkanian, "Prehistoric Polymers: Rubber Processing in Ancient Mesoamerica," *Science* 284 (1999): 1988.

[29] Michael J. Tarkanian and Dorothy Hosler, "America's First Polymer Scientists: Rubber Processing, Use, and Transport in Mesoamerica," *Latin American Antiquity* 22, no. 4 (2011): 469–86.

[30] María A. Portuondo, *Secret Science: Spanish Cosmography and the New World* (Chicago: University of Chicago Press, 2009), 2–3.

[31] "Descues de esto yo me di a saber las ciencias de Astrología y Cosmografía," see AGI, P-260, N.2, R.6, "Borrador y apuntaciones para el prólogo del libro intitulado 'Islario General,'" from note 3 in Portuondo, *Secret Science*, 3.

[32] Paul C. Mangelsdorf, *Corn: Its Origin, Evolution and Improvement* (Cambridge, MA: Belknap Press of Harvard University Press, 1974). See particularly Chapter 16, "Corn in Prehistoric Art," 187–200. See also Joaquín Meade, *Iziz Centli (El Maíz) Orígenes y Mitología. Ilustraciones de Códices y Monumentos* (Mexico City: Talleres Gráficos de la Nación, S. C. P. E. R. S., 1949). Meade's book presents scientific information (but subsequent scientific investigations have rendered it obsolete) on the domestication of maize, which he uses to argue that the plant possibly originated in the Huasteca (the area along the Gulf of Mexico).

[33] Ibid., 187.

[34] Mary Eubanks, *Corn in Clay: Maize Paleoethnobotany in Pre-Columbian Art* (Gainesville, FL: University Press of Florida, 1999).

[35] Ibid., 1.

[36] George Beadle, "Teosinte and the Origin of Maize," in *Maize Breeding and Genetics*, ed. David B. Walde, 113–28 (New York: John Wiley & Sons, 1978); Duccio Bonavia and Alexander Grobman, "Preceramic Maize in the Central Andes: A Necessary Clarification," *American Antiquity* 54, no. 4 (1989): 836–40; John Staller, *Maize Cobs and Cultures: History of Zea mays L.*, (New York: Springer Heidelberg Dordrecht, 2010), 7–84; Paul Weatherwax, *Indian Corn in Old America* (New York: MacMillan Company, 1954), 31–47; and Garrison Wilkes, *Teosinte: The Closest Relative of Maize* (Cambridge, MA: Bussey Institute, Harvard University, 1967), 3–6.

[37] See, for example, Albert J. Ammerman and Luigi Luca Cavalli-Sforza, "Measuring the Rate of Spread of Early Farming in Europe," *Man* 6 (1971): 674–88; Luigi Luca Cavalli-Sforza, Paolo Menozzi, and Alberto Piazza, *The History and Geography of Human Genes* (Princeton, NJ: Princeton University Press, 1994); Martin Richards, "The Neolithic Invasion of Europe," *Annual Review of Anthropology* 32 (2003): 135–62; Julian Thomas, "Discourse, Totalisation and the 'Neolithic,'" in *Interpretative Archaeology*, ed. Christopher Tilley, 357–94 (London: Berg, 1993); Julian Thomas, "The Cultural Context of the First Use of Domesticates in Continental Central and Northwest Europe," in *The Origins and Spread of Agriculture and Pastoralism in Eurasia,* ed. David R. Harris (London: UCL Press, 1996), 310–22; and Marek Zvelebil, "The

Social Context of the Agricultural Transition in Europe," in *Archaeogenetics: DNA and the Population History of Europe*, ed. Colin Renfew and Katie Boyle (Cambridge, England: McDonald Institute for Archaeological Research, 2000), 57–79.

[38] Terence A. Brown, "Differing Approaches and Perceptions in the Study of New and Old World Crops," in *Histories of Maize: Multidisciplinary Approaches to the Prehistory, Linguistics, Biogeography, Domestication, and Evolution of Maize*, ed. John Staller, Robert Tykot, and Bruce Benz (Walnut Creek, CA: Left Coast Press, 2009), 5. See also: Jared Diamond, "Location, Location, Location: The First Farmers," *Science* 278, no. 5341 (November 1997a): 1243–44; and Jared Diamond, *Guns, Germs, and Steel: The Fates of Human Societies* (New York: W. W. Norton & Co., 1997b).

[39] Brown, "Differing Approaches and Perceptions in the Study of New and Old World Crops," 4. Brown focuses on exploring the reasons "why there should be such a striking difference in emphasis in the New and Old Worlds."

[40] Weatherwax, *Indian Corn in Old America*, 183.

[41] C. Wayne Smith, *Crop Production: Evolution, History, and Technology* (New York: John Wiley & Sons, 1995), 5, 11-12.

[42] Ángel María Garibay Kintana, ed., *Teogonía e historia de los mexicanos: Tres opúsculos del siglo XVI*, 2nd ed. (Mexico City: Editorial Porrúa, Colección "Sepan cuantos"), 103–4, 110; Ferdinand Anders and Maarten Jansen, *Religión, costumbres e historia de los antiguos mexicanos: Libro explicativo del llamado Códice Vaticano A* (Graz, Austria: Akademische Druck- und Verlagsanstalt; Madrid: Sociedad Estatal Quinto Centenario; and Mexico City: Fondo de Cultura Económica, 1996), fol. 4v, 5v, 6r, 7r, and 7v, and for the paleography and transcriptions of the original Italian text of these folios, and their translations into Spanish, see pages 58–71.

[43] Molina, *Vocabulario de la lengua mexicana*, fols. 2r, 17r. The entries are: a) "Acicintli. lo mesmo es que acecentli" 2r; b) "Acecentli . las dichas yervas asperas" 2r; and c) "Cencocopi. zizania, que parece mata o caña de mayz, y nolo es" 17r. See Chapter 5.

CHAPTER ONE

THE CODEX BORGIA AND THE MESOAMERICAN PRE-COLUMBIAN PAINTED MANUSCRIPT TRADITION

What do we know about the manuscript painting tradition in Nahua society? Is it logical to think that the Nahua recorded scientific information pertaining to plants in their painted manuscripts? Detailed and unequivocal information regarding the pre-Columbian history, whereabouts, uses, and making of the *Codex Borgia* or any other extant Central Mexican screenfold does not exist. We do have, however, a substantial amount of general information concerning the Central Mexican manuscript-making tradition that produced the *Codex Borgia*. Close examination of that information reveals that the Nahua understood the cultivation of plants to have a scientific component beyond simple farming practices, and that they inscribed that information in their books.

Images showing manuscripts being used are rare in the extreme; nevertheless, the few extant ones are revealing. Book 10 of Fray Bernardino de Sahagún's *Florentine Codex* includes a depiction of a horticulturist sitting with a book on his lap (fig. 1.1). In the accompanying text, the horticulturist is described with the phrases *amoxmatini* and *tonalpoani*, which denote wisdom (*tlamatini*), books (*amoxtli*), reading, and interpreting (*amapoani*).[1] These qualities have been summarized in the English translation as "a knower of books."[2] Furthermore, the *Florentine Codex* differentiates the horticulturist, who is described as "a planter of seeds, a broadcaster of seeds," from the farmer who is described as a "field worker" (fig. 1.2).[3] The accompanying images show that farmers worked in the fields planting and harvesting, while horticulturists worked not just with plants but also with books. Indeed, the image of a horticulturist consulting a book demonstrates that the Nahua understood the study of plants as an intellectual endeavor,

differentiated from simple farming. It also shows that painted manuscripts from Central Mexico contain botanical information.

Repeated references to painted manuscripts in early colonial accounts indicate that in Late Postclassic society (ca. 1250–1521 CE) they were ubiquitous and esteemed artifacts, recording history, empirical concepts, belief systems, and other types of information.[4] In the opening lines of the *Historia de los mexicanos por sus pinturas* (ca. 1531), one of the earliest surviving colonial texts containing information on Nahua society, the annotator unequivocally asserts that painted manuscripts and pictorial documentation were the primary means by which the Nahua recorded significant events, stating that the creation of the world is known:

> By the characters and writings that they use, and by the account of the elders . . . gathered before me . . . [They] brought their books and figures that according to their appearance, were very old.[5]

The prologue to the *Florentine Codex* states that Nahua historical events are known: "because we have news of them by their antique paintings."[6] Bernal Díaz del Castillo, one of the soldiers who fought alongside the Spanish conquistador Hernán Cortés during the conquest and wrote a voluminous book describing their experiences, specifically recounts how the Aztec ruler Moteuczoma[7] Xocoyotzin (r. ca. 1502–20), the *huey tlatoani* or paramount ruler of Mexico Tenochtitlan, had many "books which were made of paper which they call *amal* [*amatl*],[8] and he had a great house full of these books," which held "the accounts of all the revenue that was brought to Moteuczoma."[9]

Very few indigenous manuscripts survived the destruction related to the conquest. Practically all appear to have been eventually sent to Europe. Some may have survived for a while in Mexico, perhaps hidden by indigenous peoples. Fray Diego Durán (ca. 1537–88)

explains how esteemed ancient "paintings" were to the Nahua. When he borrowed one of the surviving manuscripts from a Nahua sage, Durán says:

> He made me swear that I would return it to him. When I had given him my word that when I had copied it I would return it, he finally loaned it to me with so much ceremony and elaborate talk, and in such great secrecy, that I was astonished at the value he placed upon it. And I will affirm my belief that he stayed tenaciously with the artist until the picture was done.[10]

Cortés's first letter to King Charles V of Spain, dated July 6, 1519, includes a rather long list of valuable indigenous articles sent from Mexico to the king in Spain, among which were "two books which the Indians have."[11] Many sources compiled in the early colonial period report that government officials and Spanish priests, who immediately understood the significance of painted manuscripts to the indigenous ways of life, sought out and destroyed them in order to obliterate native religion, rituals, and belief systems.[12] Those most often singled out as leaders in burning or otherwise destroying indigenous manuscripts for their idolatrous nature are Fray Juan de Zumárraga (1468–1548),[13] who served as the first bishop and archbishop of Mexico from 1527 to 1548, and Fray Diego de Landa (1524–79), who conducted missionary work in the Maya area beginning in 1549. Landa reports: "We found a large number of books in these characters and, as they contained nothing in which there were not to be seen superstition and lies of the devil, we burned them all, which they regretted to an amazing degree, and which caused them much affliction."[14]

The indigenous peoples lamented the destruction of their painted manuscripts because they thereby lost numerous records of their histories and heritage. Some Spanish friars, who considered the manuscripts fundamental to understanding indigenous religion, and thus key to Catholic efforts to eradicate paganism in New Spain, also lamented this loss. Juan Bautista de Pomar, who in 1582 finished writing an account of the Indies commissioned by King Philip II,

reports that when Cortés and his soldiers entered Texcoco,[15] they burned the manuscripts housed at the royal libraries in King Nezahualpiltzintli's court, an event that caused their descendants to "weep with much grief for having been left as if in darkness without news or memory of their past deeds."[16]

Voicing similar sentiments, the Dominican Fray Diego Durán wrote in the 1570s:

> Those who with fervent zeal (though with little prudence) in the beginning burned and destroyed all the ancient Indian pictographic documents were mistaken. They left us without a light to guide us—to the point that the Indians worship idols in our presence, and we understand nothing of what goes on in their dances, in their market places, in their bathhouses, in the songs they chant (when they lament their ancient gods and lords), in their repasts and banquets; these things mean nothing to us. Heathenism and idolatry are present everywhere: in sowing, in reaping, in storing grain, even in plowing the earth and in building houses; in wakes and funerals, in weddings and births (especially if the child is the offspring of a nobleman, when complex rites are performed).[17]

Like Sahagún, Durán conducted extensive interviews and research with indigenous informants and came to understand the breadth of information recorded in Central Mexican painted manuscripts. Durán had a unique perspective on indigenous culture. Although he was born in Seville, Spain, he was raised in Central Mexico from a very young age—"It was there [Texcoco, Mexico] that I lost my first set of teeth," he clarifies—and lived there essentially his whole life.[18] Durán understood that the destruction of indigenous records "written down, painted in books and on long papers" signified a tremendous loss of cultural heritage:

> These paintings recorded extensive chronicles regarding the men of the past. These writings would have enlightened us considerably had not ignorant zeal destroyed them. Ignorant men ordered them burned, believing them idols, while actually they were history books worthy of being preserved instead of being buried in oblivion, as was to occur.[19]

In the remainder of this chapter, I briefly discuss the corpus of surviving pre-Columbian manuscripts. I then present information from early colonial sources relating to the many ways in which the Nahua used and manufactured painted manuscripts. Finally, I turn to a number of

topics concerning the *Codex Borgia* itself, including its archival record, physical aspects, style, provenience, and approximate date of manufacture.

The Surviving Corpus of Pre-Columbian Manuscripts

To date, only twelve undisputedly pre-Columbian Mesoamerican screenfold manuscripts are known. These have been classified into three main groups—the Borgia Group, the Mixtec Group, and the Maya Group—based on provenience and/or stylistic attributes. The *Codex Borgia* is the eponymous member of the Borgia Group, a collective name that Eduard Seler coined in 1877 to classify five of the surviving pre-Columbian manuscripts that, he argues, share a similar style, iconography, and calendrical system centered on divination.[20] They are: the *Codex Borgia*, the *Codex Cospi*, the *Codex Fejérváry Mayer*, the *Codex Laud*, and the *Codex Vaticanus B*.

Four of the surviving pre-Columbian Mesoamerican screenfolds are Mixtec: the *Codex Colombino-Becker*,[21] the *Codex Bodley*, the *Codex Vindobonensis Mexicanus 1*, and the *Codex Zouche-Nuttall*. Like the Borgia Group manuscripts, the Mixtec manuscripts are painted on hide, and the imagery often includes glyphs that denote names, places, and/or dates. The Mixtec screenfolds are the only pre-Columbian manuscripts from Central Mexico that are thought to record historical events having to do with the concerns of the nobility of the region known as the Mixteca, an area encompassing parts of modern-day Oaxaca, Puebla, and Guerrero.[22]

Three of the surviving pre-Columbian Mesoamerican screenfolds are Maya: the *Dresden Codex*, the *Madrid Codex*, and the *Paris Codex*.[23] Unlike their Central Mexican counterparts, the Maya screenfolds are painted on bark paper, not hide, and hieroglyphic writing and calendrical signs accompany the imagery. The Postclassic Maya painter scribes were clearly heirs to a

magnificent artistic tradition: the imagery in these screenfolds retains the calligraphic contour lines mastered by their celebrated ancestors, the Classic Maya painter scribes.[24]

There is disagreement about whether to include the *Aubin Manuscript no. 20* and the *Codex Porfirio Díaz* in the Borgia Group. Both are painted on animal hide, and based on similarities in style and content they could be included.[25] The *Aubin Manuscript no. 20* is pre-Columbian in date and features imagery similar to that in *Codex Borgia* pages 47 and 48 and in *Codex Vaticanus B* pages 77 and 79. However, the *Aubin Manuscript no. 20* has place names similar to those in the Mixtec manuscripts, and consequently it is often assigned a Mixtec origin.[26] Furthermore, it is not painted on a screenfold, but on a large square rectangle measuring 51 x 91 centimeters, which opens flat for viewing. The *Codex Porfirio Díaz* is early colonial in date. The manuscript contains imagery similar to that in sections of the *Codex Vaticanus B*, the *Codex Borgia*, and the *Codex Fejérváry Mayer*.[27]

The *Codex Borbonicus* is an Aztec manuscript and at least part of it may have originated in the pre-Columbian period. It is painted on bark paper and contains historical, ritual, and calendrical information. Because of its screenfold format and painting style, which does not reflect the European artistic conventions exhibited in most early colonial manuscripts, some scholars, including Ernest Théodore Hamy, Alfonso Caso, Joyce Marcus, and Juan José Batalla Rosado, consider it pre-Columbian.[28] Others, among them Jacqueline de Durand Forest, Karl Anton Nowotny, and Donald Robertson, argue that the *Codex Borbonicus* may be early colonial because of the distribution of images on each page, which they see as deliberately rendered in a manner that would allow the inclusion of glosses, an early colonial practice.[29] In 2014, the Bibliothèque de l'Assemblée Nationale, Paris (where the manuscript is currently conserved) and France's Fondation des Sciences du Patrimoine, partnered to fund a scientific investigation of the

manuscript's materials. Using the Patrimex hyperspectral imaging system, scientists expect to learn later in 2015 more about when and/or with what dyes and paper (indigenous or European) the *Codex Borbonicus* was manufactured.[30]

Although Mesoamerican artists produced all of these manuscripts, today they bear the names of their European owners or the European institutions where they once were, or are currently housed. For example, the *Codex Borgia* is named after its former owner, Cardinal Stefano Borgia (1731–1804), and the *Codex Fejérváry-Mayer* bears the combined names of two former owners, Gabriel Fejérváry (1780–1851) and Joseph Mayer (1803–86). There have been attempts by scholars—among them Gordon Brotherston, Ferdinand Anders, Maarten Jansen, and Luis Reyes García—to rename some of the manuscripts to reflect their indigenous origin. Anders, Jansen, and Reyes García, for example, have proposed to rename the *Codex Borgia* the *Codex Yaolli Ehecatl*.[31] I fully agree that, ideally, the name of each Mesoamerican manuscript should reflect its respective ethnic or geographic provenience, not its European affiliation. In the interest of avoiding confusion, however, I will follow convention and use their currently recognized European names.

Central Mexican Manuscripts and Their Uses

John B. Glass observes that "Picture writing on manuscripts of paper or animal skin is of unknown antiquity in Mesoamerica," but that the surviving evidence of polychrome paintings in more durable media (e.g., murals and pottery) "suggests that the art of manuscript painting may have been practiced as early as the Classic Period."[32] After the conquest, as part of a well-established pre-Columbian tradition—not a newly acquired one—the Nahuas continued to record information in books. As the historian James Lockhart states: "that the Spaniards had paper and

ink and used them for recordkeeping caused the Nahuas no surprise or puzzlement, for following a centuries-old Mesoamerican practice they had long been doing the same thing, and they quickly made the identification between the two traditions."[33] The Nahuas referred to their manuscripts as *amatl* (paper), *amoxtli* (book), or with the metaphoric phrase *in tlilli*, *in tlapalli*, *in amoxtli*, *in tlacuilolli* (literally, the red dye, the black dye, the book, the painting).[34] The Spaniards called indigenous books "*pinturas*" (paintings), because they recorded information in painted images and calendrical glyphs, not alphabetic text.

Central Mexican "*pinturas*" contain information on a wide variety of subjects, including plants, animals, history, genealogy, astronomy, rituals, songs, religion, mapping of migrations and geographical features, accountings and inventories of property, tribute lists, and legal information on matters such as lawsuits, marriage, and land tenure. In his second of five letters (known collectively as *Cartas de Relación*) to King Charles V of Spain, dated October 30, 1520, Cortés explains that Moteuczoma "had fortresses garrisoned with his own people, and governors and officials to collect the tributes which each province must pay; and they kept an account of whatever each one was obliged to give in characters and drawings on the paper which they make, which is their writing."[35]

According to Díaz del Castillo, Moteuczoma commissioned paintings to record recent arrivals of Spanish ships, and then showed Cortés the paintings to demonstrate how well informed he was of the Spaniards' activities. Díaz del Castillo reports that Moteuczoma told Cortés, "Only just now messengers have come to tell me that at the port where you landed there have arrived eighteen more ships and many people and horses, and they have brought it all to me painted on some cloths."[36] Moteuczoma had hoped that these newly anchored ships would help

the Spaniards leave Mesoamerica. Díaz del Castillo adds, "when Cortés heard about the ships and saw the picture on the cloth, he rejoiced greatly."[37]

The Spanish lawyer Alonso de Zorita, who lived in Central Mexico between 1556 and 1566 and wrote about indigenous thought, civics, and jurisprudence, describes other common uses of manuscripts among the Nahua: "Parents not only reared their children with much discipline and care but also gave them much good advice. Indian *principales* [leaders] have preserved these counsels in their picture writings."[38] Zorita also reports, "The judges had at their sides scribes who were very skillful painters. These parties indicated in native characters who were the parties to the suit, what it concerned, and the various claims, witnesses, and the finding or sentence."[39]

In addition to recording information on screenfold manuscripts, Nahua painter scribes also painted on cotton cloth or animal hide that lay flat and formed a single "page" ranging in size from small to very large. Carmen Aguilera notes that although the Nahua painted on cloth in the pre-Columbian period, unfortunately none of these paintings seem to have survived.[40] The Spaniards called *tira*, *mapa*, or *lienzo* those that were rolled, hung, or folded for storage. One example of the *lienzo* format is the pre-Columbian *Aubin Manuscript no. 20* (discussed above), which is painted on animal hide.

Fray Gerónimo de Mendieta, a missionary who arrived in Central Mexico in 1554, quickly understood how significant painted images were to the Nahuas in communicating information. Mendieta, like many other Catholic officials, attributed their less than impressive proselytizing record in Mesoamerica to the indigenous people's inability to relate to forms of writing other than pictographic. He therefore advocates for the use of images, which he describes as providing "a mode of preaching that is very helpful to the Indians because it conforms to their

custom; they approach all of their affairs with paintings."[41] Mendieta explains that some Catholic officials had experienced some success because they

> Had a *lienzo* painted with the articles of the faith and another one with God's ten commandments . . . and when the priests wanted to preach . . . they hung the lienzo . . . [and with] a rod similar to those used by the *alguazil* [sheriff] they pointed to the part they wanted to emphasize . . . And in this manner has been declared to them clearly and distinctly, and very much in their own custom, the Christian doctrine.[42]

Mendieta even proposes that *lienzos* with depictions of Christian doctrine be hung in indigenous children's schools to "impress it in their memories from a tender age."[43] He hopes to in this way avert what he perceives as rampant "ignorance," not what could be construed as indigenous people's desire to preserve and practice their own religion and culture.[44]

Fray Diego Durán's ethnohistoric work shows that pre-Columbian books helped to maintain the cohesiveness of indigenous communities and way of life. He said that everything "was written down, painted in books and on long papers, indicating the year, month, and date on which each event had occurred," adding: "also recorded in these painted documents were the laws and ordinances, the census, and so forth. All this was set down painstakingly and carefully by the most competent historians."[45] Nahua elders consulted books to instruct indigenous people when and how to conduct rituals. Durán recounts how the indigenous people did not hesitate to leave in the middle of mass if one of their elders announced the start of a certain activity related to their ancient customs. For example, the Nahua would not harvest the maize:

> Until the elders decide that is time to reap. I dare to swear to these things because in church I myself have heard the public announcement, all the people being present, that the time of the harvest has come. They all rush off to the fields with such haste that neither young nor old remain behind. They could have gathered the crop earlier, at their leisure; but since the old sorcerer found in his book and calendar that the day had come, he proclaimed it to the people, and they went off in great speed.[46]

When Durán reprimanded an indigenous man for partaking in the ancient feasts, he was told: "Father, do not be astonished; we are still *nepantla*," which means in between.[47] Durán, clearly exasperated, explains, "The native told me that since the people were not yet well rooted in the [Christian] faith, I should not be astonished; thus they were still neutral, meaning they neither kept one law nor the other, or better said, that they believed in God and at the same time kept their ancient customs and rites of the Devil. And that is what he meant by his abominable excuse that they were still 'in between and neutral.'"[48]

Spanish officials understood that books were instrumental in preserving indigenous traditions. Durán feared being criticized for compiling a chronicle on the Nahua because it "will revive the ancient customs and rites among the Indians."[49] Nevertheless, Durán defended his endeavor as follows: "I swear that my intention is not to instruct the Indians regarding these [pagan] things, because they are already well informed. They are so careful in hiding their papers and ancient traditions, so secretive and deceitful that they do not need an instructor!"[50]

One aspect of the venerable Nahua manuscript-making tradition, however, changed with the arrival of Europeans. The Nahuas adopted alphabetic writing, and consequently began to record information in Nahuatl, Spanish, and/or Latin script. Fray Toribio de Benavente, Motolinía, impressed with the skill and knowledge of the Nahuas, remarks "The one who teaches humans knowledge that very one provided these naturals with great ingenuity and ability, which expresses itself in all the sciences, arts, and occupations that they have learned."[51] Motolinía explains that Nahua painter scribes "learned to read rapidly our Romance Castillian language as well as Latin in script and print . . . Writing they learned in a short period of time; in a few days after they were writing and they could imitate the material placed before them or the penmanship of their teacher."[52] In spite of acquiring this new skill, however, as James Lockhart points out,

"the very word 'to write' in Nahuatl, *icuiloa*, continued to be used instead of any Spanish-influenced term."[53] Lockhart adds that *icuiloa* "meant both to paint and to write," and that there is "no firm evidence that preconquest Nahuas made any distinction of principle between the two activities" and therefore "writing always remained what it had been before the conquest, one part of a larger communication system."[54]

Furthermore, in the early colonial period, indigenous scribes and Spanish chroniclers alike relied heavily on precedent, as they routinely consulted extant pre-Columbian "paintings" to record information with images in manuscripts and/or write chronicles. John Bierhorst, who translated from the Nahuatl the *Annals of Cuauhtitlan* (ca. 1570) and the *Legend of the Suns* (ca. 1558), two of the most important chronicles compiled in alphabetic text by indigenous scribes, explains that these were likely written in part from pictographic sources, which served as "prompt books."[55] Bierhorst points out that the text of the *Legend of the Suns* demonstrates an obvious "reliance on pictures," where

> The author speaks to us as though we were looking over his shoulder, while he points to the painted figures. "This sun was 4 Jaguar," he writes; "these people . . . were blown away"; "here's when . . . "; "this is when. . . ." In places the text reads like a sequence of captions, as though the unseen pictures could carry the burden of the tale.[56]

Indeed, Nahua books were very valuable repositories of information and were relied on as trusted sources. For example, when Diego Durán asked a Nahua sage about details concerning indigenous history, the sage answered the inquiries in consultation with a painted manuscript. Durán explains:

> I questioned an Indian advanced in years, from Coatepec, who was considered a wise man in his town. This man [soon after] died of the great plague. I begged him to tell me whether what was written and painted there was true, but the Indians find it difficult to give explanations unless they can consult the book of their village. So he went to his home and brought back a painted manuscript, but

> the characters impressed me more as representations of magical things than history.[57]

Another important example of the use of pre-Columbian manuscripts as precedent during the early colonial period comes from the map-making practice that flourished in New Spain from 1577 to 1585 in response to King Phillip II's (r. 1556–98) fifty-question survey. These questionnaires were distributed among New Spain's major constituencies and requested information about the region's physical aspects and natural resources. This endeavor, known as the Relaciones Geográficas, produced 191 responses (only 167 are known), each of which consists of a map and text in a single folio, the majority executed by indigenous *tlacuiloque*.[58] Barbara Mundy has conducted extensive research on these documents and points out: "In the Relación Geográfica corpus, many of the reports coming from the cabildos [town councils] either mention their cache of 'ancient pictures' or recount histories in much the same way that they were graphically encoded in the pre-Hispanic period, thus indirectly revealing the presence of an indigenous pictorial source."[59] Mundy discusses the "experience of being trained within a community, of being exposed to pre-existing manuscripts" as "playing an important cultural role," which she explains, "linked colonial artists to their pre-Hispanic predecessors. Thus when asked to paint maps—to picture the community to itself—colonial artists had a tradition to invoke."[60] Mundy adds that "many of the native works of the Relación Geográfica corpus have an almost accretive quality about them," and that while the tradition was "always changing and growing," it nevertheless "was a work in an ongoing tradition."[61]

Despite the numerous references pointing to the breadth of information recorded in painted manuscripts, scholars tend to unduly emphasize the use of manuscripts in soothsaying practices. The *Florentine Codex* provides two images of *tonalpouque* (readers of the day signs or soothsayers[62]) consulting painted manuscripts. Book 6, of the *Florentine Codex*, titled *Rhetoric*

and Moral Philosophy, describes the *tonalpouque* as "wise men" and reports that "soothsayers studied the day signs" to inform parents of a newborn "of what sort [good or evil] the day was when the baby was born."[63] In the accompanying image, a soothsayer sits holding an open book, speaking to a woman who faces him while holding a baby (fig. 1.3). Book 4 likewise features a soothsayer holding a book, here pointing to the date 10 Rabbit (fig. 1.4). In the image, the woman who consults him sits on a reed mat and holds a baby. Beyond the reading of day signs, however, the *Florentine Codex* does not explain how the Nahua used painted manuscripts in soothsaying. Anne Walke Cassidy, who argues that the imagery in the Borgia Group manuscripts conveys divinatory messages based on the 260-day cycle, nonetheless recognizes that: "the role of the painted image in 260-day count divination is not discussed at length in any source . . . It is entirely unclear from Sahagún's account, and all other colonial accounts, what the precise role of the painted image was for the daycount specialist and client."[64]

Other images in the *Florentine Codex* demonstrate that the use of painted images was prevalent in realms other than soothsaying. For example, in Book 10 of the *Florentine Codex,* titled "The People," a singer (*cuicani*) is shown using a book (fig. 1.5). According to the text, a good singer "lifts his voice and sings clearly. He raises and lowers his voice, and composes any song from his ingenuity . . . he helps others to intone; his occupation is to compose and teach music."[65] The singer appears practicing his craft, which, as the image shows, includes the use of books. Speech scrolls symbolize oral communication (speech, song, poetry, and so on) in Nahua iconography, and are usually depicted as if coming out of people's mouths.[66] Here, however, they appear surrounding the book, implying that the singer's voice emanates from the book. This shows that for the Nahua, books stored information that could be accessed by those trained. In

the image, the man standing next to the singer is presumably there to listen, because, as the text informs, the singer "instructs others."[67]

The tradition of recording songs and/or information about music seems to predate the conquest. Book 3 of the *Florentine Codex* says that at the *calmecac* (house of learning or school), Nahua youth received a well-rounded education that included training in the art of singing "divine songs," and that these "were written in their character books."[68] In the early colonial period, numerous Nahuatl songs—for example the well-known corpus *Cantares Mexicanos* (Mexican Songs) and those that indigenous informants provided for Sahagún's *Códice Matritense*—were compiled in alphabetic text. Here is one example from the *Cantares Mexicanos* that one of the foremost scholars on the Nahuatl language, Ángel María Garibay Kintana, interprets to be in honor of a Spring god, either Cinteotl (god of maize) or Macuilxochitl (god of flowers, sexuality, and games).[69]

> I come to present myself inside the flowering enclosure
> Book that opens up is my drum
> Song my word, flower my thought
> This is what I produce . . .
> Already you have arrived, you sing here
> You arrive, painter of books
> Here, where is the flowering enclosure of the god
> Blue-green bird you rock
> Before the author of life . . .
> Red bud open up your corolla
> With it, it is intertwined . . .
> The flowering tree of our sustenance is already erect
> Delighting is there: its dew is drizzling
> With newly verdant songs
> It is full of precious tassels
> Here in Mexico . . .
> There only [in Mexico], in flowering Spring
> Among painted books it stands
> Among flowers it is moving.[70]

Fray Andres de Olmos, who soon after his arrival in the New World in 1528 began compiling information on the language and culture of the Nahua, includes in his book on grammar the word *cuique* and translates it as "master of song," suggesting that professions in musical art were well established in pre-Columbian Central Mexico.[71] Moreover, an even earlier source is Friar Toribio de Bonavente, Motolinía, who in 1524 was one of the first Catholic officials to arrive in the New World and compose chronicles about the Nahua. Motolinía observes that the Nahua "liberally recorded with symbols plainchant as well as music accompanied with instruments" in books.[72] In his later writings (from 1536 to 1541), Motolinía reports:

> Bedecked in feathers and with a bouquet of roses in their hands, the Indian lords and chiefs perform a dance and sing in their language the songs that solemnize the feast which they are celebrating. The friars have translated these songs for them and the Indian masters have put them into the meter to which the Indians are accustomed. The songs are graceful and harmonious.[73]

Book 8 of the *Florentine Codex* depicts a ruler sitting on a reed mat pointing to a painting as he discusses war strategy with one of his captains (fig. 1.6). According to the text, the ruler, having gathered his war captains, is using the painting to discuss crucial details of the campaign. The text clarifies the role of images: "Showing them the paintings [the ruler] pointed the ways that they were to follow, where the soldiers would go and how long it would take to get there, and once there where they would camp out, and he would point out the field leaders that would join them."[74] In the initial phase of the campaign, the ruler had commissioned the painting, which is essentially a survey of the land where they were about to wage war; it includes information about the most dangerous and most accessible paths. According to the *Florentine Codex*, during wartime "They brought paintings with all of this information, which was presented to the leader so that he could see the disposition of the land."[75]

The *Florentine Codex* also includes an image of a painting that a judge (*itecutlatocahoan*) uses to adjudicate a case in court (*teccalli*). Here, the text explains, "They defined and verified the complaint, they recorded it in paintings so that they might take it there to Tlacxitlan, where they informed the judges who were princes, so that their judgment might be pronounced."[76] The accompanying image does not include the scribe, but it does show the courthouse, the judge holding and studying the "painting," and the litigants discussing the merits of the case before him (fig. 1.7). Early colonial images thus emphasize more clearly the importance of the use of books in areas that include the military, history, horticulture, and jurisprudence, not astronomy and divination.

Manufacturing Pre-Columbian Central Mexican Screenfold Manuscripts

The screenfold format is a pre-Columbian Mesoamerican construction. Strikingly and uniquely different from European manuscripts, whose pages are bound on the left side so the reader can see only two pages at a time, Mesoamerican screenfolds can be viewed in many different ways. Manufacturing screenfolds involved gluing together several long strips of animal hide or paper. These usually measured different lengths, but were of approximately the same height to form an even longer strip, which was then folded back and forth, accordion-like, with the creases dividing the long strip into "pages." The front is called the obverse, and the back, the reverse. Thus, two pages, a large section, or even an entire side—obverse or reverse—can be viewed simultaneously. Regarding the manner of viewing Mesoamerican screenfolds, Peter Martyr d'Anghiera (1457–1526), a leading chronicler in the Council of the Indies under King Charles V, observes: "However one desires to view an open book, there will be two pages of writing and

below these, there will be two more; therefore, below each folio are several other folios folded underneath it, and this can be appreciated when a book is completely extended lengthwise."[77]

Scholars think that pre-Columbian screenfolds typically had wooden covers attached. Unfortunately, of all the Borgia Group manuscripts, only the *Codex Vaticanus B* retains its original wooden covers still glued to its end pages, and these were decorated with precious stones. In the upper-right corner, the front cover has a round turquoise inlay still attached; there is also a round depression in the lower-right corner and four oval-shaped ones in the center, but none of these retain their original stone inlays.[78]

After a screenfold was constructed, its obverse and reverse were covered with white gesso chalk, the base of which was most likely gypsum, to prepare it for painting. In the sixteeth century, Martyr d'Anghiera explained: "When still soft, they shape and extend the pages to their liking, and when they are hard they cover them, supposedly with gesso or some similar material."[79] Scientific testing of the *Codex Cospi*'s coloring materials has shown that its white gesso cover is indeed made of gypsum.[80]

Early colonial sources provide considerable information regarding the types of materials that the *tlacuiloque* (singular *tlacuilo*, painter-scribe) used in the manufacturing of screenfolds. These sources report of an astonishing variety of merchandise offered at the Nahua markets, where virtually every type of material artists required was available for purchase. Among the items repeatedly mentioned are hides of many different types of animals, paper, and a wide variety of dyes and pigments extracted from diverse sources in the plant, animal, and mineral kingdoms. About his experience at the great *tianquiztli* (Nahua market) in Tlaltelolco, Díaz del Castillo says: "We were astounded at the number of people and the quantity of merchandise that it contained," and he discusses seeing dealers offering various items, including "skins of tigers

and lions, of otters and jackals, deer and other animals . . . some tanned and others untanned . . . Paper, which in this country is called amal [*amatl*] . . . and much cochineal[81] [red dye extracted from insects living on cacti]."[82]

Cortés also reports about the diverse selection of materials that an artist would find available for purchase in a *tianquiztli*: "There are many sorts of spun cotton, in hanks of every color, and it seems like the silk market at Granada, except here there is a much greater quantity. They sell as many colors for painters as may be found in Spain and all of excellent hues. They sell deerskins, with and without the hair, and some are dyed white or in various colors."[83] In describing what a seller of dyes might offer at the *tianquiztli*, the *Florentine Codex* informs the following:

> Seller of colors, of various colors, of dyes; a man who piles [small baskets of color] on a large basket. He sells dried pigment, bars of cochineal pigment, cochineal mixed with chalk or flour, [pure] cochineal; light yellow, sky blue pigment; chalk, lampblack, dark blue pigment; alum, *axin*, chicle [chewing gum made from sap of trees, e.g., sapodilla], bitumen-mixed chicle, red ochre . . . a blue coloring made from blossoms.[84]

Motolinía remarks that indigenous painters extracted many of their dyes from flowers, which he cites as the reason why, when painters wanted to use the same brush but a different color, they did not hesitate to use their own mouths to clean the brush.[85] Diana Magaloni, who has conducted pioneering research on dyes, has shown that Book 11 of the *Florentine Codex* provides a "brief but significant discussion" of how the *tlacuiloque* extracted pigments from plants, animals, and/or minerals through a very specific and scientific process.[86] From such concise descriptions, Magaloni and other experts have successfully conducted experiments enabling them "to reconstruct the techniques used to make the pigments and their binders, [thus] producing a series of reference samples."[87]

Book 10 of the *Florentine Codex* describes the *tlacuiloque*'s tasks and skills concerning the manufacture and uses of coloring materials. The *tlacuiloque* would create the designs, first sketching the images with charcoal, which they proceeded to paint using the dyes that they themselves prepared.[88] Accordingly, pages 38 and 39 of the *Codex Borgia*, for example, contain images sketched in black that were never painted, confirming that the figures in this manuscript were first rendered in black outlines.

Regarding the artists themselves and specific details of how they worked, only fragmentary information exists. Reportedly, the task of the *tlacuiloque* went beyond the Western understanding of "artist." Durán, for example, reports that a *tlacuilo*'s expertise extended to other realms, including those of a historian or chronicler.[89] A few early colonial manuscripts depict *tlacuiloque* in the process of painting manuscripts. Book 11 of the *Florentine Codex*, for example, shows *tlacuiloque* painting on paper or hide (the text does not specify which), each artist holding what appears to be a reed pen or a painting knife (not a brush), held as if it were a pencil (fig. 1.8).[90] Another image in Book 11 shows a *tlacuilo* painting with a brush, which he evidently is using to paint broad strokes because of the long bristles and the manner in which he holds it (fig. 1.9).

Folio 70r of the *Codex Mendoza* features a male artist—so identified by the Spanish gloss "*pintor*" (male painter)—holding with his right hand a brush or painting knife, and with his left a rectangular cartouche with a symbol (fig. 1.10). Elizabeth Boone observes that this symbol denotes the word "day," which here is associated with a *tlacuilo* because painter-scribes painted day signs on many of the manuscripts' pages.[91] The painter is depicted facing his son, indicating that it was common practice in Nahua society for painters to train their sons to become artists. Folio 70r also features several other professionals—e.g., a carpenter, a lapidary, a metalworker,

and a master featherworker—who appear with symbols of their professions while their sons, but not their daughters, observe.

The *Codex Telleriano-Remensis* features a female artist, who is identified by name (Vichiluvitli), and as the great-granddaughter of Acamapichtli (r. 1376–95), the first *huey tlatoani* (paramount ruler) of Mexico Tenochtitlan.[92] She holds a painting knife or a very fine bristle brush (fig. 1.11). Vichiluvitli is further identified with the gloss "*la pintora*" (the female painter), demonstrating that in Nahua society at least some females pursued the profession of artist.

The *Codex Borgia* and Its Historical Record

To date, no definitive information has come to light regarding when or from where the *Codex Borgia* left Mexico, or of its whereabouts in Europe before 1795. Some have argued that it arrived in Europe as early as the sixteenth century, which may be the case, but there is very little concrete evidence supporting this view. Franz Ehrle, a prefect at the Biblioteca Apostolica Vaticana, writing the introduction to the Duke of Loubat facsimile edition of the *Codex Borgia* in 1898, cites a story frequently repeated at the Congregazione di Propaganda Fide[93] in Italy that the manuscript was saved from a fire during a 1762 *auto de fe*[94] in Mexico. That is when, according to oral tradition, Cardinal Stefano Borgia at the Congregazione obtained the manuscript.

However, Ehrle points out that this version of events cannot be reconciled with another oral tradition indicating that the manuscript was under the Congregazione's auspices before 1762.[95] Ehrle argues that the *Codex Borgia* must have been in Italy by the sixteenth century, basing his contention on the following Italian inscription found on page 68: "In queste carte sono

lidì de la setimana, verbi gracia dominica, lunez."[96] He suggests that a Mexican or a Spaniard wrote it because the inscription is written in poor Italian. Walter Lehmann, a leading linguist, echoes Ehrle's argument, adding that the writing resembles the syntax and penmanship that would have been common in the sixteenth century for a foreigner in Italy.[97]

The first confirmed historical information concerning the *Codex Borgia* is a letter dated August 30, 1795, penned by the Mexican archaeologist Antonio de León y Gama (1735–1802) to Andrés Cavo (1739–1803), a Mexican exiled in Italy. This letter mentions both the manuscript and the commentary prepared by Father José Lino Fábrega, the first commentary written on the *Codex Borgia*. The letter reads: "I reiterate to you my gratitude for your promise to send me an issue of the commentary on Cardinal Borgia's Mexican book, which I will infinitely appreciate."[98] Another letter penned by Antonio de León y Gama, dated July 8, 1796,[99] reveals that Fábrega studied the *Codex Borgia* under Cardinal Stefano Borgia's auspices, that the manuscript was by that time already being identified as "the Teoamoxtli, or Divine Book," and that it was painted "on very antique deerskin."[100] In 1796 the naturalist Etienne Borson wrote a letter to the botanist Carlo Allioni summarizing Cardinal Borgia's extensive cabinet of antiquities and natural history. In it, Borson provides brief and general information on the *Codex Borgia* including its origin (Mexico), size, and that it was painted on deerskin with images pertaining to "chronology," which Fábrega was studying.[101]

The reports of how the *Codex Borgia* had become part of Cardinal Stefano Borgia's estate are engulfed in confusion, contradiction, and vagueness. Fábrega states only:

> Among the esteemed artifacts of the ancient nations that collectively can be admired in Your Eminency's rich and erudite museum, one of them is the Mexican Codex [the *Codex Borgia*]. This rare and ancient vestige from that nation had the great fortune of escaping the flames, as its first few charred pages demonstrate; and after circulating unrecognized through plazas and cabinets in America and in Europe, it fortunately came to Your Eminency's possession, as

> you had for many years already had desired to possess an artifact from that nation.[102]

Alexander von Humboldt, who studied the manuscript a few years later, in 1805, reports that before the manuscript became Cardinal Borgia's possession it first belonged to the Giustiniani family, who owned an extensive collection of other valuable artifacts.[103] Von Humboldt relates a rather improbable story that makes a sort of hero out of Cardinal Borgia for having saved the manuscript from a fire caused by the servants' children while it was in the Giustiniani family's care.[104]

Anders et al., after analyzing Fábrega's account, conclude that Cardinal Borgia did not save the manuscript from a fire, as von Humboldt reports, but from a different fire "many centuries" ago.[105] Because Fábrega reports that the manuscript "came to Your Eminency's hands" without specifying from whom Cardinal Borgia obtained it, Anders et al. speculate that "the absence of a name or of any other precise reference" suggests that the screenfold may have been acquired through "an anonymous transfer, perhaps a gift from a person not worthy of mention, or perhaps the purchase at a marketplace, or an auction through a lowly intermediary."[106] But how did Fábrega obtain his information? Was it from Cardinal Borgia? If so, given that Cardinal Borgia surely knew how and when he obtained the screenfold in the first place, why was Fábrega so vague? And why had Cardinal Borgia been so interested in obtaining an object from Mexico, as Fábrega reports?

According to his friend Friedrich Münter, Cardinal Borgia regularly convened the greatest intellectual minds of his day at frequent gatherings at his home, where "antique artifacts [were] circulated and evaluated while current events were discussed."[107] Propagating the Christian faith across the world was the primary mission of the Congregazione, the Catholic

organization managed by Cardinal Borgia from 1798 to 1804. That mission may explain Cardinal Borgia's motives for obtaining and studying a manuscript from Mexico.

In his will dated November 22, 1804, the day before he died, Cardinal Borgia left most of his estate to the Congregazione. But he bequeathed the Museo Borgiano in his house at Velletri to his brother Cavaliere Giovanni Paolo Borgia.[108] After Cardinal Borgia's death, a legal battle regarding ownership of the *Codex Borgia* ensued between the heirs of his estate and the Catholic Church. Reportedly, the dispute arose because at the time Cardinal Borgia died, the *Codex Borgia* was in the Palazzo Altemps in Rome, and not in his house in Velletri, where it was permanently conserved. The Catholic Church ultimately won the case and retained ownership of the screenfold, housing it in the collection of the Congregazione until 1902, when the manuscript passed to the collection of the Apostolic Library, where it remains to this date.[109]

Description of the *Codex Borgia*

The *Codex Borgia* measures approximately 1,030 centimeters in length, making it the longest manuscript in the Borgia Group.[110] When completely folded, its nearly square pages can be appreciated, each measuring approximately 26.5 centimeters in width by 27 centimeters in height. The screenfold consists of 39 double-sided pages. Only 76 are painted. The two outermost pages served as the back and front covers, to which wooden panels were almost certainly attached.

Gifted artists,[111] highly skilled in the art of rendering images with precise contour lines and painting them with polychrome washes, created the magnificent *Codex Borgia*.[112] The human figure predominates in its dense imagery, although plants, trees, animals, bodies of water, day signs, architectural features, celestial bodies, shields, and various tools and accouterments

also appear prominently. The contours of the images are rendered in fine black lines, which in most instances are so delicate and precise that they resemble calligraphy. Such precision is readily apparent on virtually every page, as for example, on page 23, in the outline of the bird's beak (on the left) (fig. 1.12). Other outlines are rendered with somewhat thicker lines, but no less precision, for example, as seen in the bold lines depicting the human figure's legs (on the right) and the feathers on the outstretched wings of the bird (on the left). Sometimes lines are rendered in such a way that they evoke shading as in the narrow blue band at the base of the headdress on the figure on the right, and on the bird's claw, where diagonal lines coming from two opposite directions simulate texture.

In painting the *Codex Borgia* several vibrant colors were used, predominantly red, blue, green, turquoise, gray, and yellow, in a variety of shades and intensities. The paint was applied using several techniques, creating various effects. For instance, on page 56, which features Mictlantecuhtli (Lord of the Underworld) and Quetzalcoatl (Feathered Serpent) in profile, sitting back to back, Quetzalcoatl's beard is painted yellow and overlaid with vertical black lines, thereby conveying fluidity and texture (fig. 1.13). Mictlantecuhtli's bones are not painted a single color, but white with large yellow circles sprinkled with tiny red dots. The bones in Mictlantecuhtli's arms and legs feature what appears to be marrow, rendered as a thin oval with a blue-gray center spotted with tiny black dots.

A skilled artist (or artists) meticulously joined several leather strips to manufacture the screenfold. Some of the seams where the leather strips were joined are clearly visible; others are less conspicuous and can be detected only by very careful inspection. Physical variations and imperfections, which are natural in animal hides, have been left virtually intact. The seam on page 22, for example, is rendered even more conspicuous by the missing chunk of leather at the

top of the page, which in the seam takes the form of a small inverted triangle. Before gluing, the artist could have removed a few centimeters of the animal skin to remove this lip, but the protrusion was allowed to remain.[113]

Scholars have unanimously reported that the *Codex Borgia* screenfold is entirely of deerskin. Perhaps this began with Fábrega's claim, first voiced in the early 1790s that the manuscript was painted on deerskin,[114] which has been uncritically repeated by generations of subsequent scholars. Recently, Batalla Rosado points out that no scientific study has actually been conducted to determine the specific type of animal hide used to manufacture the screenfold.[115] Nevertheless, deerskin was a common medium for manufacturing screenfolds in Central Mexico. Book 11 of the *Florentine Codex* says that Mesoamerican "*pinturas*" (paintings) were "painted on deerskin."[116] Therefore, future research employing non-invasive scientific methods may reveal whether the *Codex Borgia* was made specifically from deerskin, or from what other material.[117]

Fábrega first reported, and all subsequent scholars have accepted, that fire damaged portions of pages 1, 2, 74, 75, 76, and the front cover of the *Codex Borgia*. Since each page has two sides, the obverse and the reverse, the pages with the burns are the front cover/76, 1/75, and 2/74. Each burn is of medium size, and in the shape of an inverted triangle located at the top and to one side of each page. Pages 75 and 76 have sustained the most loss, with almost a quarter of the imagery lost in each case.

Water or prolonged exposure to damp conditions at the Congregazione seems to have caused much of the effacing and discoloration present in a number of pages of the *Codex Borgia*. Cassidy contends that the *Codex Borgia*'s "damage matches that in the Codex Cospi exactly" and that a single sustained exposure to "sea water (or mineral-laden water from some other

source) to the same depth, for the same length of time" probably caused the discoloration in pages of both manuscripts.[118] Batalla Rosado, in contrast, argues that the damage was likely the result of various pages sticking together from the humid conditions at the Congregazione, "producing every time the manuscript was opened the loss of various images, especially along the external margins."[119] It is remarkable, however, that moisture caused the reds to bleed, whereas the other colors virtually disappeared, either without leaving a trace or blending in with the reds (e.g., page 29). Water damage to other parts of the screenfold caused large translucent silhouettes but did not efface or otherwise damage any of the imagery or disturb any of the colors (e.g., pages 5 and 6). Because the water stains and patterns of discoloration in most pages of the screenfold are not entirely consistent with damage caused by direct contact with water or even from prolonged exposure to a moist environment, the cause of the damage remains a mystery.

Other alterations and damages to the screenfold include repairs and holes of different shapes and sizes. Pages 22/54 and 40/36 have repairs made with a needle and thread. The one on page 22/54 is on the top-right corner near the tongue of the white deer on page 22; on page 54, the leftover strings from the mending thread are quite visible. On page 40/36, the damage is in the form of a large curved gash in the lower-right corner. This repair, approximately eleven centimeters long, was made with a series of horizontal stitches of brown twine. The stitching was done after the white gesso ground was applied because the twine retains its natural color, but before the pages were painted, because the *tlacuilo* has painted directly over the twine. Several pages—5/71, 6/70, 30/46, 31/45, and 33/43—have holes of different shapes and sizes, in various places; currently there is no information regarding how the screenfold was thus altered.[120]

Pages 25 and 68 of the *Codex Borgia* have alphabetic text inscriptions in European languages that obviously were added after 1521. The inscription on page 25 reads: "Ramon

Rodriguez, the salaried Mexican copied on March and April, 1856. He finished on April 19 at 9:30 in the morning."[121] Lord Kingsborough, who at the time was in the process of producing a black-and-white facsimile edition, hired Rodriguez, an artist, to copy the images from the manuscript.[122] The inscription on page 68 (discussed above), states that the imagery on the page features the days of the week. The small rectangles enclosing day signs on page 68 include Nahuatl glosses indicating their respective names, but many are now severely effaced.[123]

On the Style, Provenience, and Date of Manufacture of the *Codex Borgia*

The *Codex Borgia* is considered to be "Mixteca-Puebla" in style, a term that George C. Vaillant coined in 1938 to discuss Late Postclassic Central Mexican manuscripts, pottery, and mural painting sharing similar characteristics, including precise lines, abstraction that nevertheless incorporates some naturalism, and bright polychrome washes.[124] Analyzing style in the Postclassic period is a complex undertaking. Whereas in the Classic Period, each polity developed its own unique style, in the Postclassic the styles from different regions closely resembled one another, mostly as a result of widespread commercial and cultural exchange.[125]

Consequently, there was in the Postclassic, at least in general terms, a common style across Mesoamerica. Studies by José García Payón and Geoffrey G. McCafferty show that pottery from the Isla de Sacrificios in the Gulf Coast is "virtually indistinguishable from pottery found at UA-1 [Cholula, in modern-day Puebla, and one of the most important Postclassic economic and cultural centers]," illustrating a type of problem scholars encounter when examining Postclassic period style.[126] Nevertheless, the effort is far from futile. For example, Michael Lind's analysis of polychrome pottery from the Mixteca and the Cholula areas

demonstrates that thorough study of vessel shapes, types of tripod support, and styles of polychrome painting can reveal distinguishing characteristics of particular regions.[127]

The complexity is reflected in the difficulty in finding a fitting term to denote the style that characterizes the Postclassic period. Several alternate names besides Mixteca-Puebla have been proposed, among them, codex style, Mixteca-Popoloca, Mixtec style, horizon style, and International Style, but there is no consensus as to which term is best.[128] Eloise Quiñones Keber argues that the term "Mixteca-Puebla" may be more fitting than "codex style," which affords manuscripts an undeserved predominance over other media.[129] Noemí Castillo-Trejo rejects the all-encompassing term Mixteca Puebla, however, because it causes confusion when used to describe the great variety of pottery produced by various ethnic groups in Central Mexico. For example, she contends that the region in the Puebla-Oaxaca border was characterized by a preponderance of the Popoloca. Therefore the term "Mixteca-Popoloca," she argues, is a more appropriate term to describe the pottery produced in this particular region.[130]

In terms of the *Codex Borgia*'s provenience, most scholars agree that the evidence points to a Nahua provenience, more specifically, Puebla-Tlaxcala.[131] Much scholarly attention has focused on material culture recovered by archaeologists—in particular polychrome pottery and mural painting—featuring imagery similar in style and iconography to that in the *Codex Borgia*. For example, in the 1920s, Alfonso Caso and Eduardo Noguera excavated the Tizatlan murals in Tlaxcala, immediately noting numerous similarities with the manuscript.[132] Subsequently, several scholars have pointed out the striking resemblance between the figures of Tezcatlipoca and Tlahuizcalpantecuhtli in the Tizatlan murals and renditions of the same gods on pages 17, 21, 19, 45, 53, and 54 of the *Codex Borgia*.[133]

In the 1990s, the Ocotelolco murals and a footed polychrome ceramic plate were excavated in Tlaxcala. Scholars noted that the polychrome imagery in the Ocotelolco murals, which features Tezcatlipoca, a flint enclosure, and serpents, shares close iconographic and stylistic similarities with imagery on page 32 of the *Codex Borgia*.[134] John Pohl, for example, has discussed the similarities in the iconography and style of the Ocotelolco murals and pages 14, 17, 21, 32 and 65 of the *Codex Borgia*.[135] In addition, Pohl identifies the head depicted in the so-called Ocotelolco ceramic plate (which José Eduardo Contreras Martínez argues was a dead Tezcatlipoca because of the face painting and the closed eye) with the male figures (black Maquiltonaleque) on page 47 of the *Codex Borgia*.[136]

The 1991 excavations in Tehuacan Viejo that unearthed the so-called Mural of the Chimales suggested the Tehuacan Valley, Puebla, as a likely place of provenience for the *Codex Borgia*. Edward Sisson and Gerald Lilly argue that the iconographic and stylistic elements in the Mural of the Chimales are very similar to imagery associated with Xipe Totec on pages 2, 24, 25, 49, and 67 of the *Codex Borgia*.[137] Furthermore, as Sisson and Lilly point out, in terms of iconographic and stylistic similarities between the Mural of the Chimales and manuscript imagery, "The strongest are with the Borgia and not with any of the other members of the Borgia Group . . . or with the Mixteca historical manuscripts."[138]

In 1997, archaeologists excavating in Puebla, near the Universidad de las Américas campus, unearthed more than one hundred biconical figures that are nearly identical to those depicted on pages 27, 28, 37, 38, and 75 of the *Codex Borgia*.[139] This find provided additional support for the argument that the *Codex Borgia* was painted in Puebla-Tlaxcala. What has become clearer from comparing the *Codex Borgia* with the imagery in artifacts recovered in the Puebla-Tlaxcala region is that the manuscript has a Nahua provenience. Cecelia Klein notes that

all these "iconographic paralells" seem to indicate that the manuscript may have been "painted in an area where the principal language was Nahuatl, the language of the Aztecs."[140] In addition, Lori Diehl points out that pre-Columbian Aztec sculptures of the goddesses Cihuateteo, literally, "Divine Women" (they had died during childbirth and thus became deified) "share iconographic similarities with their pictorial counterparts," for example, on pages 47 and 48 of the *Codex Borgia* and 77 to 79 of the *Codex Vaticanus B*.[141] Diehl concludes, "the Mexica conceptualized the Cihuateteo in much the same way as the artists of these pictorials."[142]

In terms of an approximate date of manufacture, scholars generally agree that, based on style, the *Codex Borgia* was manufactured during the Late Postclassic period. The most recent scholarship has attempted to narrow the date further, arguing that the screenfold was painted in the last decades before the conquest. Susan Milbrath, for example, contends that, based on the astronomical and seasonal events she has attempted to date, "it seems likely that the codex was painted between 1496 and 1519 . . . and specific celestial events . . . point to the year 1496."[143] Through her analysis of the paint layers, Cassidy pinpoints the *Codex Borgia*'s date of manufacture to 1450–1500.[144]

Conclusion

Because the Nahua reported that horticulturists studied books, and for various other reasons that will be fully explained in Chapter 2, it is not illogical to conceive of maize and related imagery in the *Codex Borgia* as reflecting scientific information on plants. Analysis of the available evidence on the Nahua manuscript-making tradition indicates that extant pre-Columbian screenfolds can and do reflect botanical information. The physical characteristics and history of the surviving pre-Columbian screenfolds, along with the accounts written in the early colonial

period by European friars, conquerors, and indigenous nobles and scribes, provide compelling support for the conclusion that these manuscripts contain information that the Nahua deemed significant enough to record, preserve, and study. Inspecting the physical aspects of extant screenfolds shows that painter-scribes were carefully trained to produce magnificent works of art, and the care with which the paintings were executed speaks to the significance of the messages they reflect. Indigenous scribes used high-quality and long-lasting materials to paint the polychrome imagery and day sign glyphs that grace the pages of the surviving Central Mexican screenfolds. Moreover, the actions of both the Spanish friars and the Nahua themselves in the early colonial period points to the importance of the information in these documents: those who believed that the manuscripts contained messages that they regarded as dangerous sought to destroy them, and the Nahua greatly lamented the loss of the carefully crafted books that they routinely used. From various sources we also know that Central Mexican painted documents recorded information on a wide range of subjects, including horticulture, accounting, law, military, geography, rituals, and music. Of particular importance for this dissertation is the portrayal in the *Florentine Codex* of a horticulturist consulting a manuscript who is described as a "knower of books." This provides clear evidence that at least some manuscripts contained scientific information regarding plants.

Endnotes

[1] Bernardino de Sahagún, *Florentine Codex: The General History of the Things of New Spain*, trans. and ed. Charles E. Dibble and Arthur J. O. Anderson, 12 books in 13 vols. (Santa Fe: School of American Research and the University of Utah, 1953–82), bk. 10, ch. 12, 42. The phrase a*moxmatini* is composed of the words *amoxtli* "libro de escrituras" (book of writings), and *tlamatini* "embaucar a otro el hechizero" (deceive another, the sorcerer), but see also *tlamatiliz amoxtli* "arte para deprender sciencia" (art to learn science), and *tlamatiliz atoyal* "rio de sabiduria" (river of knowledge or understanding) and *tonalpoani* of *tonal* "calor del sol, o tiempo de estío," and *amapoani* "lector of relator de proceso" (reader or raconteur/interpreter of process). See Alonso de Molina, *Vocabulario de la lengua mexicana* (Leipzig: B. G. Teubner, 1880), fols. 5v, 4v, 126r, and 149r. The *Diccionario de la lengua española* defines *estío* as "Estación del año que astronómicamente principia en el solsticio de verano y termina en el equinoccio de otoño" (Year's season that astronomically begins with the summer solstice ending in the autumn solstice), see http://lema.rae.es/drae/?val=estio. For translation of *tlamatini* as "sabio" (wise one) see Bernardino de Sahagún, *Códice Florentino: El Gobierno de la República edita en facsimil el manuscrito 218–20 de la Colección Palatina de la Biblioteca Medicea Laurenziana Códice Florentino para mayor conocimiento de la historia del pueblo de México*, 3 vols. (Florence: Giunti Barbéra and the Archivo General de la Nación, 1979), bk. 10, ch. 8, fol. 19r.

[2] Sahagún, *Florentine Codex*, bk. 10, ch. 12, 42.

[3] Ibid., bk. 10, ch. 12, 41–42.

[4] For early sources on indigenous manuscripts, see: Jesuit José de Acosta, *Historia natural y moral de las Indias*, ed. Jane E. Mangan, trans. Frances M. López-Morillas (Durham, NC: Duke University Press, 2002), 339–42, 344–45; Hernán Cortés, *Hernán Cortés: Letters from Mexico*, trans. and ed. Anthony Pagden (New Haven, CT: Yale University Press, 1986), 45, 85, 109; Bernal Díaz del Castillo, *The Discovery and Conquest of Mexico, 1517–1521*, trans. Irving A. Leonard, ed. Genaro García (New York: Farrar, Straus and Cudahy, 1956), 24, 72, 157, 211, 216, 258; Diego Durán, *Book of the Gods and Rites and the Ancient Calendar*, ed. and trans. Fernando Horcasitas and Doris Heyden (Norman, OK: University of Oklahoma Press, 1971), 55, 62–67, 69, 76, 124, 293, 391, 395–99, 413, 455, 461; Toribio de Benavente Motolinía, *Motolinía's History of the Indians of New Spain*, ed. and trans. Francis Borgia Steck, (Washington, DC: Academy of American Franciscan History, 1951), 74–75, 333; Ángel María Garibay Kintana, ed., *Teogonía e historia de los mexicanos: Tres opúsculos del siglo XVI*, 2nd ed. (Mexico City: Editorial Porrúa, Colección "Sepan cuantos," 1973), 23, 102; Sahagún, *Florentine Codex*, Introductory vol., 82, bk. 10, ch. 27, bk. 1, appendix, 55, bk. 8, ch. 17; Alonso de Zorita, *Life and Labor in Ancient Mexico: The Brief and Summary Relation of the Lords of New Spain*, trans., Benjamin Keen (New Brunswick, NJ: Rutgers University Press, 1963), 86, 110, 128, 140, 174, 191, 285; and for additional bibliographical sources, including an enlightening discussion of writing in, uses of, and physical characteristics of Mesoamerican manuscripts, see Juan José Batalla Rosado, *El Códice Borgia: Una guía para un viaje alucinante por el inframundo* (Madrid: Biblioteca Apostólica Vaticana, Testimonio Compañía Editorial,

2008); and Anne Walke Cassidy, "Divination by Image: The Borgia Group of Pre-Hispanic Mexican Manuscripts," (PhD diss., Columbia University, 2004), 63–64, note 1.

[5] "Por los caracteres y escrituras de que usan, y por relación de los viejos . . . juntados ante mí y traídos sus libros y figuras, que, según lo que demostraban, eran antiguas." Garibay Kintana, ed., *Teogonía e historia de los mexicanos*, 23.

[6] "Porque por sus pinturas antiguas, ay noticia." Sahagún, *Códice Florentino*, prólogo.

[7] Instead of using Moctezuma or Montezuma, the more common Spanish forms of the Aztec ruler's name, I follow Kevin Terraciano and use Moteuczoma. Terraciano explains that the latter is the proper grammatical form of the name in Nahuatl (personal communication, June 4, 2015).

[8] Mesoamericans manufactured paper from the ficus (*amatl* or *amaquauitl*) tree's bark, and *amatl* was also the Nahuatl word for paper and/or document. "*Amatl.papel*" (*Amatl*.paper), Molina, *Vocabulario de la lengua mexicana*, fol. 4v; and Sahagún, *Florentine Codex*, bk. 11, ch. 6, 111.

[9] I changed the spelling of the Aztec ruler's name (see note 7 this chapter), which in the original Spanish is Montezuma. Díaz del Castillo, *The Discovery and Conquest of Mexico, 1517–1521*, 211.

[10] Durán, *Book of the Gods and Rites and the Ancient Calendar*, 64.

[11] Cortés, *Hernán Cortés: Letters from Mexico*, 45. Currently, there is no evidence regarding which "two books" Cortés sent to the King of Spain at this time.

[12] For primary sources on the destruction of indigenous books, see: Acosta, *Historia natural y moral de las Indias*, 339–40; Durán, *Book of the Gods and Rites and the Ancient Calendar*, 55, 395–96; Juan Bautista Pomar, *Nueva colección de documentos para la historia de México. Pomar y Zorita. Relaciones antigüas, siglo XVI* (Mexico City: Editorial Salvador Chávez Hayhoe, 1941), 4; Sahagún, *Florentine Codex*, bk. 10, ch. 29; and Zorita, *Life and Labor in Ancient Mexico*, 86, 174. For additional bibliography, and discussion of burning book practices among the pre-Hispanic Nahua and the Spaniards in New Spain during the conquest: Burr Cartwright Brundage, *A Rain of Darts: The Mexica Aztecs* (Austin: University of Texas Press, 1972), 311–12, 347–48; Joaquín García Icazbalceta, *Fray Juan de Zumárraga, Primer Obispo y Arzobispo de Méjico* (Buenos Aires, Argentina: Editora Espasa-Calpe, 1952); Michel Graulich, "Las peregrinaciones aztecas y el ciclo de Mixcóatl," *Estudios de cultura náhuatl* 2 (1974): 311–12, 347–48; and Carlos Santamarina Novillo, *El sistema de dominación azteca: El imperio tepaneca* (Madrid, España: Fundación Universitaria Española, 2006).

[13] Ironically, Zumárraga apparently brought the first printing press to Mexico. See Luna Nájera, "Contesting the Word: The Crown and the Printing Press in Colonial Spanish America," *Bulletin of Spanish Studies* 89, no. 4 (2012): 575–96.

[14] Alfred M. Tozzer, ed. *Landa's Relación de las Cosas de Yucatán* (Cambridge: Papers of the Peabody Museum of Archaeology and Ethnology, Harvard University. Vol. 18, 1941): 169.

[15] Texcoco (also Tetzcoco) was an important city in the Aztec Empire, second only to Tenochtitlan (modern-day Mexico City), the Aztec capital city built in the center of Lake Texcoco. According to various early colonial sources, the dominant Aztecs (also Tenochca or Mexica) established a close alliance with the neighboring Acolhuaque and Tepaneca; the political relationship between these three groups of Nahua people is widely known as the Triple Alliance. While the Acolhuaque built their capital city of Texcoco to the east of Tenochtitlan, the Tepaneca built their capital city of Tlacopan (modern-day Tacuba) to the west of Tenochtitlan. See note 4 in the Introduction and note 116 in Chapter 5; for fuller discussion and bibliography of primary sources see: Robert H. Barlow, "La fundación de la Triple Alianza (1427-1433)," in *Obras de Robert H. Barlow*, ed. Jesús Monjarás-Ruiz, Elena Limón, and María de la Cruz Paillés H. (Mexico City: Instituto Nacional de Antropología e Historia; and Puebla: Universidad de las Américas, 1990), 59–68; Charles Gibson, "Structure of the Aztec Empire," in *Handbook of Middle American Indians*, ed. Robert Wauchope, Gordon F. Ekholm, and Ignacio Bernal (Austin: University of Texas Press, 1971), 10:376–94; and Susan D. Gillespie, "The Aztec Triple Alliance: A Postconquet Tradition," in *Native Traditions in the Postconquest World*, ed. Elizabeth Hill Boone and Tom Cummins (Washington, DC: Dumbarton Oaks Research Library and Collection, 1998) 233–63.

[16] "Hoy día lloran sus descendientes con mucho sentimiento, por haber quedado como á escuras sin noticia ni memoria de los hechos de sus pasados." Pomar, *Nueva colección de documentos para la historia de México*, 4.

[17] Durán, *Book of the Gods and Rites and the Ancient Calendar,* 55.

[18] "Ya que no me nacieron allí los dientes, vínelos allí a mudar." Diego Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 2 vols., ed. Ángel María Garibay Kintana (Mexico City: Editorial Porrúa, 1967), 2:23.

[19] Durán, *Book of the Gods and Rites and the Ancient Calendar,* 396.

[20] Eduard Seler, "The Codex Borgia and Allied Aztec Picture Writing (Der Codex Borgia und die verwandten aztekischen Bilderschiften)," in *Collected Works in Mesoamerican Linguistics and Archaeology*, ed. J. Eric Thompson and Francis B. Richardson, 6 vols. (Culver City, CA: Labyrinthos, 1990a) 1:39–45.

[21] This manuscript became separated into two parts, but it is now understood that the first part is the *Codex Becker no. 1* (Museum für Völkerkunde, Vienna), and the second half is the *Codex Colombino* (Museo Nacional de Antropología e Historia, Mexico City), which is the only pre-Columbian remaining in its country of origin.

[22] For information and bibliography on Mixtec manuscripts, see: Elizabeth Hill Boone, *Stories in Red and Black: Pictorial Histories of the Aztecs and Mixtecs* (Austin: University of Texas Press);

Bruce Byland and John Pohl, *In the Realm of 8 Deer: The Archaeology of the Mixtec Codices* (Norman, OK: University of Oklahoma Press); Alfonso Caso, *Reyes y reinos de la mixteca*, 2 vols. (México City: Fondo de Cultura Económica, 1979); Pedro Carrasco, "Social Organization of Ancient Mexico," in *Handbook of Middle American Indians*, 14 vols., ed. Robert Wauchope, Gordon Ekholm, and Ignacio Bernal (Austin: University of Texas Press) 10:349–75; Jill L. Furst, *Codex Vindobonensis Mexicanus I: A Commentary* (Albany: State University of New York, Institute for Mesoamerican Studies, SUNY, 1978a); Mark B. King, "Poetics and Metaphor in Mixtec Writing," *Ancient Mesoamerica* 1, no. 1 (1990): 141–51; John Monaghan, "Performance and the Structure of the Mixtec Codices," *Ancient Mesoamerica* 1, no. 1 (1990): 113–40; and Mary Elizabeth Smith, *Picture Writing from Ancient Southern Mexico: Mixtec Place Signs and Maps* (Norman, OK: University of Oklahoma Press).

[23] A fourth Maya manuscript would be the *Grolier Codex*, but I do not include it because its authenticity is currently being debated. The manuscript was reportedly found in a cave in Chiapas and it was initially thought, because of its style, to have been painted in the colonial period with Central Mexican influences. See Jose Luis Ruvalcaba, Sandra Zetina, Helena Calvo del Castillo, Elsa Arroyo, Eumelia Hernández, Marie Van der Meeren, and Laura Sotelo, "The Grolier Codex: A Non Destructive Study of a Possible Maya Document using Images and Ion Beam Techniques," *Materials Research Society Proceedings*, 1047 (2007): 1–8; and John Carlson, "The Grolier Codex: A Preliminary Report on the Content and Authenticity of a Thirteenth-Century Maya Venus Almanac," in *Calendars in Mesoamerica and Peru: Native American Computations of Time*, ed. Anthony F. Aveni, and Gordon Brotherston (Oxford: British Archaeological Reports Press, 1983), 27–57.

[24] For information and bibliography on Maya manuscripts, see: Michael Coe and Justin Kerr, *The Art of the Maya Scribe* (New York: Harry N. Abrams Publishers, 1997); Christine Hernández and Gabrielle Vail, "A Case for Scribal Interaction: Evidence from the Madrid and Borgia Group Codices," in *Astronomers, Scribes, and Priests: Intellectual Interchange Between the Northern Maya Lowlands and Highland Mexico in Late Postclassic Period*, ed. Gabrielle Vail and Christine Hernández (Washington, DC: Dumbarton Oaks, 2010), 333–68; Eric Thompson, *A Commentary on the Dresden Codex: A Maya Hieroglyphic Book* (Philadelphia: Memoirs of the American Philosophical Society, vol. 93, 1972); Alfred Tozzer, *A Comparative Study of the Mayas and the Lacandones: Report of the Fellow in American Archaeology* (New York: Macmillan, 1907); and Gabrielle Vail and Christine M. Hernández, *Resource Guide to the Madrid Codex: The Calendrics, Iconography, and Hieroglyphic Texts* (Palmetto, FL: Ms. On File at Florida Institute for Hieroglyphic Research, 2002).

[25] Ferdinand Anders, Maarten Jansen, and Peter van der Loo, *Calendario de pronósticos y ofrendas: Libro explicativo del llamado Códice Cospi* (Graz, Austria: Akademische Druck- und Verlagsanstalt; Mexico City: Fondo de Cultura Económica, 1994), 46; Elizabeth Hill Boone, *Cycles of Time and Meaning in the Mexican Books of Fate* (Austin: University of Texas Press, 2006), 213–14; José Alcina Franch, *Códices Mexicanos, Colección Lenguas y Literaturas Indígenas* (Madrid: Editorial MAPFRE, 1992), 165–78; and Maarten Jansen, "La fuerza de los cuatro vientos. Los manuscritos 20 y 21 del fonds mexicaine," *Journal de la Société des Américanistes*, 84, no. 2 (1998), 125. John Pohl only includes the *Aubin Manuscript no. 20*. See

John Pohl, *Codex Borgia: Notebook for the Aztec-Mixtec Pictographic Writing Workshop at Texas* (Austin, Texas: 6th Mixtec Codex Studies Group, 1997).

[26] See Alfonso Caso, *El culto al sol: Notas a las interpretación de Walter Lehmann, Traducciones Mesoamericanistas* (Mexico City: Sociedad Mexicana de Antropología, 1966) 1:177–90; John B. Glass, "A Census of Native Middle American Pictorial Manuscripts," in *Handbook of Middle American Indians*, ed. Howard Cline (Austin: University of Texas Press, 1975a) 14:90–91; Henry B. Nicholson, "The Problem of Provenience of the Members of the 'Codex Borgia Group': A Summary," in *Summa antropológica en homenaje a Roberto J. Weitlaner*, ed. Antonio Pompa y Pompa (Mexico City: Instituto Nacional de Antropología e Historia, 1966), 145–58; and Martine Simonin, "De los puntos cardinales en el Códice Aubin núm. 20," *TRACE: Travaux et Recherches dans les Amériques du Centre d'Études Mexicains et Centroaméricaines* 16 (1989), 131–46.

[27] Eva Hunt, "The Provenience and Contents of the Porfirio Díaz and Fernandez Leal Codices: Some New Data and Analysis," *American Antiquity* 43, no. 4 (1978): 673–90; and Bas van Doesburg, "The Codex Porfirio Díaz and the Map of Tutepetongo: The Curious Relationship Between Pictography and Glosses in Oaxacan Screenfolds," *Ethnohistory* 48, no. 3 (2001): 403–32.

[28] For further discussion of and extensive bibliography on the *Codex Borbonicus*, see: Ferdinand Anders, Maarten Jansen, Luis Reyes García, *El Libro del ciuacoatl: Homenaje para el año del fuego nuevo. Texto explicativo del llamado Códice Borbónico* (Mexico City: Fondo de Cultura Económica, 1991), 27–32; Juan José Batalla Rosado, "Datación del Códice Borbónico a partir del análisis iconográfico de la representación de la sangre," *Revista Española de Antropología Americana* 24 (1994): 47–74; and Henry B. Nicholson, "The Provenience of the Codex Borbonicus: A Hypothesis," in *Smoke and Mist: Mesoamerican Studies in Memory of Thelma Sullivan*, ed. J. Kathryn Josserand and Karen Dakin (Oxford, England: B. A .R. Press, 1988), 77–87.

[29] Karl Anton Nowotny and Jacqueline de Durand-Forest, *Codex Borbonicus* (Graz, Austria: Akademische Druck- und Verlagsanstalt, 1974); and Donald Robertson, *Mexican Manuscript Painting of the Early Colonial Period* (Norman, OK: University of Oklahoma Press, 1959), 86–93.

[30] Vahé Ter Minassian, "Les mystères d'un trésor aztèque au Palais-Bourbon." *Le Monde*, October 8, 2014, http://www.lemonde.fr/sciences/article /2014/10/06/azteques-un-calendrier-hors-du-temps_4501308_1650684.html.

[31] Ferdinand Anders and Gabina Aurora Pérez Jiménez, "Renaming the Mexican Codices," *Ancient Mesoamerica* 15 (2004): 270; Gordon Brotherston, *Painted Books from Mexico: Codices in UK Collections and the World They Represent* (London: British Museum Press, 1995); and Gordon Brotherston, *The Book of the Fourth World: Reading the Native Americans Through Their Literature* (London: Cambridge University Press, 1992).

[32] John B. Glass, "A Survey of Native Middle American Pictorial Manuscripts," in *Handbook of Middle American Indians*, ed. Howard Cline (Austin: University of Texas Press, 1975b), 14:3.

[33] James Lockhart, *The Nahuas After the Conquest: A Social and Cultural History of the Indians of Central Mexico, Sixteenth Through Eighteenth Centuries* (Stanford: Stanford University Press, 1992), 326.

[34] Sahagún, *Florentine Codex*, Bk. 10, ch. 29, 191.

[35] Cortés, *Hernán Cortés: Letters from Mexico*, 109.

[36] Díaz del Castillo, *The Discovery and Conquest of Mexico, 1517–1521*, 258.

[37] Ibid.

[38] Zorita, *Life and Labor in Ancient Mexico*, 140.

[39] Ibid., 128.

[40] "Hasta la fecha, no se conoce lienzo prehispánico alguno; sin embargo, hubo mapas en este formato." Carmen Aguilera, *Códices de México* (Mexico City: D. R. Consejo Nacional de Ciencia y Tecnología, 2001), 27. Information regarding this practice in pre-Columbian Mesoamerica is very limited and can only be reconstructed through references and surviving examples from the early colonial period.

[41] "Un modo de predicar muy provechoso para los indios por ser conforme al uso que ellos tenían de tratar todas sus cosas por pintura." Fray Gerónimo de Mendieta, *Historia eclesiástica indiana* I, (Mexico City: Cien de México, 2002), 402.

[42] "Hacían pintar en un lienzo los artículos de la fe, y en otro los diez mandamientos de Dios . . . Y cuando el predicador quería predicar de los mandamientos, colgaban el lienzo de los mandamientos junto a él, a un lado, de manera que con una vara de las que traen los alguaciles pudiesen ir señalando la parte que quería. Y así les iba declarando los mandamientos. Y lo mismo hacía cuando quería predicar de los artículos, colgando el lienzo en que estaban pintados. Y de esta suerte se les declaró clara y distintivamente y muy a su modo toda la doctrina Cristiana." Ibid., 402.

[43] "Y no fuera de poco fruto si en todas las escuelas de los muchachos la tuvieran pintada de esta manera, para que por allí se les imprimiera en sus memorias desde su tierna edad" (And it would be fruitful if in all the children's schools they would have it painted in this manner, so that through it we may imprint it in their memories from a tender age). Ibid., 403.

[44] "Y no hubiera tanta ignorancia como a veces hay por falta de esto" (And there would be no such rampant ignorance as it is seen at times for lack of this [painted information with Catholic teachings]). Ibid.

[45] Durán, *Book of the Gods and Rites and the Ancient Calendar*, 396.

[46] The English translation reads "book or almanac," but in the original it is "libro y calendario." I therefore made a slight change in the translation. See Durán, *Book of the Gods and Rites and the Ancient Calendar*, 397; and Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 1:227.

[47] "—Padre, no te espantes, pues todavía estamos *nepantla*." Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 1:237.

[48] "Torné a insister me dijese qué medio era aquel en que estaban. Me dijo que, como no estaban aún bien arraigados en la fe, que no me estantase; de manera que aún estaban neutros, que ni bien acudían a la una ley, ni a la otra, o por major decir, que creían en dios y que juntamente acudían a sus costumbres antiguas y ritos del demonio, y esto quiso decir aquel en su abominable excusa de que aún permanecían 'en medio y era neutros.'" Ibid.

[49] Durán, *Book of the Gods and Rites and the Ancient Calendar*, 411.

[50] Ibid.

[51] "El que enseña al hombre la ciencia, ese mesmo proveyó y dió á estos naturales grande ingenio é habilidad, la cual habilidad parece por todas las ciencias, artes é oficios que les han enseñado." Toribio de Benavente Motolinía, *Memoriales*, ed. Luis García Pimentel (Mexico City: En Casa del Editor, 1903), 160.

[52] "Deprendieron á leer brevemente, ansí nuestro romance castellano como el latin, y de tirade y letra de mano . . . El escribir se enseñaron en muy breve tiempo, porque en pocos dias que escriben, luego contrahacen la materia que les dan, y la letra de su maestro." Motolinía reports about a young man from Texcoco who was given a sample of a bulla (Papal written order) and he copied it exactly; some Spaniards took it to Spain to show what they thought was an outstanding feat. Here is the full quote: "por muestra una bula, y sacóla tan al natural, que la letra que hizo parecia el mesmo molde, porque el primer ringlon era de letra grande, y bajo sacó la firma, ni más ni menos, y un Jesus con una imágen de Ntra. Sra: todo lo sacó tan al propio, que parecia no haber diferencia del molde á la otra, y por cosa notable y prima la llevó un español á Castilla para la mostrar. Letras grandes quebradas y griegas de grandes maestros, é ansimismo á veces de molde letra grande, como las pongan en cualquier escuela, luego hay muchachos que las sacan tan contrahechas, que no hay quien juzgue haber diferencia entre la muestra ó en las que de Nuevo sacan." Motolinía, *Memoriales*, 177.

[53] Lockhart, *The Nahuas After the Conquest*, 327. See also Elizabeth Hill Boone, "Ruptures and Unions: Graphic Complexity and Hybridity in Sixteenth-Century Mexico," in *Their Way of Writing: Scripts, Signs, and Pictographies in Pre-Columbian America*, ed. Elizabeth Hill Boone and Gary Urton (Washington DC: Dumbarton Oaks Research Library and Collection, 2011), 204–19.

[54] Lockhart, *The Nahuas After the Conquest*, 328.

[55] John Bierhorst, ed. and trans., *History and Mythology of the Aztecs: The Codex Chimalpopoca* (Tucson: University of Arizona Press, 1992a), 3. See also Miguel León-Portilla, "La riqueza semántica de los códices mesoamericanos," *Estudios de cultura Náhuatl* 43 (2012): 144–46.

[56] Ibid., 7.

[57] Durán, *Book of the Gods and Rites and the Ancient Calendar*, 64–65.

[58] The Nettie Lee Benson Latin American Collection, the University of Texas at Austin, accessed April 6, 2015, https://www.lib.utexas.edu/benson/rg/.

[59] Barbara Mundy, *The Mapping of New Spain: Indigenous Cartography and the Maps of the Relaciones Geográficas* (Chicago: Chicago University Press, 1996), 92.

[60] Ibid., 97.

[61] Ibid.

[62] Sahagún, *Florentine Codex*, bk. 4, ch. 14, 54; and bk. 6, ch. 36, 197.

[63] Ibid.

[64] Cassidy, "Divination by Image," 230.

[65] "Alza la voz y canta claro, levanta y baja la voz, y compone cualquier canto de su ingenio . . . entona a los otros, ocúpase en componer y en enseñar la música, y antes que cante en public primero se ensaya." Sahagún, *Florentine Codex*, bk. 10, ch. 8, 29.

[66] See, for example, folios 62r through 71r of the *Codex Mendoza*. Folio 70r features a man with speech scrolls emitting from his mouth, and the accompanying gloss decribes him as a "father who counsels his son." Translation taken from: Frances F. Berdan and Patricia Rieff Anawalt, *The Essential Codex Mendoza* (Berkeley: University of California Press, 1997), 145. For thorough discussion of speech scrolls in Mesoamerican iconography see: Stephen D. Houston, David Stuart, and Karl Taube, *The Memory of Bones: Body, Being, and Experience among the Classic Maya* (Austin: University of Texas Press, 2006, 153–63.

[67] Sahagún, *Florentine Codex*, bk. 10, ch. 8, 29.

[68] "Que se llamavan divinos cantos: los quales versos estavan escritos en sus libros por carácteres." Sahagún, *Códice Florentino*, bk. 3, ch. 8, fol. 39v.

[69] Ángel María Garibay Kintana, ed., *Poesía Náhuatl II. Cantares mexicanos. Manuscrito de la Biblioteca Nacional de México* (Mexico City: Universidad Nacional Autónoma de México, 1965), LXXXII-LXXXIII.

[70] Ibid., 20. The original in Nahuatl is:
Ni ya noquetzaco Aya
Xochiithualla itic Ayahue
Amoxtli in cueponi
Ye no huehueh Huiya
Cuicatl notlatol Aya
Xochitl in notlayocol
In nocon ya chihua in . . .
Zan ti ya yecoc
Ye nican toncuica
Amoxtlacuilo tihuitz Huiya
In teotl in xochithualli manican Ohuaya Ohuaya
Timoxiuhquechol tzetzelohua
Ipalmemohua ah.
Zan tlapalxilotl on cuepntihuiz Huiya
Ic on malintihuitz quetzalizquixochitl . . .
Tonacaxochincuahuitl a on icac Aya
A oncan ye moch ahuia ahuachtzetzeliuhticac Aya
On ceceliztica on quetzalmiyahuayoticac Aya
Mexico ye nican Aya . . .
Zan ye oncan oh in xochin quiapan yehuan
In tlacuilocalitic oncan ya icac Ah
Xochinolinticatca Ohuaya Ohuaya.

[71] "*Amatl*, papel," "*cuique*, señor del canto," and "*tlacuilo*, escriuano." Fray Andrés de Olmos, *Arte para aprender la lengua mexicana*, ed., Rémi Siméon (Mexico City: Edmundo Aviña Levy, 1972 [1547]), 21, 37, and 56. With regard to music, as is well known the Nahua had various musical instruments including flutes and drums. An entry in Molina's sixteenth century Nahuatl dictionary, *nauhtecuicatl* is translated as "song accompanied with instruments." See "Nauhtecuicatl.canto de organo." Molina, *Vocabulario de la lengua méxicana*, fol. 63v.

[72] "Pautaban y apuntaban muy liberalmente ansí canto llano como canto de órgano, con sus letras grandes en los principios, y no van á buscar quien se los encuadernen, que también han deprendido á encuadernar. Motolinía, *Memoriales*, 176.

[73] Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 1:20, 142.

[74] "Y mostrandoles la pintura, señalavales los caminos, que avian de llevar por donde avian de yr los soldados: y enquantos dias avian de llegar, y donde avian de assentar los reales, y señalavales los maestros de campo, que avian de llevar." Sahagún, *Códice Florentino*, bk 8, ch. 17, fol. 32r.

[75] "Los pasos peligrosos y los pasos por donde seguramente podían entrar; y todo lo traían pintado, y lo presentaban al señor para que viese la disposición de tierra." Ibid.

[76] Sahagún, *Florentine Codex*, bk. 8, ch. 17, 55.

[77] "Por donde quiera que se mire el libro abierto, se presenta dos caras escritas; aparecen dos páginas, y se ocultan bajo ella otras dos como no se extienda a lo largo, pues debajo de un folio hay otros muchos folios unidos." Pedro Mártir de Anglería, *Décadas del Nuevo Mundo* (Madrid: Ediciones Polifemo, 1989), 279.

[78] Cassidy, "Divination by Image," 124–25.

[79] "Cuando están blandas, les dan la forma que quieren y la extienden a su arbitrio, y luego de endurecida la cubren, se supone que con yeso o con alguna materia parecida." Anglería, *Décadas del Nuevo Mundo*, 279.

[80] See Giorgio Gasparotto and Giovanni Valdrè, "Indagini Conoscitive sul Supporto Scrittorio del Codice Cospi," in *Cadendario e rituali precolombiani: Codice Cospi*, ed. Laura Laurencich Minelli (Milan: Editoriale Jaca Book, 1992); and Costanza Miliani, Davide Domenici, C. Clementi, F. Presciutti, Francesca Rosi, D. Buti, A. Romani, Laura Laurencich Minelli, and A. Sgamellotti, "Colouring Materials of Pre-Columbian Codices: Non-Invasive In Situ Spectroscopic Analysis of the *Codex Cospi*," *Journal of Archaeological Science* 39 (2012): 676. In 1992, Giorgio Gasparotto and Giovanni Valdrè scientifically tested a piece of the *Codex Cospi*, and determined that the screenfold ground cover is made of gypsum. Subsequently, in 2012, Constanza Miliani and a team of experts analyzed the *Codex Cospi*'s coloring materials using non-invasive spectroscopic techniques identified "gypsum as the main component of the ground layer on both sides."

[81] For discussion of cochineal see Diana Magaloni, "Painters of the New World: The Process of Making the *Florentine Codex*," in *Colors Between Two Worlds: The Florentine Codex of Bernardino de Sahagún*, ed. Gerhard Wolf and Joseph Connors (Florence: Villa I Tatti The Harvard University Center for Italian Renaissance Studies, 2011), 57.

[82] Díaz del Castillo, *The Discovery and Conquest of Mexico, 1517–1521*, 215–16.

[83] Cortés, *Hernán Cortés: Letters from Mexico*, 104.

[84] Sahagún, *Florentine Codex*, bk. 10, ch. 21, 77.

[85] "Muchos colores hacen los indios de flores, y cuando los pintores quieren mudar el pincel de una color en otra, con la boca limpian el pincel, por ser las colores de flores." (The Indians manufacture a variety of colors from flowers, and when painters want to use the same brush but use a different color, they clean their brushes with their mouth because the colors are made of flowers). Motolinía, *Memoriales*, 160.

[86] Magaloni, "Painters of the New World," 57.

[87] Ibid., 59–60.

[88] "El pintor, en su oficio, sabe usar de colores, dibujar o señalar las imágenes con carbón, y hace muy buena mezcla de colores, y sábelos moler muy bien y mezclar." (The painter-scribe, in his work, knows how to use colors, to draw or mark the images with charcoal and he makes a good mix of colors and he knows how to grind them and mix them very well). Sahagún, *Códice Florentino*, bk. 10, ch. 8, fol. 8r.

[89] Durán describes painters as "excelentísimos historiadores que, con estas pinturas, componían historias amplísimas de sus antepasados." Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 226.

[90] Boone mentions reed pens, but she does not provide a detailed discussion of the instrument. See Boone, *Stories in Red and Black*, 24; and Naoto Okaichhi, Henry Johan, Takashi Imagire, and Tomoyuki Nishita, "A virtual painting knife," *Visual Comput* 24 (2008): 753–63, who report "Using a painting knife, it is possible to paint thickly, paint flat using the blade face, or draw a fine line using the edge of the blade."

[91] Boone, *Stories in Red and Black*, 35. See image and gloss in the *Codex Mendoza* fol. 19r.

[92] Eloise Quiñones Keber, *Codex Telleriano-Remensis: Ritual, Divination, and History in a Pictorial Aztec Manuscript* (Austin: University of Texas Press, 1995), fol. 30v.

[93] An organization of the *Sancta Sedes* or the Holy See (the administrative entity overseeing the diplomatic and ecclesiastic affairs of the Catholic Church), founded in 1622 by Pope Gregory XV to encourage proselytizing efforts throughout the world. See Nikolaus Kowalski and Josef Metzler, *Inventory of the Historical Archives of the Sacred Congregation for the Evangelization of Peoples or* "*De Propaganda Fide*" (Rome: Pontifica Universitas Urbaniana, 1983).

[94] Literally "act of faith," a term used to describe the public execution or destruction by fire of a person or object during the Catholic Inquisition as a form of punishing and denouncing heresy.

[95] Franz Ehrle, *Il Manoscritto Messicano Borgiano del Museo Etnográfico della S. Congregazione di Propaganda Fide*, *Riprodotto in fotocromografia a spese di Duca di Loubat a cura della Biblioteca Vaticana* (Rome: Stabilimento Danesi, 1898).

[96] In these cards are the days of the week, for example, Sunday, Monday. Ehrle, *Il Manoscritto Messicano Borgiano del Museo Etnográfico della Sacra Congregazione di Propaganda Fide*, 8.

[97] Walter Lehmann, "Les Peintures Mixtéco-Zapotèques et Quelques Documents Apparentés," *Journal de la Société des Américanistes* 2, no. 2 (1905): 252. Lehmann declares on page 252, footnote 1 that "Des études minutieuses m'ont donné la conviction que les Codices les plus importantes sont venus en Europe au courant du XVI siècle" (Painstaking studies have provided

me with the conviction that the most important codices came to Europe in the sixteenth century), but does not cite such studies or give further details.

[98] "Repito a V. mi agradecimiento por el Nuevo favor que me promete, de mandarme un exemplar de la explicación del libro mexicano del Cardenal Borja, lo que apreciare infinito." Ferdinand Anders, Maarten Jansen, and Luis Reyes García, *Los templos del cielo y de la oscuridad, oráculos y liturgia: Libro explicativo del llamado Códice Borgia* (Graz, Austria: Akademische Druck- und Verlagsanstalt; Madrid: Sociedad Estatal Quinto Centenario; Mexico City: Fondo de Cultura Económica, 1993), 16–22.

[99] The original Antonio de León de Gama letters and other related documents are housed at the Archivo Generale della Compagnia di Gesù in Rome, in Vitae 1005 (Epistulae scriptae ab ex-Iesuitis vel Mexicanis in Italia vel ad illos, 1774–1819). Regarding various aspects of these archives, consult Anders, et al., *Los templos del cielo y de la oscuridad, oráculos y liturgia: Libro explicativo del llamado Códice Borgia*, 16–18; Kowalski and Metzler, *Inventory of the Historical Archives of the Sacred Congregation for the Evangelization of Peoples or "De Propaganda Fide"*; Edmond Lamalle, "L'archivo generale di un grande ordine religioso: Quello della Compagnia di Gesù," *Archiva Ecclesiae Archiva Ecclesiae* 24–25, no. 1 (1981–82): 89–120; and Lajos Pásztor, *Guida delle fonti per la storia dell'America Latina negli archivi della Santa Sede e negli archivi eccelsiastici d'Italia* (Rome: Vatican, 1970).

[100] "El Teoamoxtli, o Libro Divino" and "en piel de Venado muy antiguo." Abate José Lino Fábrega, *Códice Borgiano. Interpretación del Códice, Anales del Museo Nacional* (Mexico City: Museo Nacional, 1900 [ca. 1792–97]), 5:1.

[101] This is the whole entry: "Neuvieme Classe des Monumens Mexiquains. N. 1 Beaucoup d'Idoles en bois et en terre cuite. N. 2. Un Manuscrit Mexicquain de peau de Cerf, peint des deux cotés, Dela longueur de 45 *palmi romani*. Ce monument précieux de la Chronologie de ces peoples fournit la matiere à un ouvrage que travaille actuellement M. L'abbé *Linus* Joseph Fabrega Mexicain, pour son explication" (New class of Mexican artifacts. Many idols in wood and in terra-cotta. A Mexican manuscript in deerskin, painted on both sides, measuring 45 Roman palms in length. This precious artifact documenting the chronology of these people is the subject of a work currently being conducted by Abbot Linus Joseph Fábrega, for its explanation). Etienne Borson, *Lettre á M. le medecin Allioni Professeur émérite de botanique, a l'Université Royale de Turin, Directeur du Jardin public des plantes, et member des plus célébres académies de l'Europe, sur les beaux arts et en particulier, sur le cabinet d'antiquités et d'histoire naturelle de S. E. Monseigneur le Cardinal Borgia a Velletri. Par l'Abbé Etienne Borson, Docteur en Théologie, Doyen de la Collégiale de Chamoux, et membre de l'Académie des Beaux Arts de Florence* (Rome: National Library of Naples, 1796), 39.

[102] "Entre los apreciables monumentos de las Naciones más antiguas que reunidos se admiran en el rico y erudito museo de V. Ema., [Vuestra Eminencia, literally "Your Eminence"] uno de ellos es el Códice Mexicano. Este raro resto de la antigüedad de aquel pueblo, tuvo la suerte de escapar de las llamas, como lo demuestran sus primeras páginas chamuscadas; y despues de haber girado desconocido, muchos siglos, por plazas y gabinetes de la América y de la Europa,

afortunadamente llegó á las manos de V. Ema., que há muchos años deseaba poseer un monumento de aquella Nación." Fábrega, *Códice Borgiano*, 5.

[103] He wrote: "Le manuscit de Velletri paroit avoir appartenue à la famille Giustiniani" (The Velletri manuscript seems to have belonged to the Giustiniani family). Alexander von Humboldt, *Vue des cordillères et monumens des peoples indigènes de l'Amérique* (Paris: Librairie Grecque, Latine, Alemande, Rue des Fossés, Montmartre, 1816), 1:248–49.

[104] Ibid.

[105] "Muchos siglos." Fábrega, *Códice Borgiano*, 5.

[106] "Llegó a las manos de Vuestra Eminencia" and "la ausencia de un nombre o de otra referencia precisa. Estas palabras sugieren una transferencia anónima, ora el regalo de una persona no considerada digna de mención, ora la compra en un Mercado, en una subasta o mediante un intermediario cualquiera." Anders et al., *Los templos del cielo y de la oscuridad, oráculos y liturgia: Libro explicativo del llamado Códice Borgia*, 39.

[107] "Se mostraban, se evaluaban y se explicaban las antigüedades, mientras se discutían los asuntos nuevos del día." Anders et al., *Los templos del cielo y de la oscuridad, oráculos y liturgia: Libro explicativo del llamado Códice Borgia*, 31. Also see the account in Friedrich Gottlieb Welcker, a leading philologist in Germany. Friedrich Gottlieb Welcker, *Zoega's Leben: Sammlung seiner Briefe und Beurtheilung seiner Werke* (Stuttgart und Tübingen, Germany: In der J. G. Cotta'schen Buchhandlung, 1819), 2:11, 117, 120. For Cardinal Borgia's biography, see: Paulinus da S. Barthomomaeo, *Vitae synopsis Stephani Borgiae S. R. E. Cardinalis amplissimi S. Congregazione de Propaganda Fide praefecti curante P. Paulino a S. Bartholomaeo* (Rome: Apud Antonium Fulgonium, 1805); Horst Enzensberger, "Stefano Borgia," in *Dizzionario Biografico degli Italiani, XII* (Rome: 1971), 739–42, available online: http://www.treccani.it/enciclopedia/tag/stefano-borgia/; and Josef Metzler, "Ein Mann mit neuen Ideen: Sekretär und Präfekt Stefano Borgia (1731–1804)," in *Sacrae Congregationis de Propaganda Fide Memoria Rerum, 350 Years in the Service of the Missions 1622–1972*, ed. Josef Metzler (Rome, Freiburg, Vienna: Herder, 1976), 119–52.

[108] "Intendo di lasciare il Museo Borgiano esistente nella casa di Velletri a mio fratello Gio. Paolo Cavaliere Borgia, e i suoi discendienti primogeniti" (I intend to leave to my brother Gio. Paolo Cavaliere Borgia, and to his first-born descendants, the Borgiano Museum at the Velletri Estate). Archivio de la Congregazione di Propaganda Fide (located at the Piazza di Spagna, Roma), Stato temporale, Eredità Borgia, tome v, p. 16.

[109] For secondary sources summarizing the history of the manuscript that also provide an extensive bibliography on primary sources, letters, and pertinent archives, see: Anders et al., *Los templos del cielo y de la oscuridad, oráculos y liturgia: Libro explicativo del llamado Códice Borgia,* chs. 2 and 3; Ehrle, *Il Manoscritto Messicano Borgiano del Museo Etnográfico della S. Congregazione di Propaganda Fide*; and Karl Anton Nowotny, *Codex Borgia (Cod. Borg. Messicano 1) Kommentar* (Graz, Austria: Akademische Druck- und Verlagsanstalt, 1976).

[110] The physical characteristics of the *Codex Borgia* that I describe here are from my studies of facsimiles, not the original manuscript. Other scholars have had access to the original manuscript and these include: Batalla Rosado, *El Códice Borgia: Una guía para un viaje alucinante por el inframundo*, 311–510; Cassidy, "Divination by Image," 143–51; and Susan Milbrath, *Heaven and Earth in Ancient Mexico: Astronomy and Seasonal Cycles in the Codex Borgia* (Austin: University of Texas Press, 2013).

[111] Throughout the *Codex Borgia*, the figures' forms in particular, but the application of paint as well, show little artistic variation in their execution. This may indicate that a single artist sketched and painted all the images or directed apprentices to execute them within a specified style and quality. Other Central Mexican manuscripts, for example the *Codex Cospi*, were clearly painted by two different artists or two sets of artists because the images in its obverse are different in form and style from those on its reverse. However, we simply do not know whether a single artist working alone or in collaboration with several artists painted the *Codex Borgia*. I suspect that a main artist directed the work with the assistance of various artists training under his or her tutelage. This may be the case given that most professionals in Nahua society were trained through a system of apprenticeship, often from parent to child. I am not aware of any scholar who has addressed this particular issue in the literature.

[112] The Nahua called the contour lines *tlilanianitla*, which they explained signified "to draw or make lines with ink, or mold an outline in black that is then painted with a brush." "tlilania.nitla. debuxar o hazer rayas con tinta, o echar perfil denegro alo que se pinta co pinzel. P. onitlatlilani." Molina, *Vocabulario de la lengua méxicana*, fol. 147v.

[113] Scholars (e.g., Nowotny and Anders et al.) generally report—based on the seams they perceive—that fourteen to sixteen pieces of leather were glued together to create the *Codex Borgia* screenfold. Batalla Rosado, however, argues that there is an uncharacteristic adhesion consisting of two very thin strips between pages 21 to 23, which he contends was added later specifically to accommodate additional pages, namely the passage spanning pages 29 through 46. He regards the section as anomalous, inserted in an otherwise entirely divinatory manuscript. See Nowotny, *Codex Borgia (Cod. Borg. Messicano 1) Kommentar*, 15; Anders et al., *Los templos del cielo y de la oscuridad, oráculos y liturgia: Libro explicativo del llamado Códice Borgia*, 39; and Batalla Rosado, *El Códice Borgia: Una guía para un viaje alucinante por el inframundo*, 314, see also 413, 506.

[114] "En piel de Venado muy antiguo" (on very antique deerskin). Fábrega, *Códice Borgiano. Interpretación del Códice,* 5:1.

[115] "Caracterizan la misma como venado sin ningún tipo de confirmación científica" (they characterize it as deerskin without any type of scientific proof). He provides information indicating that animal hides other than deer were used in manufacturing screenfolds. See Batalla Rosado, *El Códice Borgia: Una guía para un viaje alucinante por el inframundo*, 312.

[116] "Pintadas enpellejos de venados." Sahagún, *Códice Florentino*, bk. 11, ch. 13, fol. 247r.

[117] Pioneering investigations of the materials and artistic techniques used in the manufacture of the *Florentine Codex*, conducted by Piero Baglioni et al. using noninvasive and portable X-ray fluorescence (XRF) and microreflectance Fourier-transform infrared (FT-IR) spectroscopy, led to some significant discoveries about pigments. Similarly, Constanza Miliani et al. have conducted scientific testing using "non-invasive spectroscopic techniques" on the *Codex Cospi*, which revealed the characteristics of the coloring agents and the techniques used in their application. See Miliani et al., "Colouring Materials of Pre-Columbian Codices," 672–79.

[118] Cassidy, "Divination by Image," 146–47, note 25. However, inspection of the damaged pages in both manuscripts (compare, for example, pages 7 and 8 of the *Codex Cospi* to pages 24 and 68 of the *Codex Borgia*) reveals that the pattern of discoloration is actually very irregular. Cassidy does not provide any evidence other than a personal communication with Dr. Lawrence D. Cercone (presumably a chemist), who informed her that when iron oxide is "combined with seawater that can contain iodine and bromine complexes, new iron complexes can and do form," which can create a "pink complex."

[119] "Produciendo con su apertura la pérdida de varias imágenes, sobre todo en los márgenes exteriors de las mismas." Batalla Rosado, *El Códice Borgia: Una guía para un viaje alucinante por el inframundo*, 315. See also, Anders et al., *Los templos del cielo y de la oscuridad, oráculos y liturgia: Libro explicativo del llamado Códice Borgia*, 140, note 6. Nevertheless, it is interesting that the damage is concentrated mostly around the edges of the pages. If exposure to the moist environment at the Congregazione caused the effacement, then the damage would be more evenly distributed throughout rather than concentrated in specific areas (i.e., the edges). It could be that the pattern of effacement is the result of turning the pages of the screenfold as if it were a European book, by handling the outer edges.

[120] Page 5/71 has a hole at the bottom that is roughly in the shape of a garbanzo bean, measuring about 1 centimeter in diameter. The upper part of page 6/70 has two holes, each roughly in the shape of an oval, with the one on the right measuring about 1 by 1½ centimeters, and the one on the left 1½ by 2. There is a small hole at the top-left corner of page 30/46, and the lower right-hand part of page 31/45 has two side-by-side small holes, each measuring 4 millimeters in diameter. Page 33/43 has a very small oval hole on the right side, roughly midway between the top and bottom of the page. The "holes" on pages 38/back cover and 76/front cover, are actually very small brown circles evenly spaced along three of the four sides. These are consistent with the assertion of Anders et al. that at one point in the *Codex Borgia*'s history, nails attached wooden covers to the leather pages. Anders et al., *Los templos del cielo y de la oscuridad, oráculos y liturgia: Libro explicativo del llamado Códice Borgia*, 40.

[121] "Ramon Rodriguez, i Megicano Pensionado, lo copió en Marzo y Abril del 1856. lo terminó 19. Abril. A las 9 y ½ de la mañana."

[122] The Mexican historian José Fernando Ramírez commissioned Ramón Rodriguez to paint a black-and-white edition on Lord Kingsborough's behalf. Batalla Rosado, *El Códice Borgia: Una guía para un viaje alucinante por el inframundo*, 322.

[123] The glosses' orthography and the identifications of many of the day signs are often wrong. For example: *uzamatle* (instead of *ozomatli*, monkey) appears with the day sign for *quiauhtle* (instead of *quiahuitl*, rain); *quiahuitl* appears with the day sign for *cipactli* (crocodile); *cipactli* appears with the day sign for *cuetzpalin* (lizard); and *izquintli* (instead of *itzquintli*, dog) appears with the day sign for *tochtli* (rabbit). As Anders et al. note, the text is decisively rendered in an Italian orthography, particularly evident in the use of "ch" to denote the sound "k," which in Spanish would be denoted by "qu," as for example in the word *michiztli* versus *miquiztli*. Anders et al. do not acknowledge that the Italian orthography is not consistently applied to all of the glosses. Note, for example, that in Italian the syllable "ci" would be read as "chi" (as in the word "chin" in English), but when annotating the day sign crocodile, the annotator wrote "*cipactli*," whereas an Italian annotator would have opted to spell the word as "sipactli" to render the annotation phonetically correct to an Italian. Anders et al. further point out, regarding the Italian text, "la forma de la escritura, así como la mano que señala, son propias del siglo XVI" (the type of penmanship is typical of the sixteenth century), but without providing support for their conclusion. Anders et al., *Los templos del cielo y de la oscuridad, oráculos y liturgia: Libro explicativo del llamado Códice Borgia,* 38.

[124] Mixteca-Puebla refers to the area comprising central and southern Puebla and western Oaxaca. See George Vaillant, "A Correlation of Archaeological and Historical Sequences in the Valley of Mexico," *American Anthropologist* 40 (1938): 535–73. In art history, style and iconography are considered as two separate—albeit relatable—concepts. As Elizabeth Boone and Michael Smith have pointed out in studying Postclassic Mesoamerican art, this distinction is particularly significant "because the iconography and the style of a work may belong to different traditions." This is exemplified in Donald Robertson's work on the Tulum murals, which reveals that the style is Central Mexican, but the iconography is Maya. Elizabeth Boone and Michael Smith, "Postclassic International Styles and Symbols Sets," in *The Postclassic Mesoamerican World*, ed. Michael Smith and Frances Berdan (Salt Lake City: University of Utah Press, 2003), 186.

[125] For additional sources on style, see: Esther Pasztory, *Aztec Art* (New York: Harry N. Abrams, 1993), 94, where she writes: "The skills and traditions of other contemporary peoples were brought together in the workshops of the capital. Out of these eclectic sources was created a new style and iconography"; Esther Pasztory, "Identity and Difference: The Uses and Meaning of Ethnic Styles," in *Cultural Differentiation and Cultural Identity in the Visual Arts*, ed. Susan J. Barnes (Washington, DC: National Gallery of Art, 1989), 27; and John M. D. Pohl and Bruce E. Byland, "The Mixteca-Puebla Style and Early Postclassic Socio-Political Interaction," in *Mixteca-Puebla: Discoveries and Research in Mesoamerican Art and Archaeology*, ed. Henry B. Nicholson and Eloise Quiñones Keber (Culver City, CA: Labyrinthos, 1994), 189–200. For an excellent discussion of style presented in relation to the Cacaxtla painting tradition, see Claudia Brittenham Lozoff, *The Murals of Cacaxtla: The Power of Painting in Ancient Central Mexico* (Austin: University of Texas Press, 2015).

[126] Geoffrey G. McCafferty, "The Mixteca-Puebla Stylistic Tradition at Early Postclassic Cholula," in *Mixteca Puebla: Discoveries and Research in Mesoamerican Art and Archaeology*,

ed. Henry B. Nicholson and Eloise Quiñones Keber (Culver City, CA: Labyrinthos, 1994), 73; and José García Payón, "Archaeology of Central Veracruz," in *Handbook of Middle American Indians*, 16 vols., ed. Robert Wauchope (Austin: University of Texas Press, 1971), 11:505–42.

[127] Michael Lind, "Cholula and Mixteca Polychromes: Two Mixteca-Puebla Regional Sub-Styles," in *Mixteca-Puebla: Discoveries and Research in Mesoamerican Art and Archaeology*, ed. Henry B. Nicholson and Eloise Quiñones Keber (Culver City, CA: Labyrinthos, 1994), 79–100.

[128] Eloise Quiñones Keber, "The Codex Style: Which Codex? Which Style?" in *Mixteca-Puebla: Discoveries and Research in Mesoamerican Art and Archaeology*, ed. Henry B. Nicholson and Eloise Quiñones Keber (Culver City, CA: Labyrinthos, 1994), 147–48.

[129] Ibid.

[130] Noemí Castillo-Tejero, "Los Popolocas y la Región Mixteca-Puebla," in *Mixteca-Puebla: Discoveries and Research in Mesoamerican Art and Archaeology*, ed. Henry B. Nicholson and Eloise Quiñones Keber (Culver City, CA: Labyrinthos, 1994), 185.

[131] See Boone, *Cycles of Time and Meaning in the Mexican Books of Fate*, 227–28; Milbrath, *Heaven and Earth in Ancient Mexico: Astronomy and Seasonal Cycles in the Codex Borgia*, ch. 1; and Kevin Terraciano, *The Mixtecs of Colonial Oaxaca: Ñudzahui History, Sixteenth Through Eighteenth Centuries* (Stanford: Stanford University Press, 2001), 347–55. Anne Walke Cassidy argues that Tenochtitlan should be included as a possible place of provenience for the *Codex Borgia*, stating: "Tenochtitlan and its nearby urban centers are universally rejected on stylistic grounds. However, the nature of the painted 260-day calendar practice is such that it is easily conceivable that calendar workshops could have flourished in the Tenochtitlan area while adhering to the popular, widespread, traditional 260-day calendar style." Cassidy, "Divination by Image," 102, 150.

[132] Alfonso Caso, "Las ruinas de Tizatlan, Tlaxcala," *Revista mexicana de estudios históricos* 1, no. 4 (1927): 144–45; and Eduardo Noguera, "Los altares de sacrificios de Tizatlán, Tlaxcala," in *Ruinas de Tizatlán*, ed. Agustín García Vega (Mexico City: Publicaciones, vol. 15. Secretaría de Educación Pública, 1927), 23–62.

[133] Henry B. Nicholson, "The Eagle Claw/Tied Double Maize Ear Motif: The Cholula Polychrome Ceramic Tradition and Some Members of the Codex Borgia Group," in *Mixteca-Puebla: Discoveries and Research in Mesoamerican Art and Archaeology*, ed. Henry B. Nicholson and Eloise Quiñones Keber (Culver City, CA: Labyrinthos, 1994), 114; Karl Anton Nowotny, *Tlacuilolli: Style and Contents of the Mexican Pictorial Manuscripts, with a Catalogue of the Borgia Group*, trans. and ed. George A. Everett Jr. and Edward B. Sisson (Norman, OK: University of Oklahoma Press, [1961] 2005), 5–6, 8, 204; Edward Sisson, "Recent Work on the Borgia Group Codices," *Current Anthropology* 24 (1983): 653–4; and Boone, *Cycles of Time and Meaning in the Mexican Books of Fate*, 222.

[134] José Eduardo Contreras Martínez, "Los murales y cerámica policromos de la zona arqueológica de Ocotelulco, Tlaxcala," in *Mixteca-Puebla: Discoveries and Research in Mesoamerican Art and Archaeology*, ed. Henry B. Nicholson and Eloise Quiñones Keber (Culver City, CA: Labyrinthos, 1994), 109–17; John Pohl, "Themes of Drunkenness, Violence, and Factionalism in Tlaxcalan Altar Paintings," *Res: Anthropology and Aesthetics* 33 (1998): 186–91; and Sylvie Peperstraete, "Los murales de Ocotelulco y el problema de la procedencia del *Códice Borgia*," *Estudios de cultura Náhuatl* 37 (2006): 15–32.

[135] Pohl, "Themes of Drunkenness," 184–91, 196. Pohl sees similarities with the *Codex Borgia* in Tezcatlipoca's head and the serpents as well.

[136] Ibid., 186–88, 196–97, and also note 8 on page 196.

[137] Edward B. Sisson and T. Gerald Lilly, "The Mural of the Chimales and the Codex Borgia," in *Mixteca-Puebla: Discoveries and Research in Mesoamerican Art and Archaeology*, ed. Henry B. Nicholson and Eloise Quiñones Keber (Culver City, CA: Labyrinthos, 1994), 35, 42.

[138] Ibid., 42.

[139] Gabriela Uruñuela, Patricia Plunket, Gilda Hernández, and Juan Albaitero, "Biconical God Figurines from Cholula and the Codex Borgia," *Latin American Antiquity* 8 (1997): 63–70.

[140] Cecelia Klein, "The Devil and the Skirt," *Ancient Mesoamerica* 11, no. 1 (2000): 10. Gabrielle Vail and Christine Hernández, currently at the forefront of studies on the *Codex Borgia* and the nature of the cultural exchange in Mesoamerica during the Late Postclassic period, concur. They state: "Numerous studies dedicated to comparing images of material culture in the Borgia Codex with artifacts, houses styles, ceramics, and mural art recovered archaeologically from sites in the Puebla-Tlaxcala region support the attribution of the manuscript to that area of the central highlands. . . . This suggests that the scribe or scribes who drafted the codex would have been fluent in Nahuatl, if not native speakers of the language." Gabrielle Vail and Christine Hernández, "Introduction. Part III: Archaeoastronomy, Codices, and Cosmologies," in *Astronomers, Scribes, and Priests: Intellectual Interchange Between the Northern Maya Lowlands and Highland Mexico in Late Postclassic Period*, ed. Gabrielle Vail and Christine Hernández (Washington, DC: Dumbarton Oaks, 2010b), 264–65.

[141] Lori Boornazian Diehl, "Clothing Women: The Female Body in Pre- and Post-Contact Aztec Art," in *Woman and Art in Early Modern Latin America*, ed. Kellen Kee McIntyre and Richard E. Phillips (Leiden, The Netherlands: Brill, Hotei Publishing, 2007), 230.

[142] Ibid.

[143] Milbrath, *Heaven and Earth in Ancient Mexico: Astronomy and Seasonal Cycles in the Codex Borgia*, 15–16.

[144] Cassidy, "Divination by Image," 150.

CHAPTER TWO

IN TLILLI, IN TLAPALLI, IN AMOXTLI, IN TLACUILOLLI:[1] THE SCIENCE OF MAIZE AGRICULTURE

Many pages of the *Codex Borgia* feature maize cobs painted in an array of colors. On page 24, for example, four cobs appear on a stylized tree accompanying the day sign Flower, the twentieth day sign of the Mesoamerican calendar.[2] One is painted white, its kernels rendered with red lines; another one is painted blue with kernels sketched in black; and two are painted solid yellow (fig. 2.1). Page 52 features three cobs that Cinteotl, the god of maize, bears on his back. One of the cobs is painted white, overlaid with kernels sketched in red; one is solid yellow; and one is solid blue (fig. 2.2). Significantly, maize plants in the *Codex Borgia* are depicted with tassels (the plant's male flower), and silks (the plant's female flower), both of which are essential for their reproduction and genetic manipulation. On page 52, it appears that pollen—represented as a string made up of circles with a flower between them, one above the other—has landed on the blue cob's silks (see fig. 2.2).[3] Why are the maize cobs depicted in different colors? Did the Nahua understand that selectively crossing maize types causes the plant to reproduce specific traits targeted by humans?

Maize is a unique organism. Most plants produce seeds that easily disperse on their own simply by falling to the ground. Not maize. As the biologist Paul Mangelsdorf explains:

> The kernels on an ear of corn cling tightly to the rigid cob, and if the ear were simply allowed to drop to the ground, so many competing seedlings would emerge that in all likelihood none would grow to maturity. The ear in its hundreds of modern varieties was created by human beings for human purposes through centuries of selective breeding; it has no counterpart anywhere in the wild, or for that matter among other cultivated plants.[4]

Human selection of kernels for planting in the next season is therefore the first and most important moment in the life cycle of the maize plant. The evolutionary geneticists Viviane

Jaenicke-Després and Bruce Smith affirm: "Without humans to harvest, store, and plant maize kernels, the cultivated plant rapidly ceases to exist."[5]

At the turn of the twentieth century, the United States government employed scientists to conduct maize research and interbreeding projects to improve the plant's productivity and obtain other desirable characteristics. This began a vigorous quest to learn about maize's origin and genetics.[6] One of the leading botanists in the Department of Agriculture in the late 1930s, James H. Kempton, remarked about the fully domesticated plant:

> Since the occupation of the Americas by the Europeans no real change has been made in corn except to discard the gaudy colors of the seeds and to establish a greater uniformity by the preservation of the best of the Indian's product . . . With the stimulus to experimental heredity that came at the beginning of the century, on the rediscovery of Mendel's principles, corn rapidly assumed a leading role as a subject ideally suited for the study of inheritance in plants. Had the Indian creators of corn anticipated such studies they hardly could have fashioned a more satisfactory plant. Controlled pollinations are made with the greatest of ease because of the separation of the sexes, the complete receptiveness of the stigmas over their entire length, and the vast quantities of pollen produced by a single plant. Common grocer's paper bags and string are the only really essential technical equipment necessary to embark upon the fascinating analysis of the transmission of traits from one generation to the next.[7]

Indeed, the Nahua knew how to manipulate the plant to produce cobs in a wide variety of colors and other genetic characteristics. In the sixteenth century, fray Diego Durán reported that the Nahua specifically used maize cobs with kernels in four colors—white, black, yellow, and purple—during a feast in honor of Xochiquetzal, the goddess of flowers.[8] At this celebration, priests dispersed the kernels on the ground, which Durán states people rushed to collect, adding, "even if they could only obtain but two grains, they took and kept [those grains] with great care and planted them so that they could have seed of that blessed maize."[9] From this account, we can see that the Nahua deliberately selected seeds to plant and produce cobs with those specific traits that they desired.

In Book 11 of the *Florentine Codex* the Nahua discuss how they cultivated the plant: "Maize in the ear [is] selected for planting. The best seed is selected. . . . the very very best is chosen. It is shelled, placed in water. Two days, three days it swells in the water. It is planted in worked soil or in similar places."[10] The accompanying image depicts a man holding several cobs in a cotton canvas tied around his neck, while on the ground are two more cobs, and numerous seeds of different sizes (fig. 2.3). The speech glyph in the man's mouth likely indicates that he is imparting knowledge about maize.[11] According to the *Florentine Codex*, the Nahua harvested different strains of maize, including those yielding cobs with white, black, yellow, red, tawny, and varicolored kernels.[12] The text is emphatic in describing the essential role the human cultivator plays in creating maize with specific traits: "I cause it to have a slender cob. I cause it to form first. I make it like a gourd seed. I cause it to have a slender cob. I make the cob slender."[13]

This process has ancient roots. Approximately eight thousand years ago, Central Mexicans began manipulating the wild grass teosinte (*Zea mays* ssp. *parviglumis*), thus creating maize (*Zea mays* L.).[14] Maize's domestication is widely recognized as an extraordinary scientific achievement with tremendous cultural and scientific significance. Through selective breeding, indigenous people transformed a grass, which produces tiny spikes, into a plant that produces large cobs (fig. 2.4). As a result, the domesticated plant yields more nutrition than its wild progenitor, and yet, ironically, maize cannot diversify or even survive in the wild without human intervention.

An intermediate step in the development of maize is demonstrated in a photograph of the archaeologist Richard MacNeish's hand holding a miniscule cob of early domesticated maize that he recovered in the 1960s from the Coxcatlán Cave in the Tehuacán Valley (fig. 2.5).

Another photograph shows maize cobs—found in archaeological contexts—of different widths and lengths also recovered by MacNeish from the Tehuacán Valley (fig. 2.6). In the photograph, the cobs are lined up next to one another for comparative purposes, literally illustrating that once domesticated, humans manipulated the maize plant to produce cobs of increasingly larger size. For example, the smallest cob (far left) dates from ca. 7,000 BCE, and the largest (far right), from ca. 1,500 CE;[15] the latter is the time when the Nahua civilization flourished in Central Mexico and the *Codex Borgia* was painted.

Scientific information on the maize plant, I contend, affords us significant insight into pre-Columbian Mesoamerican thought and belief systems that is useful in studying imagery in their extant artifacts. For example, understanding the science behind the maize plant's origin, reproduction, and nature of its subsequent transformations helps to unlock meaning in images of maize, Ehecatl-Quetzalcoatl, and grass in the *Codex Borgia*. Accordingly, I introduce in this chapter the biological, botanical, genetic, and archaeological information that supports the arguments I present throughout this dissertation. Chapter 2 begins with a discussion of the biology of the maize plant, and how fertilization and cob production occurs. Next I describe the collective effort of scientists in different disciplines—e.g., biology, botany, and archaeology—that has clarified details about the origin, morphology and physiology of the plant. Last, I discuss the ethnohistoric record compiled in the early colonial period that reports about the sophisticated scientific knowledge of the Nahua with regard to plants. The chronicles from this period indicate that the Spaniards fully recognized that Nahua horticulturists had acquired an advanced scientific knowledge of plants, often far superior to that known to even the most sophisticated scholars and scientists of sixteenth-century Europe.

The Morphology and Physiology of the Maize Plant

Maize is an angiosperm, a flowering plant that produces fruit and seeds. Angiosperms may be classified as either dioecious or monoecious based on their sexuality, reflected in their flowers.[16] In dioecious angiosperms, each plant bears flowers of only one sex—either male or female—and is, therefore, unisexual. In monoecious angiosperms, each plant bears both male and female flowers and is, therefore, bisexual. Maize is monoescious, or bisexual.[17]

Monoecious angiosperms can be further divided into monoclinous and diclinous plants depending on their flowers.[18] In monoclinous plants, each flower has male and female parts that appear together in the same part of the plant. Diclinous plants, in contrast, have separate male and female flowers located on different parts of the plant. Maize is diclinous: the tassel at the top of the plant produces pollen containing the male sexual cells, and the silks below contain the female sexual cells. Therefore, the maize plant is both monoecious (bisexual plant) and diclinous (unisexual flowers, both appearing in the same plant but in different locations). Regarding the effects of the plant's sexuality on its own reproduction and genetic manipulation, biologists Stephen Dellaporta and Alejandro Calderon-Urrea explain that the "unisexual inflorescences [flowers] are the principal feature of maize that facilitates efficient hybrid seed production and genetic experimentation."[19]

The maize plant, like other angiosperms, reproduces through pollination, a process by which pollen containing male sex cells is transferred to the female parts of the plant. In nature there are two main types of pollen dissemination: abiotic pollination involving wind (anemophily) and/or water (hydrophily), and biotic pollination involving animal pollinators, for example, bees, birds, flies, butterflies, bats, and, often, humans.[20] The structure of a plant's flowers largely determines the most likely or optimal manner of pollen transfer. In the maize

plant, and in many other angiosperms, both modes of pollination may occur. Nevertheless, wind (abiotic pollination) is the primary mechanism for pollination in maize. Scientific field studies involving transgenic maize plants confirm that wind is more readily evident and assessable than insect pollinators. Christine Loos et al. report that because the maize plant is diclinous, it "is an ideal organism for studying and modeling pollen dispersal driven by wind born pollen transport."[21] Figure 2.7 illustrates the sexual reproduction of maize: wind carries pollen from tassels (male flowers) to silks (female flowers).[22] Each individual silk receives pollen and this is how kernels form on the cob. Fertilization thus creates cobs containing numerous kernels (seeds) for human sustenance and for creating new generations of plants in the next season.

The Origin and Domestication of Maize in the Modern Scientific Literature

The domestication of maize is Mesoamerican's most researched botanical accomplishment. Experiments with the plant have led to remarkable scientific discoveries, most notably in the field of genetics and the theory of evolution. The geneticists Edward S. Buckler IV and Natalie M. Stevens characterize the domestication of maize as "the most impressive feat of genetic modification and morphological evolution ever accomplished in any plant or animal domesticate."[23] They explain:

> The ability of Native Americans to transform a wild grass into the world's largest production grain crop is not only the product of skillful breeding but also a tribute to the tremendous diversity of the teosinte genome. Years before his time, these ancient farmers first practiced what Darwin later preached: that selection must be combined with natural variation in order for evolution to take place.[24]

In large part because of the incredible variation in maize types, throughout much of the twentieth century scientists debated whether the plant originated in the Andes or Central Mexico, and whether the plant was domesticated once or multiple times.[25] In recent years, however, a

strong consensus has emerged on a number of points, including that the teosinte is the progenitor of the plant; that the grass was first manipulated in the Balsas River Basin in southwest Mexico by indigenous groups more than 8,000 years ago; and that the plant was domesticated only once, not multiple times as previously thought.[26] As one of the most ardent proponents for an Andean origin, Bonavia himself now acknowledges, "In the case of the origin of maize there is no doubt that all specialists agree that it is Mesoamerican, and there is no way this position can be rejected with the evidence currently available."[27]

In the late-nineteenth century, scientists did not know much about the progenitor of maize. The botanist Heinrich A. Schräder appears to be the first modern-day scientist in the West to have received teosinte seeds from Mexico; he grew them at the Goettingen Horticultural Academy, published about the yield of maize-like plants, and gave them a Latin name (*Euchlaena mexicana* Schrad).[28] In 1875, the botanist Paul F. Ashcherson proposed that *Euchlaena mexicana* Schrad (teosinte) was an intermediate breed between the fully domesticated maize and the wild grass variety.[29] Recognizing that teosinte grass and maize successfully crossed and produced fertile hybrids proved to be an important insight in the study of maize's origin.[30] In the 1890s, the agronomist José Segura noticed in a field in Central Mexico that maize and a common grass *asese* (now known to be a strain of teosinte) grew side-by-side and freely crossed to produce a fertile hybrid that he called *maiz de coyote* (*Zea canina*).[31] Segura shared his observations with fellow scientists in Europe. By 1920, J. W. Harshberger, Guy N. Collins, and James H. Kempton and other scientists recognized the close genetic relation between teosinte and maize.[32]

At the turn of the twentieth century in the United States, breeding projects designed to improve maize's productivity motivated research on the plant's genetic origin.[33] Guy N. Collins,

the United States Department of Agriculture's principal botanist, remarked in 1921, "before our recent trip to Mexico we were familiar with but two forms of teosinte."[34] Collins collected specimens of different strains and distributed them among plant geneticists in the United States, thus motivating a revolution in teosinte and maize research. Classical genetics—that is, observations of how selective cross pollinations affect traits passed from parent to offspring over the course of a few generations, similar to those conducted by the Friar Gregor Mendel (1822–84)—were fundamental in advancing research on maize and teosinte. As Ramakrishna Wusirika et al. explain, "Maize and its wild relatives provide a tractable model system for both classical and molecular genetic research because maize and the teosintes are fully interfertile."[35]

Identifying maize's progenitor elicited enduring, and at times contentious discussions throughout much of the twentieth century. The hypothesis that maize's progenitor is teosinte is linked most closely to the biologist George Beadle, who began research on maize in the 1930s when he was a graduate student at Cornell University. He studied the homology (in biology, shared ancestry based on similar appearance or genes) between teosinte and maize and the chromosomal behavior of teosinte-maize hybrids during meiosis (cell division). In 1932 Beadle concluded that maize and teosinte belonged to the same genus.[36]

Genetics and interfertility notwithstanding, there was an opposing view. The morphological differences between the grass and the domesticated plant were so remarkable that most scientists thought this precluded the possibility of teosinte being maize's sole progenitor (see fig. 2.4). Elizabeth Kellogg, a biologist whose research focuses on the evolution of flowering plants, describes the difference in cob morphology as follows: "The maize ear, or corn cob, is a monstrosity. There is no other structure quite like it in the plant kingdom, so its origin has been, if not quite an abominable mystery, at least obscure."[37] In contrast to what is true of

most domesticated plants, there is no wild prototype that bears a ready resemblance to maize. As the biologist John Doebley points out,

> Most crop plants differ from their wild progenitor in a simple quantitative way. For example, wild tomato is merely a small-fruited version of the large-fruited domesticated tomato. Unlike most crops, maize has no morphologically equivalent wild form, and so the identity of the wild progenitor of maize was a topic of considerable interest in the early 1900s.[38]

There are two salient botanical differences between maize and teosinte: one pertains to plant architecture and the other to cob morphology. The maize plant consists of a single branch, a single tassel, and one or two cobs, each of which bears hundreds of kernels tightly attached to the cob, arranged in twenty or more rows (fig. 2.8). In contrast, the teosinte plant consists of several branches with a tassel located at the top of each branch, and each branch produces several spikes bearing two rows of six to twelve kernels enclosed in stony fruitcases (fig. 2.8). Doebley remarks: "the stunning morphological differences between the ears of maize and teosinte seemed [for several decades] to exclude the possibility that teosinte could be the progenitor of maize. However, because scientists knew that maize and teosinte crossed producing fully fertile hybrids, these two conflicting observations needed to be reconciled if the origin of maize was to be solved."[39]

Botanists theorized that a period of a few thousand years or more would have been required to domesticate maize from teosinte to cause the astonishing changes in plant and especially fruit morphology. Kempton went as far as sarcastically remarking, "maize could arise from teosinte by selection just as a troupe of monkeys pounding at random on a typewriter would in time reproduce the works of Shakespeare."[40] Evolutionary theory postulates, scientists thought at the time, that changes in an organism occur in slow increments over a long period of time—surely more than the 8,000 years that humans had been manipulating maize and teosinte—and

progressed from "primitive" to "advanced."[41] Scientists were troubled by the notion that teosinte, a more "advanced" organism that can reproduce and survive in the wild on its own, could have evolved into maize, which cannot. Consequently, the theory that teosinte is the progenitor of maize did not fit evolutionary theory, as understood at that time, on multiple levels.

To account for the differences in cob morphology between maize and its putative progenitor, Paul Mangelsdorf pioneered the theory that the plant resulted from crosses of different grasses including Tripsacum and an unknown strain or perhaps extinct wild maize. Mangelsdorf's theory, which he presented with Robert G. Reeves in 1938, became known as the "tripartite hypothesis" because it involved wild maize (unknown), Tripsacum, and maize. Their theory postulates that teosinte is the product of Tripsacum-maize hybrids, not maize's progenitor.[42] Although the teosinte hypothesis had some adherents,[43] for most of the twentieth century the tripartite hypothesis remained more widely accepted.[44]

Mangelsdorf and Reeves planted backcrosses (cross of hybrid with one parent) of maize and teosinte and noted that the changes between them occurred because four regions of maize's genome had been affected with what they thought were introgressions from other grasses, not genetic mutations.[45] They contended that teosinte "appears to be nothing more than Zea with a slight infection of Tripsacum germplasm."[46] Tripsacum and maize, however, do not have the same number of chromosomes. Moreover, Mangelsdorf and Reeves had to prove that the two plants could cross and produce fertile offspring, but, as they conceded, "Tripsacum does not cross naturally with maize," and their experimental crosses produced seeds only through "a tedious technique and by dealing with enormous numbers," as they described it.[47] Mangelsdorf and Reeves admitted that the hybrids were "completely sterile," and that "no pollen has been shed and so far no seeds have set, either when Tripsacum or maize pollen was applied."[48]

Nevertheless, based on the modest success of their crosses, they theorized that Tripsacum was a progenitor of maize, and that the grass's chromatin (nucleic acid in the cell nucleus that condenses into chromosomes during mitosis and meiosis) must have contaminated maize to produce teosinte.

Regarding where the initial domestication took place, Mangelsdorf and Reeves maintained that, "Peru was undoubtedly the primary center," but that the wild maize—which has never been found—probably originated in the "lowlands of South America."[49] The debates regarding the identity of the ancestor of maize and where it took place were related. Tripsacum exists in both Mesoamerica and the Andes, but teosinte is native only to Mesoamerica.[50] If initial domestication occurred in Peru, teosinte could not have been the progenitor.

In 1939 Beadle, in response to Mangelsdorf and Reeve, argued that teosinte was the progenitor of maize and that a single gene mutation could indeed cause enormous changes in an organism.[51] The "teosinte hypothesis" postulates that 1) indigenous people of Central Mexico cultivated and used teosinte; 2) because of sustained cultivation, mutations occurred that were deliberately selected by humans; 3) only a few gene mutations (geneticists now think as few as four or five) caused the most stunning morphological differences between teosinte and maize;[52] 4) one single gene mutation was responsible for each major morphological change (e.g., one gene mutation caused apical dominance, another caused ear type differences, etc.); and 5) beginning with the very first domestication, humans selected for desired mutations in the plant.[53] Thinking the matter resolved, Beadle moved on to study other issues, and for most of his career he focused on genetics in general, not on maize specifically. His collaboration with Edward Tatum on gene behavior and the chemical events they regulate, which essentially gave birth to the field of biochemical genetics, earned them the 1958 Nobel Prize in Medicine.

In spite of the sound basis of the teosinte theory, Mangelsdorf's ideas became so influential, particularly among the general public (e.g., breeders, businesses looking to engage in lucrative agricultural ventures, and government agencies interested in learning more about maize genetics to impart among farmers) and in the field of archaeology that, as Doebley observes, "the tripartite hypothesis was elevated to fact" and "Mangelsdorf's name became synonymous with the study of maize evolution."[54]

Archaeologists have contributed critical information regarding when and where first domestication occurred.[55] In the United States, Richard MacNeish and Kent Flannery were the two leading archaeologists on maize's origin.[56] The cobs that they recovered indicate that maize was already domesticated and thus dependent on humans by 4,200 BCE and that the fully domesticated plant first produced small cobs.

In 1949, MacNeish excavated in Tamaulipas in northwestern Mexico, and found a cave known as La Cueva de la Perra, where, he reports, his Mexican assistant Alberto Aguilar "handed me three tiny, tiny, primitive corncobs" that date from 3,000 BCE.[57] From 1967 to 1975, MacNeish worked in Tehuacán and in South America.[58] In the Tehuacán Valley, he excavated a series of caves, among them the famed Coxcatlán and San Marcos Caves, which produced 23,607 maize remains including what were at the time the earliest fully domesticated cobs recovered archaeologically.[59] Bruce Benz and Hugh Iltis recently analyzed these cobs' morphology and recalibrated their date using accelerator mass spectrometer (AMS), a method that yields more precise information than radiocarbon dating. Their analysis revealed that the cobs date from approximately 3,500 BCE and that in spite of their very small size, they are the offspring of fully domesticated maize, not wild, as previously hypothesized.[60]

An effort to reconstruct the history of settled life in Oaxaca led Kent V. Flannery in the 1960s to excavate in the humid lowlands of the Balsas River drainage. In the Guilá Naquitz Cave in Oaxaca, Flannery found maize cobs that AMS dating revealed to be older than those recovered from the Tehuacán Valley by approximately 700 years.[61] They date from approximately 4,250 BCE and therefore are "the oldest in the Americas."[62] This indicated that maize probably originated in the Balsas River drainage in Oaxaca, and not in the Mexican highlands in the Tehuacán Valley.[63] The morphology of the Guilá Naquitz cobs also showed that by approximately 4,250 BCE maize had already acquired all the traits of the modern plant.[64]

In the 1960s, during his early retirement, Beadle resumed research on maize, and began to promote in earnest the teosinte hypothesis. To demonstrate that a single gene mutation could cause astonishing changes in an organism he planted crosses and backcrosses (cross of hybrid with one parent) of maize and teosinte strains to show genetic changes in the offspring. First, with the intention of producing a facsimile of a cob similar to that found in the Tehuacán Valley caves, Beadle crossed Chapalote maize ("a primitive variety and the most teosinte-like that was clearly corn") with Chalco teosinte ("the most corn-like teosinte that was unmistakably teosinte").[65] He then planted 50,000 of these hybrid backcrosses (cross of hybrid with one parent) or F_1 generation with maize and teosinte. The F_2 generation revealed that 1 in 500 plants were either like maize or teosinte. This is precisely the Mendelian ratio expected in second-generation backcrosses to show that only four genes had been affected to cause the dramatic evolution.[66] Thus, Beadle's experiment proved rather conclusively that the significant morphological differences between maize and teosinte could have been caused by changes in only four genes. Beadle rejected the idea that "maize originated through hybridization of teosinte with a species now either extinct or undiscovered," proposing instead: "maize arose directly from

teosinte through selection by man."[67] Figure 2.9 shows an F_1 maize-teosinte hybrid (left) and an F_2 (right), where it is clear that in the F_1 hybrid the spikelet is in the process of evolving into a maize-like cob, whereas the F_2 hybrid has fully evolved.

Advances in molecular biology have also shed light on the origin of maize. Barbara McClintock, a pioneering cytogeneticist, was the first scientist to map out maize's genome and indicate which chromosomes produced particular morphological traits in the plant.[68] McClintock began her research in maize cytogenetics in the 1920s when she was a graduate student at Cornell University. In the 1940s, she conducted experiments with self-pollinated maize plants, and toppled the current understanding that genes were fixed. McClintock discovered genetic transposition, which showed that DNA sequences could change positions within the genome.[69] Therefore, evolution could proceed from advanced traits to more primitive ones (or vice versa) because it was driven by selection. When in the 1970s research on bacteria corroborated the conclusions of her experiments with maize, her work received the worldwide attention it deserved. For her discovery of transposable elements (TEs), commonly known as "jumping genes," McClintock was awarded the Nobel Prize in Medicine in 1983.

In 1971, Beadle organized a "teosinte hunt" in the Balsas River valley in southwestern Mexico, enlisting a team of fifteen leading experts, including Kent Flannery, David Galinat, Walton Galinat, Hugh Iltis, L. F. Randolph, Wayne Smith, and Hugh G. Wilkes. Scientists were hoping to find teosinte strains showing natural mutations that could help to advance research on maize's early stages of evolution.[70] Although Beadle and colleagues did not accomplish their primary goal, their collective effort encouraged further searches for teosinte strains as well as a large body of scholarship on how the grass could have been cultivated, domesticated, and consumed in early Mesoamerica.

Hugh Iltis (Mangelsdorf's student at Harvard) and Raphael Guzmán found in 1979 a new strain of perennial teosinte, *Z. diploperennis* in Jalisco, Mexico.[71] The discovery was significant because the only known strain of perennial teosinte, *Zea perennis*, is a tetraploid (2n=40; has cells with four copies of each chromosome) and crosses with maize but produces sterile plants, which lent credence to the argument that annual teosinte was a hybrid of maize and not its progenitor.[72] Iltis and Doebley showed that the newly discovered strain is a diploid (2n=20; has cells with two copies of each chromosome) exactly like maize, and their hybrids are fertile.[73]

Discovery of this new strain of teosinte helped scientists to more fully understand and consequently classify maize and teosinte within a botanical genus. As now classified, both maize and teosinte belong to the genus *Zea*, which includes the following five species: *Zea diploperennis*, *Zea perennis*, *Zea luxurians*, *Zea nicaraguensis*, and *Zea mays*.[74] Doebley further divides the species *Zea mays* into the following four subspecies based on their striking genetic similarities, even though morphologically they look different: *huehuetenangensis*, *mexicana*, *parviglumis*, and *mays*.[75] All of the subspecies of *Zea mays* are teosintes and naturally reproduce in the wild, except for *mays*, which is maize (corn).

Genetic studies of maize and teosinte, particularly after the discovery of the *Zea diploperennis* strain, rendered the Tripsacum theory biologically untenable. Mangelsdorf himself recognized at that point that the "discovery of the new perennial teosinte changed rather drastically the terms of the debate on the genealogy of corn and teosinte."[76] Mangelsdorf accepted the filial relation between maize and teosinte as "now unquestioned," but on archaeological grounds he never fully accepted the teosinte hypothesis.[77] Genetics notwithstanding, Mangelsdorf still saw "serious flaws" because there is no evidence that

"Indians ever grew teosinte as a crop" and "only a few fragments of teosinte have turned up at any of the early archaeological sites."[78]

Various scholars have also noted this persistent problem in maize studies.[79] If teosinte had been a staple crop, they reasoned, it would appear with more frequency in archaeological excavations, and if the wild grass had not constituted a staple, how could it ever have been manipulated and consequently domesticated? Michael Coe is among the most pessimistic, observing that, "no truly early teosinte has ever been found, either as plant remains or as pollen."[80] Flannery responds that teosinte remains, including pollen and seeds, have indeed been recovered from archaeological sites. For example, at Guilá Naquitz in Oaxaca, teosinte remains date from approximately 1500–50 BCE, which he argues makes its use in Oaxaca at this time "indisputable."[81] According to Duccio Bonavia, MacNeish recovered from the Tamaulipas caves alone "more than 12,000 specimens" of maize, teosinte, and hybrids of maize-teosinte remains that included not only cobs, but also tassels and leaves; however, of these, only "nine remains are of teosinte."[82]

Most scholars currently agree that teosinte was grown and widely used for a variety of reasons in pre-Columbian Mesoamerica. Beadle notes that teosinte grains when exposed to fire can pop, thus yielding a good source of food, and a reason for indigenous people to use it.[83] He therefore argues that teosinte was very likely used for its grain, among various other uses, in spite of it being difficult to harvest.[84] Flannery concurs, and even provides quantitative analysis of its potential yield as a crop and nutritional value.[85] Iltis has more recently argued that teosinte "was initially domesticated not for its grain but for its sugary pith or other edible parts."[86] John Smalley and Michael Blake expand on Iltis's idea by exploring how pre-Columbian

Mesoamericans could have used the sugary stalks to make alcohol, which, they argue, could have incited the subsequent revolution in its domestication.[87]

Dolores Piperno et al. concluded from their 1999 to 2005 field research and analysis of paleoecological and archaeological evidence from the Central Balsas watershed that "neither grain size nor morphology allow teosinte and maize to be distinguished" and that "pollen size and especially morphology allow the genus to be separated from all non-*Zea* grasses, including Tripsacum."[88] Therefore, because of the similarities in teosinte and maize remains, it seems quite possible that there are more teosinte deposits in the archaeology than currently recognized.

Molecular biologists' research continues to clarify our understanding about the progenitor of maize. Among the most noteworthy recent advances is Doebley and colleagues' recreation of the gene mutant *Teosinte glume architecture 1*, widely known as *Tga 1*, which causes the stony fruitcases surrounding the teosinte seeds (fig. 2.10).[89] In the 1990s, Doebley and colleagues planted different strains of fully domesticated maize plants until they produced a facsimile of teosinte, thus uncovering the genetic basis of the changes in cob morphology. They also found through similar experiments other mutant genes, including the *Teosinte branched 1*, widely known as *tb1*, responsible for apical dominance (the transition from a multibranched plant to a single-branched one).[90]

Cytologists (scientists who study cells) have also helped to explain the close genetic relationship between maize and grass. John Doebley points out about maize and teosinte that their "genomes are so similar that they share the same chromosome number, similar or identical chromosome morphologies, and they can be easily cross-hybridized."[91] Hugh Iltis agrees, stating: "Maize is domesticated teosinte (*Zea mays ssp. parviglumis*), differing *not at all* in any of its basic vegetative, floral, or genetic attributes."[92] Recent research by Rong-Lin Wang and

colleagues of *the teosinte branched 1* (*tb1*), the principal gene causing the most dramatic changes in cob morphology, estimate the mutations to "have been rapid, over just several hundred years."[93]

Molecular biology, therefore, has helped to settle the debate in favor of the teosinte hypothesis, and has clarified certain aspects of the process of evolution. It has also shed light on the nature of mutant genes responsible for large-scale morphological changes between parent and offspring. In 2002, Yoshihiro Matsuoka et al. recreated the maize (*Zea mays* L.) genome with 99 microsatellite loci, which they evaluated in comparison to the DNA of 264 plants that included maize (*Zea mays ssp. mays*) and teosinte (*Zea mays* ssp. *parviglumis*) taken from various places in America from Canada to Chile. Their genotyping revealed more conclusively the "extraordinary morphological and genetic diversity among the maize landraces."[94] However, they report that this diversity alone could not support arguments about multiple (e.g., the Andes and Central Mexico simultaneously) rather than independent domestications, and their molecular study indicates that maize was domesticated only once, from teosinte (*Zea mays* ssp. *parviglumis*) of the Balsas River drainage.[95]

Nonetheless, the fair question that Mangelsdorf and others have asked about why so little teosinte remains has been found in archaeological sites remains unanswered. According to Benz, "the problem resides in the archaeological camp," where the evidence available to determine teosinte's first domestication "is too young."[96] As previously noted, the oldest archaeobotanical specimens date from 4,250 BCE, but genetic research and experiments indicate that initial domestication occurred between 6,000 and 10,000 BCE. Benz describes the genetic estimates as "internally consistent" and "corroborated with quantitative estimates based on archaeological material."[97] He points out that in analyzing the archaeological and genetic evidence, "Each lends

credence to the other," and he calls for more expeditions similar to those undertaken by MacNeish and Flannery.[98] There is a symbiosis between biology and archaeology in maize studies.[99] Benz's wish for more "enthusiasm and tenacity to conduct the systematic archaeological work in this region" seems not only justified, but also necessary.[100]

I would add that it behooves scientists to analyze more closely Central Mexican material culture and the ethnohistoric record, which include evidence of indigenous people's scientific achievements with plants. As discussed throughout this dissertation, these sources present a wealth of botanical information that can shed light on aspects of maize's origin that scientists continue to probe. Book 10 of the *Florentine Codex*, for example, seems to corroborate Beadle's hypothesis that "properly dried teosinte will pop in the same way as does modern popcorn."[101] In the *Florentine Codex* the Nahua report that *cocopi* (see fig. 5.16), is "similar to maize: just like the maize stalk."[102] As will be explained in Chapter 5, Hugh Iltis thinks that *cocopi* is teosinte based on the *Florentine Codex*'s assertion and accompanying image. Scientists have not yet discussed Nahua reports about their consumption of *cocopi* seeds, which they explained was prepared as follows: "The grains of this are parched . . . They are ground together; *atole* is made; it is topped with chili."[103] Furthermore, the *Florentine Codex* reports of the inhabitants of Matlatzinco, in the Toluca Valley in Central Mexico during the Postclassic period, that "popcorn [*momochitl*] was produced right there in their land."[104] Diego Durán also reports that the Nahua had "toasted and popped maize that they call *momochitl*."[105] The Spanish doctor Francisco Hernández, sent by King Phillip II to New Spain in the 1570s to record Nahua knowledge of plants, also writes about what appears to be popcorn, obtained from a plant he reports to be "*izquixochitl*, which means a plant that has flowers like the grains of maize that pops when put in the fire."[106]

Spanish Acknowledgement of the Nahua's Sophisticated Knowledge of Plants

The Nahua in the sixteenth century continued the ancient Mesoamerican tradition of plant manipulation, as indigenous painted manuscripts and early colonial chronicles indicate. None of this was lost on the Spaniards, who quickly understood both the depth and sophistication of indigenous knowledge and the value of learning what the Nahua could teach them. Starting immediately after the first European contact with the Indies and continuing into the colonial period, the Spanish crown commissioned numerous natural histories and chronicles, including accounts focusing specifically on plants. Yet scholars have largely overlooked the usefulness of this early colonial documentation of indigenous botanical knowledge in analyzing plant imagery in pre-Columbian manuscripts.

When the initial reports of indigenous people's advanced knowledge of plants reached the Old World, it whetted Europeans' appetite for more information on the flora and fauna of the New World. The Spanish crown under Ferdinand (r. 1474–1516), Isabella (r. 1474–1504), Charles V (r. 1517–56), and Phillip II (r. 1556–98) commissioned envoys and historians to carefully document the names, uses, and modes of cultivating the numerous plants that were routinely used by indigenous people but unknown in Europe. Royal historians who never traveled to the New World but had unrestricted access to the information and imports continuously arriving from the Americas also began to write accounts of New World natural history and medicine with significant information on plants. These included, for example, Peter Martyr d'Anghiera's work collectively known as the *Décadas del Nuevo Mundo* (1511–30) and Nicolás Monardes's *Historia medicinal de las cosas que se traen de nuestras Indias Occidentales que sirven en medicina* (1565–74). Natural histories penned by Spanish travelers to

the Indies also proliferated, including, for example, the *Historia general y natural de las Indias* (1535) by Gonzalo Fernández de Oviedo y Valdez and the *Historia natural y moral de las Indias* (1590) by José de Acosta, who had been traveling throughout Peru and Mexico since 1571.

The Spanish crown specifically requested information on plants. In 1552, Francisco de Mendoza, son of Antonio de Mendoza, the viceroy of New Spain, commissioned the indigenous *ticitl* (physician) Martín de la Cruz, working at the Colegio Santa Cruz of Tlatelolco, an institution of higher learning established in the mid-sixteenth century by Franciscan friars for the indigenous nobility, to write and illustrate an Aztec medical treatise. Intended as a gift for King Charles V (1500–88, r. 1519–55), it became known as the *Libellus de medicinalibus indorum herbis*, more commonly as the *Codex Badianus*.[107] The codex consists of sixty-three folios with 184 polychrome depictions of plants, which the Aztec doctor supplemented with alphabetic text in Nahuatl discussing their medicinal qualities, plus descriptions of an additional sixty-seven plants not depicted. De la Cruz identified each plant by its Nahuatl name, and Juan Badiano, an indigenous scribe from Tlatelolco, also working at the Colegio de Santa Cruz, translated the glosses into Latin, the lingua franca of academic and scientific writing in Europe at the time.

In 1570, Phillip II sent the Spanish physician Francisco Hernández (1514–87) to New Spain to collect plant-related information systematically from indigenous sages. In a document dated January 11, 1570, addressed to Hernández and appointing him "chief medical officer of the Indies," the Spanish monarch gives the following instructions:

> First, that with the first fleet to leave these realms for New Spain you shall embark and shall go first to that land and no other of the said Indies because we are informed that more plants, herbs, and medicinal seeds are to be found there than elsewhere. . . . You shall consult, wheresoever you go, all the doctors, medicine men, herbalists, Indians, and other persons with knowledge in such matters, if it seems to you that they have understanding and knowledge, and thus you shall gather information generally about herbs, trees, and medicinal plants in whichever province you are at the time. . . . You are to find out how the above-

> mentioned things are applied, what their uses are in practice, their powers, and in what quantities the said medicines are given, as well as the places in which they grow and their manner of cultivation, and whether their habitat be dry or moist, or if they grow among other trees and plants, and if they occur in different varieties, and you shall write down descriptions thereof. . . . You shall experience and test at first hand all the above-mentioned if you can, but otherwise, you are to obtain information from the said persons, and once you are satisfied that you have an accurate account, you shall describe their nature, virtue, and temperament.[108]

Also starting in the 1570s, Phillip II commissioned the *Relaciones Geográficas* (discussed in Chapter 1), a series of questionnaires for Spanish officials in Mexico to use in collecting information on New World history, geography, and resources. Among the questions posed to colonial officials were: "What are the grains and seed plants, and other garden plants and vegetables that are or have been used as sustenance for the natives?" "What are the herbs or aromatic plants that the natives use for healing?" and "What are their medicinal or poisonous properties?"[109]

Why did the Spanish Crown avidly seek and record this botanical information? European explorations beginning in the late fifteenth century originally sought a new route to join the lucrative Eastern Spice trade, and this in part predisposed the crown and explorers to search for, collect, and document as much information as could be obtained on plants, their uses, and various other aspects of natural history in the Americas. European interest in plants, more specifically spices, is precisely what motivated the Christopher Columbus voyages beginning in 1492 and subsequent ones by Ferdinand Magellan beginning in 1519. Although the Spaniards failed to achieve their initial goal of joining the Eastern Spice trade, they stumbled upon a new and, in many respects, more remarkable avenue that yielded other botanical products that were to exert a tremendous effect in the world's economy and influence subsequent scientific and religious thought in the West.[110]

Much has been written regarding the extent to which, and the reasons why, Spain and other European powers were interested in botanical products and materials coming from the Americas.[111] But the scholarship is for the most part silent about the origin of the imports, almost as if the materials themselves had not been extracted from the natural world by skilled indigenous thinkers with capable hands. As Daniela Bleichmar points out in her study of the botanist Nicolás Monardes (1493–1588), in Spain he "was hailed as the discoverer of local, American secrets."[112] She further observes that the botanical and medical knowledge taken from the New World to Europe "was dependent on native knowledge yet [Europeans were] unable to access and credit indigenous populations as sources. American natives were at the center of this cycle and at the same time excluded from it."[113] Discussions of the properties of plants and plant material, and the extent of their exportation to Europe, barely reflect on the fact that these were the product of indigenous people's empirical work. It is almost as if a un-entity or a geographical space devoid of human population produced these domesticated plants and plant materials.

What little discussion acknowledges the pre-Columbian indigenous people's scientific understanding of botanical concepts dwells on how the Europeans collected the information and how it affected European scientific developments. For example, Jacqueline de Durand-Forest and E. J. de Durand do acknowledge that the discovery of the New World and access to indigenous knowledge of the natural world in New Spain invigorated European research in natural history. They maintain, however, that any pre-Columbian botanical or zoological record that may have existed before the conquest is now lost. Consequently, the authors discuss the scientific information in chronicles compiled in the early colonial period as the product of indigenous and European people's knowledge. For example, de Durand and de Durand contend that the *Codex Badianus*—written and painted by an Aztec doctor—presents "precise but

limited" information, and they credit the Franciscans with helping to produce a manuscript "where idolatrous practices do not seem at first to play any role."[114] The authors describe the information on indigenous medicine in the *Florentine Codex* as "the product of prehispanic ideas and concepts of European origin," adding that "the information comes from natives who have been partially acculturated."[115] Ultimately, the scholarship to date focusing on Mesoamerican plants does not fully discuss or even acknowledge that Nahuas in the early colonial period provided Europeans with substantial amounts of information on the natural world—new only to the Europeans—that they had acquired exclusively from their pre-Columbian ancestors and from their own observations and experimentations.

Currently, scholars have begun to call attention to the fact that the Spanish Empire's contributions to the development of the Scientific Revolution in Europe have not received adequate scholarly attention. Consequently, Spain has for the most part been portrayed as scientifically backward in the fifteenth and the sixteenth centuries in comparison to Britain, Portugal, the Netherlands, and various other European powers. Antonio Barrera-Osorio and Jorge Cañizares-Esguerra's scholarship focuses on Spaniards' contributions to the development of science in Europe, and their work has begun to fill the lacunae in the field. An edited volume by Daniela Bleichmar, Paula De Vos, Kristin Huffine, and Kevin Sheehan offers what Jorge Cañizares-Esguerra describes as "a much needed study of the Spanish and Portuguese contributions to the Scientific Revolution in Europe and abroad, a topic about which very little has been published in English."[116] As important and exciting as are these new developments in scholarship on Spain, they still fail to address another significant point. Spain was compiling and disseminating in Europe indigenous scientific knowledge concerning plants that has nothing to do with independent Spanish empirical research. Spanish explorers and doctors did not

"discover" the information about indigenous plants from Mexico on their own; rather, they appropriated it as part of a transfer of knowledge from one advanced civilization to another.

Francisco Hernández consistently reiterates this fact throughout his oeuvre. There, each Central Mexican plant is identified by its original Nahuatl name, and the source of plant information, repeatedly include phrases such as: "according to what the Indians say," "where the Indians hold this grass in great esteem," "from where the Indians took the name for this plant," and even asking, "What is strange about the notion that Indian doctors have discovered [the medicinal properties of a plant] through experience?"[117]

An observation made by Germán Somolinos d'Ardois, a scholar who has conducted extensive research on Hernández's work, illustrates this point. Somolinos d'Ardois has noted that when the indigenous *tlacuiloque* represented Spanish officials in their codices, they usually included a character known as *el preguntador* ("one who asks many questions"), indicating that Spanish officials had extracted information from indigenous Mesoamericans (fig. 2.11).[118] Hernández sometimes complained that he encountered some reluctant indigenous informants who concealed their knowledge from him and other Spanish officials.[119]

Therefore, Hernández's writings explicitly indicate that he did not "discover" information on plants and their properties independently; instead, he collected that information from the indigenous Nahua doctors, scientists, and other sages who graciously shared with him of their wisdom. In a letter dated March 31, 1573, addressed to the king, Hernández reports the following about his work in New Spain:

> Four volumes of paintings of plants have been completed recently, in which there are 1,100, and another in which there are 200 animals, all exotic and native to this region, and scripts in draft and almost half of the descriptions in fair copy. . . . According to the Indians, whose experience stretches over hundreds of years here . . . great care has been taken that no plant is painted unless I have seen it ten or more times in different seasons, smelled and tasted all its parts and asked more

> than twenty Indian doctors, each one individually, and considered how they agree and differ.[120]

Hernández even relied on indigenous painters to depict the numerous "New World" plants included in his work. The extent of his interactions and appreciation for the Nahua doctors and painter-scribes who helped him to undertake his ambitious project is reflected in the provisions he made for them in his will, where he states his desire "to compensate the Indians who were engaged to bring me herbs," namely the "Indian doctors of Mexico," and "the Mexican painters," three of whom he specifies by their Spanish names: Pedro Vásquez, Anton, and Baltasar Elías.[121]

Conclusion:

By the Late Postclassic period, the Nahua had obtained a sophisticated understanding of the natural world. The Nahua understood the biology of plants, and through genetic manipulation and selective breeding, they domesticated numerous plants. The collective effort of scholars working in different fields, including biology (particularly genetics), archaeology, botany, and anthropology, has demonstrated that Central Mexicans domesticated a wild grass and turned it into a plant that could produce large cobs with hundreds of kernels, providing sufficient nutrition to sustain large populations. Cytologists and other biologists, through their experimentations, have uncovered the genetic basis that has enabled them to identify the progenitor of the plant, and their work has also led to a better understanding of where the process originally took place and how it may have occurred approximately 8,000 years ago. The Nahuas' ancestors began a process of manipulation of a plant that has proved to be highly adaptable, capable of yielding cobs with specific desired characteristics targeted by humans. Their exploitation and management—through a process that can only be called scientific—caused the plant to produce

progressively larger cobs, and cobs with different desired genetic characteristics, for example color, taste, size, and/or nutritional value.

In the remainder of this dissertation, I use the scientific discussions regarding the maize plant presented in this chapter, as well as information provided in the ethnohistoric record, to support my contention that the iconography of the maize plant in the *Codex Borgia* encodes scientific messages. Specifically, I argue that a closer analysis of the ethnographic record shows that the science and history of the maize plant is inscribed in the pages of the *Codex Borgia*. Any study of maize and its relation to the imagery accompanying it in pre-Columbian and early colonial Central Mexican manuscripts should take into consideration the biology of the plant, its means of reproduction (i.e, through pollination), and the history of domestication recounted in the scientific record.

Indeed, the West's Scientific Revolution owes much to the pre-Columbian indigenous scientists who manipulated and found ingenious ways to use countless plants that prior to 1492 were known only to them. Regrettably, indigenous people's remarkable achievements and contributions have not been adequately acknowledged. This is an important reason, I think, why the imagery in the surviving Central Mexican manuscripts has not been recognized as presenting scientific information about plants. My analysis of the maize imagery in the *Codex Borgia* attempts to address that problem.

Endnotes

[1] "In tlilli, in tlapalli, in amoxtli, in tlacuilolli" (the ink, the blood, the book, the painting). This metaphorical Nahuatl phrase connotes the idea of painting or recording knowledge. For Spanish translations in early colonial sources see Bernardino de Sahagún, *Códice Florentino: El Gobierno de la República edita en facsimil el manuscrito 218–20 de la Colección Palatina de la Biblioteca Medicea Laurenziana Códice Florentino para mayor conocimiento de la historia del pueblo de México*, 3 vols. (Florence: Giunti Barbéra and the Archivo General de la Nación, 1979), bk. 11, fols. 180r, 180v; and Alonso de Molina, *Vocabulario de la lengua méxicana* (Leipzig: B. G. Teubner, 1880), fols. 147v, 130v, 5v, and 120r.

[2] For a discussion of the Mesoamerican calendar, see Chapter 3.

[3] See also page 51 of the *Codex Borgia* where Xochipilli (Flower Prince), a god associated with flowers and sexuality, holds a tree teeming with yellow-petaled flowers. As if emphasizing that the central message pertains to flowers, one of them, enlarged, appears at the top and center of the tree, rendered emitting a similar string. See Chapters 3 and 4 for further discussion of flowers and pollination.

[4] Paul C. Mangelsdorf, "The Origin of Corn," *Scientific American* 255, no. 2 (1986): 80.

[5] Viviane R. Jaenicke-Després and Bruce D. Smith, "Ancient DNA and the Integration of Archaeological and Genetic Approaches to the Study of Maize Domestication," in *Histories of Maize: Multidisciplinary Approaches to the Prehistory, Linguistics, Biogeography, Domestication, and Evolution of Maize*, ed. John Staller, Robert Tykot, and Bruce Benz (Walnut Creek, CA: Left Coast Press, 2009), 91; and Mangelsdorf, "The Origin of Corn," 72.

[6] Arnel R. Hallauer, Marcelo J. Carena, and J. B. Miranda Filho, "Quantitative Genetics in Maize Breeding," in *Handbook of Plant Breeding*, vol. 6 (New York: Springer Science & Business Media, 2010); and Merle T. Jenkins, "Maize Breeding During the Development and Early Years of Hybrid Maize," in *Maize Breeding and Genetics*, ed. David B. Walden (New York: John Wiley & Sons, 1978), 13–40.

[7] James Howard Kempton, "Maize: Our Heritage from the Indians," in *Report of the Smithsonian Institution* (1937): 407.

[8] "La una de maíz blanco, y la otra, de maíz negro, y la otra, de maíz muy amarillo, y la otra de maíz morado." Diego Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 2 vols., ed. Ángel María Garibay Kintana (Mexico City: Editorial Porrúa, 1967), 1:154.

[9] "En acabando de derramar aquellos cuatro géneros de maíz la gente acudía con gran prisa a coger de ello lo que más podían, porque aunque no cogiese sino dos granos, los llevaba y guardaba con mucho cuidado y lo sembraba para tener semilla de aquel maíz bendito" (In finishing the tossing of those four types of maize, people rushed to take as much as they could, because even if they could only obtain but two grains, they took and kept [those grains] with

great care and planted [them] so that they could have seed of that blessed maize). Ibid., 1:154–55.

[10] Bernardino de Sahagún, *Florentine Codex: The General History of the Things of New Spain*, trans. and ed. Charles E. Dibble and Arthur J. O. Anderson, 12 books in 13 vols., (Santa Fe: School of American Research and the University of Utah, 1953–82), bk. 11, ch. 13, 283.

[11] See note 66 in Chapter 1, this dissertation.

[12] Ibid., bk. 11, ch. 13, 279–82.

[13] Ibid., bk. 11, ch. 13, 280.

[14] George W. Beadle, "Teosinte and the Origin of Maize," in *Maize Breeding and Genetics,* ed. David B. Walden (New York: John Wiley & Sons, Inc., 1978), 113–28; John Doebley, "The Genetics of Maize Evolution," *Annual Review of Genetics* 38 (2004): 37–59; John Doebley, A. Stec, and L. Hubbard, "*teosinte branched 1* and the Origin of Maize: Evidence for Epistasis and the Evolution of Dominance," *Genetics* 141 (1995): 333–46; Walton C. Galinat, "The Origin of Maize as Shown by Key Morphological Traits of its Ancestor, Teosinte," *Maydica* 28 (1983): 121–38; and Yoshihiro Matsuoka, Yves Vigouroux, Major M. Goodman, Jesús Sánchez G., Edward Buckler, and John Doebley, "A Single Domestication for Maize Shown by Multilocus Microsatellite Genotyping," *Proceedings of the National Academy of Sciences of the United States of America* 99, no. 9 (2002): 6080–84.

[15] Paul C. Mangelsdorf, Richard S. MacNeish, and Walton C. Galinat, "Prehistoric Wild and Cultivated Maize," in *The Prehistory of the Tehuacan Valley: Environment and Subsistence*, ed. Douglas S. Byers, 5 vols. (Andover, MA: Robert S. Peabody Foundation, Phillips Academy, 1967a), 5:198.

[16] Stephen L. Dellaporta and Alejandro Calderon-Urrea, "The Sex Determination Process in Maize," *Science* 266, no. 5190 (1994): 1501–05; Allison DeLong, Alejandro Calderon-Urrea, and Stephen L. Dellaporta, "Sex Determination Gene TASSELSEED2 of Maize Encodes a Short-Chain Alcohol Dehydrogenase Required for Stage-Specific Floral Organ Abortion," *Cell* 74, no. 4 (1993): 757–68; M. S. Kinney, J. T. Columbus, and E. A. Friar, "Molecular Evolution of the Maize Sex-Determining Gene TASSELSEED2 in Bouteloua (Poaceae)," *Molecular Phylogenetics and Evolution* 29, no. 3 (1993): 519–28; Sabine Lebel-Hardenack and Sarah R. Grant, "Genetics of Sex Determination in Flowering Plants," *Trends in Plant Science* 2, no. 4 (1997): 130–36; Susan E. Parkinson, Stephen M. Gross, and Jay B. Hollick, "Maize Sex Determination and Abaxial Leaf Fates are Canalized by a Factor That Maintains Repressed Epigenetic States," *Developmental Biology* 308, no. 2 (2007): 462–473.

[17] Dellaporta and Calderon-Urrea, "The Sex Determination Process in Maize," 1504.

[18] Iván F. Acosta, Hélène Laparra, Sandra P. Romero, Eric Schmelz, Mats Hamberg, John P. Mottinger, Maria A. Moreno, and Stephen L. Dellaporta, "*tasselseed1* is a Lipoxygenase

Affecting Jasmonic Acid Signaling in Sex Determination of Maize," *Science* 323, no. 5911 (2009): 262–65; Christine Loos, Ralf Seppelt, Sara Meier-Bethke, Joachim Schiemann, and Otto Richter, "Spatially Explicit Modelling of Transgenic Maize Pollen Dispersal and Cross-Pollination," *Journal of Theoretical Biology* 225, no. 2 (2003): 241–55; Joaquima Messeguer, Gisela Peñas, Jordi Ballester, Marta Bas, Joan Serra, Jordi Salvia, Montserrat Palaudelmàs, and Enric Melé, "Pollen-Mediated Gene Flow in Maize in Real Situations of Coexistence" *Plant Biotechnology Journal* 4, no. 6 (2006): 633–45; and Caroline H. Mitchell and Pamela K. Diggle, "The Evolution of Unisexual Flowers: Morphological and Functional Convergence Results from Diverse Developmental Transitions," *American Journal of Botany* 92, no. 7 (2005): 1068–76.

[19] Dellaporta and Calderon-Urrea, "The Sex Determination Process in Maize," 1501.

[20] See, for example, Michael Bannert and Peter Stamp, "Cross-Pollination of Maize at Long Distance," *European Journal of Agronomy* 27, no. 1 (2007): 44–51; Nathalie Jarosz, Benjamin Loubet, and Laurent Huber, "Modelling Airborne Concentration and Deposition Rate of Maize Pollen," *Atmospheric Environment* 38, no. 33 (2004): 5555–66; Etienne K. Klein, Claire Lavigne, Xavier Foueillassar, Pierre-Henri Gouyon, and Catherine Larédo, "Corn Pollen Dispersal: Quasi-Mechanistic Models and Field Experiments," *Ecological Monographs* 73, no. 1 (2003), 131–50; Loos et al., "Spatially Explicit Modelling of Transgenic Maize Pollen Dispersal and Cross-Pollination," 241–55; and David Quist and Ignacio H. Chapela, "Transgenic DNA Introgressed Into Traditional Maize Landraces in Oaxaca, Mexico," *Nature* 414, no. 6863 (2001): 541–43.

[21] Loos et al., "Spatially Explicit Modelling of Transgenic Maize Pollen Dispersal and Cross-Pollination," 242.

[22] For an explanation of the sexual reproduction of maize, see Herbert Kendall Hayes, *A Professor's Story of Hybrid Corn* (Minneapolis: Burgess Publishing Company, 1963), 123. Hayes, however, does not provide an image of the entire plant that explains the process, only a picture of the plant's tassel.

[23] Edward S. Buckler IV and Natalie M. Stevens, "Maize Origins, Domestication, and Selection," in *Darwin's Harvest: New Approaches to the Origins, Evolution, and Conservation of Crops*," ed. Timothy J. Motley, Nyree Zerega, and Hugh B. Cross (New York: Columbia University Press, 2006), 82.

[24] Ibid.

[25] Duccio Bonavia, Takeo Kato-Yamakake, and others have argued that because of its great genetic diversity the maize plant may have had multiple and independent domestications (e.g., Mesoamerica and South America). See Duccio Bonavia, *Maize: Origin, Domestication, and Its Role in the Development of Culture* (Cambridge: Cambridge University Press, 2013), 61; and Takeo Kato-Yamakake, "Chromosome Morphology and the Origin of Maize and its Races," *Evolutionary Biology* 17 (1984): 219–53. Richard MacNeish and Mary Eubanks have analyzed archaeological and genetic material to support the theory that maize originated in Mesoamerica's

highlands. For a summary of their arguments, and how these were received, see: Richard S. MacNeish and Mary W. Eubanks, "Comparative Analysis of the Rio Balsas and Tehuacán Models for the Origin of Maize," *Latin American Antiquity* 11, no. 1 (2000): 3–20; Jeff Bennetzen, Edward Buckler, Vicki Chandler, John Doebley, Jane Dorweiler, Brandon Gaut, Michael Freeling, Sarah Hake, Elizabeth Kellogg, R. Scott Poethig, Virginia Walbot, and Susan Wessler, "Genetic Evidence and the Origin of Maize," *Latin American Antiquity* 12, no. 1 (2001): 84–86; and Mary Eubanks, "An Interdisciplinary Perspective on the Origin of Maize," *Latin American Antiquity* 12, no. 1 (2001b): 91–98.

[26] See George Beadle, "Teosinte and the Origin of Maize," *Journal of Heredity* 30 (1939): 245–47; Bruce F. Benz, "Maize in the Americas," in *Histories of Maize: Multidisciplinary Approaches to the Prehistory, Linguistics, Biogeography, Domestication, and Evolution of Maize*, ed. John Staller, Robert Tykot, and Bruce Benz (Walnut Creek, CA: Left Coast Press, 2009), 18; Doebley et al., "*teosinte branched 1* and the Origin of Maize," 333–46; Galinat, "The Origin of Maize as Shown by Key Morphological Traits of its Ancestor, Teosinte," 121–38; Paul C. Mangelsdorf, *Corn: Its Origin, Evolution and Improvement* (New York: Harvard University Press, 1974); Matsuoka et al., "A Single Domestication for Maize Shown by Multilocus Microsatellite Genotyping," 6083; Bruce D. Smith, *The Emergence of Agriculture* (New York: Scientific American Library, W. H. Freeman & Co., 1995); and Hugh G. Wilkes, "Corn, Strange and Marvelous: But Is a Definitive Origin Known?," in *Corn: Origin, History, Technology, and Production*, ed. C. W. Smith, J. Bertran, and E. C. A. Runge (London: Unwin Hyman, 2004), 3–63.

[27] Bonavia, *Maize: Origin, Domestication, and Its Role in the Development of Culture*, 61.

[28] Mangelsdorf, *Corn: Its Origin, Evolution and Improvement*, 16.

[29] Paul Freidrich Ascherson, "Ueber Euchlaena mexicana Schrad" *Bot. Vereins Prov. Brandenburg* 18 (1875): 76–80.

[30] Doebley, "The Genetics of Maize Evolution," 39. See also Guy N. Collins, "Structure of the Maize Ear as Indicated in Zea-Euchlaena Hybrids," *Journal of Agricultural Research* 17 (1919): 127–35.

[31] J. W. Harshberger, "Fertile Crosses of Teosinte and Maize," *Garden and Forest: A Journal of Horticulture, Landscape Art, and Forestry* 9 (1896): 522–23. See also Hugh Iltis and John Doebley, "Zea—A Biosystematical Odyssey," in *Plant Biosystematics*, ed. William F. Grant, 587–616 (Montreal: Academic Press, 1984), 591.

[32] Guy N. Collins, "Teosinte in Mexico," *Journal of Heredity* 12 (1921): 339–50; Collins, "Structure of the Maize Ear as Indicated in Zea-Euchlaena Hybrids," 127–35; Guy N. Collins and James Howard Kempton, "A Teosinte-Maize Hybrid," *Journal of Agricultural Research* 19 (1920): 1–38; Harshberger, "Fertile Crosses of Teosinte and Maize," 522–23; K. M. Schuman, "Mais und Teosinte," in *Festschrift für Paul Ascherson*, ed. Ignaz Urban and Paul Graebner (Leipzig, Germany: Verlag von Gebrüder Borntraeger, 1904), 137–57; and A. Vinson, "Extraits

de Correspondance," *Bulletin de la Société Nationale d'Acclimatation de France* 24 (1877): 580–84.

[33] Jenkins, "Maize Breeding During the Development and Early Years of Hybrid Maize," 13–40. For example, in the United States, George Harrison Shull is widely credited to have in 1909 discovered heterosis (vigor of cross breeding). Henry Agard Wallace and William L. Brown, *Corn and Its Early Fathers* (Kalamazoo: Michigan State University Press, 1956), 25, 39–41

[34] Collins, "Teosinte in Mexico," 339.

[35] Ramakrishna Wusirika, Kefeng Li, Ronald L. Phillips, and Jeffrey L. Bennetzen, "Zea," in *Wild Crop Relatives: Genomic and Breeding Resources: Cereals*, ed. Chittaranjan Kole (New York: Springer, 2011), 470.

[36] George W. Beadle, "Studies of *Euchlaena* and its Hybrids with *Zea*," *Molecular Genetics and Genomics* 62 (1932a): 291–304. (Please note that *Molecular Genetics and Genomics* is the first journal to publish peer-reviewed articles on genetics, and is widely known among scientists by any of the following names as well: *Molecular and General Genetics MGG*, *Zeitschrift für Vererbungslehre*, and *Zeitschrift für Induktive Abstammungs- und Vererbungslehre*. I mention this information because it caused me some confusion). Beadle observes: "*Euchlaena Mexicana* Shrad, annual teosinte, has long been known to cross freely with *Zea mays* L and produce fertile hybrids. These hybrids have been of special interest because of the rather great morphological differences between the two genera and because of the fact that *Euchlaena* represents the only known relative of *Zea* with which it will hybridize readily." See also George Beadle, "The Relation of Crossing Over to Chromosome Association in Zea-Euchlaena Hybrids," *Genetics* 17 (1932b): 481–501.

[37] Elizabeth A. Kellogg, "Plant Evolution: The Dominance of Maize," *Current Biology* 7 (1997): R411–R413.

[38] Doebley, "The Genetics of Maize Evolution," 39.

[39] Ibid. See also Collins, "Structure of the Maize Ear as Indicated in Zea-Euchlaena Hybrids," 127–35.

[40] Kempton, "Maize: Our Heritage from the Indians," 385–408.

[41] John F. Doebley, "George Beadle's Other Hypothesis: One-gene, One-trait," *Genetics* 158 (2001): 488. See also Buckler and Stevens, "Maize Origins, Domestication, and Selection," 71.

[42] Paul Mangelsdorf and Robert G. Reeves, "The Origin of Indian Corn and its Relatives," *Texas Agricultural Experiment Station Bulletin* 574 (1939): 304. See also J. M. J. DeWet and Jack R. Harlan, "Origin of Maize: The Tripartite Hypothesis," *Euphytica* 21 (1972): 271–79.

[43] For example C. D. Darlington, D. G. Langham, A. E. Longley, C. S. Miranda, K. M. Schuman, and A. Vinson.

[44] Cyril Dean Darlington, *Chromosome Botany* (London: Allen & Unwin, 1956); Doebley, "The Genetics of Maize Evolution," 40; Derald George Langham, "The Inheritance of Intergenomic Difference in *Zea-Euchlaena* Hybrids," *Genetics* 25 (1940): 88–107; Albert E. Longley, "Chromosome Morphology in Maize and its Relatives," *Botanical Review* 7 (1941): 263–89; Schuman, "Mais und Teosinte," 137–57; and Vinson, "Extraits de Correspondance," 580–84.

[45] Mangelsdorf and Reeves, "The Origin of Indian Corn and its Relatives," 209.

[46] Ibid. In 1921, Collins learned during his field trip in Mexico looking for teosinte strains that in certain communities, "the name teosinte is applied sometimes to Tripsacum" and that "before flowering, there is a superficial resemblance between Euchlaena and Tripsacum, but as soon as the inflorescences appear the two genera should not be confused by the most casual observer." See Collins, "Teosinte in Mexico," 347.

[47] Paul Mangelsdorf and Robert G. Reeves, "Hybridization of Maize, Tripsacum, and Euchlaena," *The Journal of Heredity* 22 (1931): 329, 338, 342. The technique included trimming silks; removing husks; and after pollination, surgically transferring kernels (embryos) to sterile agar in Petri dishes in a temperature of 33° C to germinate. They explained that, "out of approximately 185,000 silks exposed to pollination [they reported to have applied an unusually large amount of Tripsacum pollen on the maize plants' silks], approximately 35,000 set seed and of these only 84 matured."

[48] Ibid., 341.

[49] Mangelsdorf and Reeves, "The Origin of Indian Corn and its Relatives," 242, 310.

[50] Bonavia, *Maize: Origin, Domestication, and Its Role in the Development of Culture*, 37; J. M. J. DeWet and Jack R. Harlan, "Cytogenic Evidence for the Origin of Teosinte (*Zea mays ssp. mexicana*)," *Euphytica* 25 (1976): 447–55; Jack R. Harlan and J. M. J. DeWet, "Pathways of Genetic Transfer from *Tripsacum* to *Zea mays*," *Proceedings of the National Academy of Sciences of the United States of America* 74, no. 8 (1977): 3494–97; and Paul C. Mangelsdorf, "Introgression in Maize," *Euphytica* 10 (1961): 159.

[51] Beadle, "Teosinte and the Origin of Maize," 245–47.

[52] Edward S. Buckler IV and Natalie M. Stevens point out that the work of Paul Mangelsdorf and Robert G. Reeves helped scientists to develop this aspect of the teosinte hypothesis. Buckler and Stevens state: "Beadle actually used Mangelsdorf and Reeve's own data against them, claiming that their four factors might just as well correspond to four major genes, each of which controlled a single trait that differentiated teosinte from maize." Edward S. Buckler IV and Natalie M. Stevens, "Maize Origins, Domestication, and Selection," in *Darwin's Harvest: New Approaches*

to the Origins, Evolution, and Conservation of Crops," ed. Timothy J. Motley, Nyree Zerega, and Hugh B. Cross (New York: Columbia University Press, 2006), 71.

[53] For a further details see Doebley, "The Genetics of Maize Evolution," 40, from which this synopsis was adapted.

[54] Doebley, "George Beadle's Other Hypothesis: One-Gene, One-Trait," 489.

[55] See for example Melinda A. Zeder, Eve Emshwiller, Bruce D. Smith, and Daniel G. Bradley, "Documenting Domestication: The Intersection of Genetics and Archaeology," *Trends in Genetics* 22, no. 3 (March 2006): 139–55; and John F. Doebley, Brandon S. Gaut, and Bruce D. Smith, "The Molecular Genetics of Crop Domestication," *Cell* 127 (2006): 1309–21.

[56] MacNeish excavated in Tamaulipas and the Tehuacán Valley, and Flannery in the Balsas River drainage.

[57] Helke Ferrie, "An Interview with Richard S. MacNeish," *Current Anthropology* 42, no. 5 (December 2001): 717. This interview also reveals that the Mexican archaeologists Javier Romero and Juan Valenzuela, who in the 1930s conducted archaeological excavations in the Tamaulipas area, guided by local residents, informed MacNeish of the likelihood of finding significant archaeobotanical material in the dry caves in the area. For further information on MacNeish's archaeological work, see Richard MacNeish, *The Origins of Agriculture and Settled Life* (Norman, OK: University of Oklahoma Press, 1992). MacNeish's excavations in Tamaulipas in the 1950s led him to a group of caves collectively known as the Cuevas de Ocampo, which include the Romero and the Valenzuela Caves, where he found an abundance of maize remains. However, as Kevin Hanselka, who specializes in the origins and development of agriculture in Tamaulipas has pointed out, "By the mid-1950s it was clear that none of the Ocampo cultigens had originated locally in Tamaulipas, but rather all had been introduced from elsewhere in Mexico." He adds that "for the most part the Ocampo excavations remain unpublished." See J. Kevin Hanselka, "Prehistoric Plant Procurement, Food Production, and Land Use in Southwestern Tamaulipas, Mexico" (PhD diss., Washington University, 2011), 13.

[58] McNeish's early success caught Mangelsdorf's attention, encouraging him to conduct more archaeological work in Central Mexico and in Peru.

[59] See Austin Long, Bruce F. Benz, D. J. Dinahue, A. J. T. Jull, and L. J. Toolin, "First Direct AMS Dates on Early Maize from Tehuacán, Mexico," *Radiocarbon* 31, no. 3 (1989): 1036; Gayle J. Fritz, "Are the First American Farmers Getting Younger?" *Current Anthropology* 35, no. 3 (1994): 305–9; and Gayle J. Fritz, "New Dates and Data on Early Agriculture: The Legacy of Complex Hunter-Gatherers," *Annals of the Missouri Botanical Garden* 82 (1995): 3–15.

[60] Bruce F. Benz and Hugh H. Iltis, "Studies on Archaeological Maize I: The 'Wild' Maize from San Marcos Cave Reexamined," *American Antiquity* 55, no. 3 (1990): 507; Paul C. Mangelsdorf, Richard MacNeish, and Walton Galinat, "Domestication of Corn," *Science* 143, no. 3606 (1964):

541–44; Long et al., "First Direct AMS Dates on Early Maize from Tehuacán, Mexico," 1036, 1039.

[61] Dolores R. Piperno and Kent V. Flannery, "The Earliest Archaeological Maize (*Zea mays* L.) From Highland Mexico: New Accelerator Mass Spectrometry Dates and Their Implications," *Proceedings of the National Academy of Sciences of the United States of America* 98, no. 4 (2001): 2101–3. In the 1980s, the AMS method was used to revise the Tehuacán chronology. For a full discussion, consult the following publications: Mary Eubanks, "The Mysterious Origin of Maize," *Economic Botany* 55, no. 4 (2001a): 492–514, where she argues that "the Tehuacán Valley macrofossils represent the full spectrum of maize evolution," 499; Kent V. Flannery, "In Defense of the Tehuacán Project," *Current Anthropology* 38, no. 4 (1997): 660–62; Fritz, "Are the First American Farmers Getting Younger?" 305–8; Long et al., "First Direct AMS Dates on Early Maize from Tehuacán, Mexico," table 1, 1037, 1039; Austin Long and Gayle J. Fritz, "Validity of AMS Dates on Maize for the Tehuacán Valley: A Comment on MacNeish and Eubanks," *Latin American Antiquity* 12, no. 1 (2001): 87–90; Richard MacNeish, "In Defense of the Tehuacán Project," *Current Anthropology* 38, no. 4 (1997): 666–70; MacNeish and Eubanks, "Comparative Analysis of the Rio Balsas and Tehuacán Models for the Origin of Maize," 15; Deborah M. Pearsall, "Investigating New World Tropical Agriculture: Contribution from Phytolith Analysis," in *Tropical Archaeobotany: Appplication and New Development*, ed. Kohn G. Hather (London: Routledge, 1994), 115–38; and Bruce D. Smith, "Reassessing Coxcatlan Cave and the Early History of Domesticated Plants in Mesoamerica," *Proceedings of the National Academy of Sciences of the United States of America* 102, no. 27 (2005): 9443, table 1.

[62] Piperno and Flannery, "The Earliest Archaeological Maize (*Zea mays* L.) From Highland Mexico," 2101–3; and Bruce F. Benz, "Archaeological Evidence of Teosinte Domestication From Guilá Naquitz Oaxaca," *Proceedings of the National Academy of Sciences of the United States of America* 98 (2001): 2104–6.

[63] John Doebley, "Molecular Evidence and the Evolution of Maize," *Economic Botany* 44, no. 3 (1990): 6–27; Kent V. Flannery, ed., *Guilá Naquitz: Archaic Foraging and Early Agriculture in Oaxaca, México* (Orlando: Academic Press, 1986a); Matsuoka et al., "A Single Domestication for Maize Shown by Multilocus Microsatellite Genotyping," 6080–84; and Garrison H. Wilkes, "Maize and its Wild Relatives," *Science* 177, no. 4054 (1972): 1071–77.

[64] Benz, "Archaeological Evidence of Teosinte Domestication from Guilá Naquitz Oaxaca," 2104–6.

[65] George W. Beadle, "The Mystery of Maize," *Field Museum of Natural History Bulletin* 43, no. 10 (1972), 10; Beadle, "Teosinte and the Origin of Maize," 245–247.

[66] Beadle, "The Mystery of Maize," 6.

[67] Beadle, "Teosinte and the Origin of Maize," 246.

[68] Barbara McClintock, "Mutable Loci in Maize," *Carnegie Institution of Washington Year Book* 47 (1948): 155–69.

[69] Barbara McClintock, "The Origin and Behavior of Mutable Loci in Maize," *Proceedings of the National Academy of Sciences of the United States of America* 36, no. 6 (1950): 344–55; and Barbara McClintock, "Induction of Instability at Selected Loci in Maize," *Genetics* 38, no. 6 (1953): 579–99.

[70] Doebley, "George Beadle's Other Hypothesis: One-Gene, One-Trait," 487–93; Beadle, "The Mystery of Maize," 2–11; and Beadle, "Teosinte and the Origin of Maize," 113–28.

[71] Hugh H. Iltis, John F. Doebley, Rafael M. Guzmán, and Batia Pazy, "Zea diploperennis (Gramineae): A New Teosinte from Mexico," *Science* 203, no. 4376 (1979): 186–88.

[72] Mangelsdorf, "The Origin of Corn," 74.

[73] Hugh Iltis and John Doebley, "Taxonomy of *Zea*. II. Subspecific Categories in the *Zea mays* Complex and a Generic Synopsis," *American Journal of Botany* 67 (1980): 994–1004; and Iltis and Doebley, "Zea—A Biosystematical Odyssey," in *Plant Biosystematics*, 591

[74] *Zea diploperennis* is a perennial diploid (n=10) that Iltis, Doebley, and Guzmán discovered in southwestern Jalisco, Mexico, in 1979. See: Iltis et al., "Zea Diploperennis (Gramineae): A New Teosinte from Mexico," 186–88; and Bruce Benz, L. R. Sánchez-Velásquez, and Michel F. J. Santana, "Ecology and Ethnobotany of Zea diploperennis: Preliminary Investigations," *Maydica* 35 (1990): 85–98. *Zea perennis* is a perennial tetraploid (n=2x=20) endemic to the northern slopes of southwestern Jalisco, Mexico. See John Doebley, "Molecular Evidence for a Missing Wild Relative of Maize and the Introgression of its Chloroplast Genome into *Zea perennis*," *Evolution* 43 (1989): 1555–59; and Jens Clausen, David D. Keck, and William H. Hiesey, *Experimental Studies on the Nature of Species. II. Plant Evolution Through Amphidiploidy and Autopolyploidy with Examples from the Madiinae* (Washington, DC: Carnegie Institution of Washington Publication 564, no. 1, 1945). On *Zea luxurians*, which is native to Honduras, Guatemala, and Nicaragua, see Robert McK. Bird, "A Name Change for Central American Teosinte," *Taxon* 27, no. 4 (August 1978): 361–63. On *Zea nicaraguensis*, discovered in 1980 growing in the Pacific Coast of Nicaragua, see Hugh H. Iltis and Bruce F. Benz, "*Zea nicaraguensis* (Poaceae), A new Teosinte from Pacific Coastal Nicaragua," *Novon* 10 (2000): 382–90. And for a discussion of *Zea mays,* see Hugh H. Iltis, "The Taxonomy of *Zea mays* (Gramineae)," *Phytologia* 23 (1972): 248–49.

[75] John Doebley's website teosinte.wisc.edu/taxonomy.html presents a very informative guide that is thorough in its description and classification of each strain of teosinte and its close relatives, including maize and *Tripsacum*. The site also includes an extensive bibliography on major publications on maize genetics with attached PDFs. See also John Doebley, "Molecular Evidence and the Evolution of Maize," *Economic Botany* 44 (3 suppl., 1990): 8.

[76] Mangelsdorf, "The Origin of Corn," 75; see also Mangelsdorf, *Corn: Its Origin, Evolution and Improvement*.

[77] Mangelsdorf, "The Origin of Corn," 74.

[78] He affirms: "With the discovery of Z. diploperennis . . . one of corn's wild parents has at last been found. And with the recognition that modern cultivated corn has two parents, the long debate over its ancestry can be laid to rest. The question 'Which is the ancestor of cultivated corn—teosinte or wild corn?' is now beside the point: both are." Ibid., 75, 77–78.

[79] Mangelsdorf, "Corn: Its Origin, Evolution, and Improvement, 157; and Hugh Iltis, "Homeotic Sexual Translocations and the Origin of Maize (*Zea mays*, Poaceae): A New Look at an Old Problem," *Economic Botany* 54, no. 1 (2000): 36.

[80] Michael D. Coe, *Mexico,* 4th ed. (New York: Thames and Hudson, 1994), 33.

[81] Kent V. Flannery, "The Research Problem," in *Guilá Naquitz: Archaic Foraging and Early Agriculture in Oaxaca, México*, ed. Kent V. Flannery (Orlando: Academic Press, 1986b), 8. For further discussion of this topic, particularly archaeological pollen, consult also: Paul C. Mangelsdorf, Richard S. MacNeish, and Walton C. Galinat, "Prehistoric Maize, Teosinte and Tripsacum from Tamaulipas, Mexico," *Botanical Museum Leaflets* 22, no. 2 (1967b): 33–63; Piperno and Flannery, "The Earliest Archaeological Maize (*Zea mays* L.) From Highland Mexico," 2101–3; James Schoenwetter, "Pollen Records of Guilá Naquitz Cave," *American Antiquity* 39, no. 2 (1974): 292–303; Matsuo Tsukada and John Rowley, "Identification of Modern and Fossil Maize Pollen," *Grana Palynologica* 5 (1964): 406–12.

[82] Bonavia, *Maize: Origin, Domestication, and Its Role in the Development of Culture*, 122–38.

[83] Beadle, "Teosinte and the Origin of Maize," 122.

[84] Beadle, "The Mystery of Maize," 10. See also Doebley, "The Genetics of Maize Evolution," 43–44.

[85] Kent V. Flannery, "The Origins of Agriculture," in *Annual Review of Anthropology*, ed. B. J. Siegel, A. R. Beals, and S. B. Tyler (Palo Alto, CA: Annual Reviews, vol. II, 1973), 290–97.

[86] Iltis, "Homeotic Sexual Translocations and the Origin of Maize," 36.

[87] John Smalley and Michael Blake, "Sweet Beginnings: Stalk Sugar and the Domestication of Maize," *Current Anthropology* 44, no. 5 (December 2003): 675–703. More recently, in 2011, David Webster argued that teosinte use for its sugary stalk and other non-grain purposes before 1,000 CE can explain the relative dearth of teosinte in the archaeological record. He contended that humans inadvertently set the stage for the development of the maize plant by targeting the plant's non-grain parts to make fermented drinks, thus reducing teosinte's genome, and creating what he called a genetic "backward bottleneck." According to Webster, this explains how a

multi-branched grass that produced several spikelets (teosinte) was converted into a single-branched plant that produced one or at most two cobs (maize). See David Webster, "Backward Bottlenecks," *Current Anthropology* 52, no. 1 (February 2011): 77–104.

[88] Dolores R. Piperno, Jorge Enrique Moreno, José Iriarte, Irene Holst, Matthew S. Lachniet, John G. Jones, Anthony J. Ranere, and R. Castanzo, "Late Pleistocene and Holocene Environmental History of the Iguala Valley, Central Balsas Watershed of Mexico," *Proceedings of the National Academy of Sciences of the United States of America* 104, no. 29 (2007): 11876, 11880.

[89] Doebley, "The Genetics of Maize Evolution," 42–43; Jane E. Dorweiler and John F. Doebley, "Developmental Analysis of Teosinte Glume Architecture. 1: A Key Locus in the Evolution of Maize (Poaceae)," *American Journal of Botany* 84, no. 10 (1997): 1313–22; Jane E. Dorweiler, Adrian Stec, Jerry Kermicle, and John Doebley, "Teosinte Glume Architecture 1: A Genetic Locus Controlling a Key Step in Maize Evolution," *Science* 262, no. 5131 (1993): 233–35; and Huai Wang, Tina Nussbaurn-Wagner, Bailin Li, Quiong Zhao, Yves Vigoroux, Marianne Faller, Kirsten Bomblies, Lewis Lukens, and John F. Doebley, "The Origin of Naked Grains of Maize," *Nature* 436, no. 7051 (2005): 714–19.

[90] John F. Doebley, Adrian Stec, and L. Hubbard, "The Evolution of Apical Dominance in Maize," *Nature* 386, no. 6624 (1997): 485–88.

[91] Doebley, "The Genetics of Maize Evolution," 37–59. For further discussion see Beadle, "Studies of *Euchlaena* and its Hybrids with *Zea*," 291–304; Beadle, "The Mystery of Maize," 2–11; Rollins Adams Emerson and George Beadle, "Studies of *Euchlaena* and its Hybrids with *Zea*. II. Crossing Over Between the Chromosomes of *Euchlaena* and those of *Zea*," *Z. Abst. Vererb.* 62 (1932b): 305–15; Takeo A. Kato-Yamakake, "Cytological Studies of Maize (*Zea mays* L.) and Teosinte (*Zea mexicana* (Schrader) Kuntze) in Relation to their Origin and Evolution," *Massachusetts Agricultural Experiment Station Bulletin* 635 (1976): 1–186; and Longley, "Chromosome Morphology in Maize and its Relatives," 263–89.

[92] Hugh H. Iltis, "Origin of polystichy in maize," in *Histories of Maize: Multidisciplinary Approaches to the Prehistory, Linguistics, Biogeography, Domestication, and Evolution of Maize*, ed. John Staller, Robert Tykot, and Bruce Benz (Walnut Creek, CA: Left Coast Press, 2009), 22.

[93] R. I. Wang, J. Stec, J. Hey, L. Lukens, and John Doebley, "The Limits of Selection During Maize Domestication," *Nature* 398 (1999): 236–39. Scientists created a facsimile of the *tb1* gene mutant, which showed the probable appearance of the ancient mutant in teosinte. See: Doebley, "The Genetics of Maize Evolution," 42–43; Jane Dorweiler, Adrian Stec, Jerry Kermicle, and John Doebley, "Teosinte Glume Architecture 1: A Genetic Locus Controlling a Key Step in Maize Evolution," *Science* 262, no. 5131 (1993): 233–35; and Smith, *The Emergence of Agriculture*, 230.

[94] Matsuoka et al., "A Single Domestication for Maize Shown by Multilocus Microsatellite Genotyping," 6083.

[95] Ibid.

[96] Benz, "Maize in the Americas," 18.

[97] Ibid.

[98] Ibid.

[99] See for example Benz, "Maize in the Americas," 18; and Zeder et al., "Documenting Domestication: The Intersection of Genetics and Archaeology," 139–55.

[100] Benz, "Maize in the Americas," 18.

[101] Beadle, "Teosinte and the Origin of Maize," 122.

[102] Sahagún, *Florentine Codex*, bk. 11, ch. 7, 187.

[103] Ibid.

[104] Sahagún, *Florentine Codex*, bk. 10, ch. 29, 183. For information on the inhabitants of Matlatzinco, see Noemí Quezada, *Los matlatzincas: Época prehispánica y época colonial hasta 1650* (Mexico City: Universidad Nacional Autónoma de México, 1996).

[105] "Maíz tostado y reventado, que ellos llaman momochitl." Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 1:28.

[106] "Izquixochitl, que quiere tanto dezir como planta que tiene las flores como los granos del mayz que puestos al fuego rebentaron." Francisco Hernández, *Extratado de las obras del Dr. Francisco Hernández*, ed. and trans. Francisco Ximenes (Mexico City: C. Licenciado Agustín Canseco, 1645), bk. 1, ch. 38. Also, Alonso de Molina makes a reference to toasted maize; he includes an entry of a word *izquiatl*, which he translates as "drink made from toasted and ground maize," probably a compound word from "*izqui*" (maize?) and "atl" (water). Molina, *Vocabulario de la lengua méxicana*, fol. 49r.

[107] Millie Gimmel, "Reading Medicine in the Codex de la Cruz Badiano," *Journal of the History of Ideas* 69, no. 2 (2008): 169–92.

[108] Simon Varey, ed., *The Mexican Treasury: The Writings of Dr. Francisco Hernández*, trans. Rafael Chabrán, Cynthia L. Chamberlin, and Simon Varey (Stanford: Stanford University Press, 2000), 46.

[109] Barbara Mundy, *The Mapping of New Spain: Indigenous Cartography and the Maps of the Relaciones Geográficas* (Chicago: University of Chicago Press, 1996), 229.

[110] The literature on this topic is extensive. See, for example: Antonio Barrera-Osorio, "Knowledge and Empiricism in the Sixteenth-Century Spanish Atlantic World," in *Science in the Spanish and Portuguese Empires, 1500–1800*, ed. P. D. Daniela Bleichmar, Kristin Huffine, and Kevin Sheehan (Stanford: Stanford University Press, 2009), 219–32; Fernando J. Bouza Álvarez, *Corre manuscrito: Una historia cultural del Siglo de Oro* (Madrid: Marcial Pons, 2001); Karl W. Butzer, "From Columbus to Acosta: Science, Geography, and the New World," *Annals of the Association of American Geographers* 82, no. 3 (1992): 546–65; Paula De Vos, "Research, Development, and Empire: State Support of Science in Spain and Spanish America, Sixteenth to Eighteenth Centuries," *Colonial Latin American Review* 15, no. 1 (2006a): 55–79; Paula De Vos, "The Science of Spices: Empiricism and Economic Botany in the Early Spanish Empire," *Journal of World History* 17, no. 4 (2006b): 399–427; Nicolás García Tapia and M. I. Vicente Maroto, "Juan de Herrera, un científico en la corte española," in *Instrumentos científicos del siglo XV: La corte española y la Escuela de Lovaina* (Madrid: Fundación Carlos de Amberes, 1997), 41–54; Antonello Gerbi, *Nature in the New World: From Christopher Columbus to Gonzalo Fernández de Oviedo*, trans. Jeremy Moyle (Pittsburgh: University of Pittsburgh Press, 1985); David Goodman, *Power and Penury: Government, Technology, and Science in Phillip II's Spain* (Cambridge: Cambridge University Press, 1988); José María López Piñero and José Pardo Tomás, *Nuevos materiales y noticias sobre la historia de las plantas de Nueva España de Francisco Hernández* (Valencia, Spain: Instituto de Estudios Documentales e Históricos sobre la Ciencia, Universitat de València-CSIC, 1994); and José Pardo Tomás and María Luz López Terrada, *Las primeras noticias sobre plantas americanas en las relaciones de viajes y crónicas de Indias, 1493–1553* (Valencia, Spain: Instituto de Estudios Documentales e Históricos sobre la Ciencia, Unviersitat de València, C.S.I.C., 1993).

[111] See, for example: Antonio Barrera-Osorio, *Experiencing Nature: The Spanish American Empire and the Early Scientific Revolution* (Austin: University of Texas Press, 2006); Jorge Cañizares Esguerra, *Nature, Empire, and Nation: Explorations of the History of Science in the Iberian World* (Stanford: Stanford University Press, 2006); and José Pardo Tomás, *Oviedo, Monardes, Hernández: El tesoro natural de América, colonialismo y ciencia en el siglo XVI* (Madrid: Nivola, 2002).

[112] Daniela Bleichmar, "Books, Bodies, and Fields: Sixteenth-Century Transatlantic Encounters with New World Materia Medica," in *Colonial Botany: Science, Commerce, and Politics*, ed. Londa Schiebinger and Claudia Swan (Philadelphia: University of Pennsylvania Press, 2004), 95.

[113] Ibid.

[114] "Précis mais limité," "où les pratiques idolâtriques ne semblaient de prime abord jouer aucun role." Jacqueline de Durand-Forest and E.J. de Durand, "A la découverture de l'histoire naturelle en Nouvelle Espagne," *Histoire, Économie et Société* 7, no. 3 (1988): 306, 308

[115] "Le produit d'idées préhispaniques et de concepts d'origine européenne, mais dans une moindre mesure puisque les informations émanent d'indigènes partiellement acculturés." De Durand-Forest and de Durand, "A la découverture de l'histoire naturelle en Nouvelle Espagne," 308.

[116] Daniela Bleichmar, Paula DeVos, Kristin Huffine, and Kevin Sheehan, ed. *Science in the Spanish and Portuguese Empires, 1500–1800* (Stanford: Stanford University Press, 2009), xix.

[117] "Según dicen los indios," "donde los indios tienen esta hierba en gran estimación," "de donde los indios pusieron el nombre," and "¿qué tiene de extraño que los médicos indios hayan descubierto por experiencia que sucede así?" Francisco Hernández, *Obras completas: Historia natural de Nueva España*, trans. José Rojo Navarro (Mexico City: Universidad Nacional de México, 1959b), 796, 826, 807, and 859.

[118] Germán Somolios d'Ardois, *Historia natural de Nueva España. Obras completas*, 2 vols. (Mexico City: Universidad Nacional Autónoma de México, 1959a), 1:196. Nevertheless, fieldwork is inherently difficult, and Hernández specifically complained that the Nahua often related to him the wrong information about plants, and that counteracting such tendencies was an arduous task. See "Poema a Arias Montano," in *Obras completas*, vol. 7, page 30. The image of "el preguntador" that Somolinos d'Ardois refers to appears in the Maya book known as *El Libro de Chilam Balam de Chumayel*, a colonial document recording in text (in Yucatec Mayan) and images a variety of information pertaining historical events, myths, religious, and medical information, which scholars argue began to be compiled in the sixteenth century and was subsequently altered and expanded by Maya painter scribes in the 1700s.

[119] "Esconden en arcanos lo que tienen conocido e investigado." Francisco Hernández, *Antigüedades de la Nueva España*, ed. and trans. Joaquín García Pimentel (Mexico City, Editorial P. Robredo, 1945), fol. 1v of facsimile.

[120] A copy of the letter appears in Varey, ed., *The Mexican Treasury: The Writings of Dr. Francisco Hernández*, 52.

[121] For a copy of Dr. Francisco Hernández's will, see ibid., 62.

CHAPTER THREE

THE SEXUAL REPRODUCTION OF MAIZE DEPICTED ON PAGE 28 OF THE CODEX BORGIA

Page 28 of the *Codex Borgia* (fig. 3.1), which features maize in association with male and female figures, is a symbolic portrayal of the sexual reproduction of the maize plant. I support that contention in this chapter with iconographic, scientific, and ethnographic evidence. Understanding the biology of the plant is key to unlocking some of the messages encoded in the imagery, which have remained largely unexamined or unexplained in the existing scholarship. As discussed in Chapter 2, the maize plant has male and female parts and reproduces sexually, relying on wind to disseminate its pollen to reproduce. Figure 2.7 illustrates this: wind carries the pollen (containing the male sex cells) from the tassels at the top of the plants to the silks (containing the female sex cells) below. In this chapter I argue that the imagery on page 28 reflects this same information.

Each of the male and female figures on page 28 wears costume elements and/or holds accouterments of gods that the Nahua related to fertility, sexuality, sustenance, wind, and maize reproduction. Among the gods most prominently invoked is Quetzalcoatl, who is closely linked to the origin of maize and agriculture in Nahua mythology and who in his persona of Ehecatl-Quetzalcoatl is the god of wind, the very means by which maize reproduces.[1]

Brief Introduction to the Iconography on Page 28 of the *Codex Borgia*

Page 28 (fig. 3.1) presents five compartments, one in the center and one in each corner, with a repeating theme of male and female figures amid maize plants. The imagery in each compartment is strikingly similar in structure, featured elements, and spatial distribution: a male

occupies the top and central space; a female is directly below him; a container sits directly behind her; and plots of land cultivated with maize plants occupy the entire width and lower space. Three side-by-side rectangles, each containing a day sign glyph, appear directly below the cultivated fields, occupying the entire width of the lowest edge of each compartment.

To the right and left of each female (fig. 3.2), maize plants bear cobs that have anthropomorphic features including eyes and/or mouths, and each cob is painted a different color. Each maize plant is depicted with silks on the cobs, a tassel, and a root system. The emphasis placed on depicting botanical features indispensable for the plant's reproduction—i.e., the male and female parts—indicates that the imagery refers to something more than simply farming.

The poses of the male and female figures echo each other: their heads are tilted backward with their faces looking directly upward, their eyes are open, and their arms are outstretched to the sides. Only in the arrangement of their legs do the positions of their bodies differ. The males stand in midair, with one leg in front of the other as if walking, whereas the females' legs are bent at the knee, with one leg in front of the other, in what Elizabeth Boone describes as a "pinwheel stance."[2] Each of the females has open hands. The males are depicted with the goggled eyes and long fangs that identify them as Tlaloc, the Aztec god of rain. Each male holds with his left hand a serpent and an undulating stick representing lighting (*tlapetlaniliztli*), accouterments that further identify him with Tlaloc.[3] In his right hand, each holds an effigy vessel in the form of a face with the goggled eyes of Tlaloc, like those also seen on pages 27, 37, and 75 of the *Codex Borgia*.[4]

Streams of water emanate from each Tlaloc. One flows from each of his wrists onto the maize plants, while the stream emanating from his groin falls on the female directly below him.

Each Tlaloc is also depicted with costume elements and facial paint of an additional god, and the streams are studded with attributes of that additional god. Evidently, the males disseminate those attributes since they fall on the maize plants and the goddesses. Beginning in the lower-right compartment, and following a counterclockwise direction, these attributes are: flint knives, a "fungus design," excrement and/or fire curls, Ehecatl-Quetzalcoatl serpents, and flowers.[5]

Tlaloc's costume elements are: a headdress, a pectoral, a necklace, a *maxtlatl* (loincloth[6]), bands around the wrists and the upper legs, and sandals; however, there is variation in the form and coloring of these elements as well as in the face and body painting. A ray protruding from an inverted trapezoid, a symbol associated with fire and used to denote the beginning of a *xihuitl* (solar year), appears superimposed on Tlaloc's customary *aztatl* (heron) feather headdress.[7] Whereas each male is dressed in full regalia, the female accompanying him wears jewels, a headdress, and, in some instances, face or body paint, but is otherwise naked. Their fully exposed breasts accentuate their femaleness. Their nakedness evokes sexuality.

Eduard Seler, Anthony Aveni, Christine Hernández and others have analyzed this page, but the females' significance has not been thoroughly examined.[8] Most scholars dismiss their presence altogether, and one has declared them to be "secondary female figures."[9] Certainly, however, the females' presence appears to be as important as that of the males. Significantly, in the lower-right compartment, the female wears the headdress of Quetzalcoatl in his aspect of the god of wind (fig. 3.3). As will be discussed in greater detail in Chapter 4, the Nahua credited Quetzalcoatl with obtaining maize for humans, abundance in agricultural production, and, more generally, pregnancy, childbearing, sustenance, and prosperity. Why the need to conjure the god of wind on page 28?

I contend that the biology of the maize plant can answer questions about the iconography on this page. Maize reproduces sexually through pollination. Each Tlaloc on this page is essentially rendered as a personified maize tassel, floating in midair while each female sits below him amid maize plants personifying the silks. The iconographic reference to wind is not at all surprising when considering the critical role that this element plays in disseminating pollen.

The Mesoamerican Calendar and Scholarship to Date on Page 28 of the *Codex Borgia*

To date, studies of page 28 of the *Codex Borgia* have primarily focused on its calendrical symbols. By the time of the conquest, the Nahua were still using the same system devised and used by their early ancestors, which the *Florentine Codex* simply describes as dating "from time immemorial."[10] Days had a unique name formed by the combination of a number and a day sign symbol. Each number was represented with dots or, sometimes, a combination of dots and bars (each dot represented one unit, and each bar the number five), while each day sign with an image reflecting its name. There were thirteen possible numbers used consecutively from one to thirteen, and twenty possible day signs, which in sequential order were: *Cipactli* (Crocodile), *Ehecatl* (Wind), *Calli* (House), *Cuetzapalin* (Lizard), *Coatl* (Snake), *Miquizitli* (Death), *Mazatl* (Deer), *Tochtli* (Rabbit), *Atl* (Water), *Itzcuintli* (Dog), *Ozomatli* (Monkey), *Malinalli* (Grass), *Acatl* (Reed), *Ocelotl* (Jaguar), *Cuauhtli* (Eagle), *Cozcacuauhtli* (Buzzard), *Ollin* (Movement), *Tecpatl* (Flint), *Quiahuitl* (Rain), and *Xochitl* (Flower). The days of a year could begin, for example, with the first day sign (*Cipactli*) accompanied by the first number (1), proceeding to the second day sign (*Ehecatl*) and second number (2), and so on until all possible combinations were used. After 260 days, the cycle of counting began anew.

The Nahua used this combination of thirteen numbers and twenty day signs in two primary calendars that ran concurrently: the 365-day count, called the *xihuitl*, which literally means "year, comet, turquoise, and herb";[11] and the 260-day count, called the *tonalpohualli*, literally, "day count."[12] Once every 52 years the 260-day count and the 365-day count started and ended together. The Aztecs called this 52-year cycle *xiuhmopilli* (year bundle) and celebrated it with a solemn ritual called the New Fire ceremony. The 365-day count consisted of eighteen "months" of twenty days each (yielding 360 days) to which the Nahua added five days they called *nemontemi*, "extra days and profitless."[13] Because of the way in which the Nahua counted days, every 365-day count began with one of four day signs: Rabbit, Reed, Flint, or House.[14] These are called year bearers because they gave the year its name. The "AO" symbol, so called because it consists of a figure resembling an "A" interlaced with one resembling an "O," denotes the beginning of a solar year in Central Mexican iconography. In calendrical signs, this "AO" symbol often accompanies year bearers to distinguish a year from a day. In the *Codex Borgia*, the "AO" symbol takes the form of an "A" interlaced with a trapezoid instead of an "O" (fig. 3.4).

At the bottom of each of the five compartments on page 28 of the *Codex Borgia*, the three side-by-side rectangles demarcated by red lines, each contains a day sign and a series of dots denoting a numerical coefficient (see fig. 3.1). In each compartment, one of the three markings also includes the "A-O" symbol, but the other two do not. Therefore, one of the three calendrical signs denotes a year date, and the other two, days. Due to natural wear, aging, and damage caused by misuse and abuse, however, more than a third of the calendrical markings show effacement. The day sign in the lower-right compartment, for example, cannot be reconstructed with any degree of certainty; only part of the coefficient, namely three dots, is discernible.[15]

The year signs appear on this page in consecutive order. Therefore, page 28 depicts five consecutive solar years that begin with 1 Reed in the lower-right compartment, followed counterclockwise by 2 Flint, 3 House, and 4 Rabbit in the next three compartments, and ending with 2 Reed in the central compartment. The calendrical symbols denoting days, however, do not appear in an easy-to-recognize sequential order. Scholars have used several tactics to interpret these day signs including the reconstruction of the most severely effaced ones. This has prompted a debate about the exact dates they refer, as well as the significance of the combined calendrical signs. Perhaps future research will shed more light on the identity and significance of these day signs, but for the moment, we are dealing largely with possibilities when discussing them.

In his celebrated treatise on the *Codex Borgia*, Eduard Seler presents a very useful description of the imagery on page 28. However, he does not provide an explanation for how the iconography of a male-female couple amid maize plants supports his astronomical interpretation. Seler focuses instead on the calendrical symbols, and argues that the page records Venus cycles and solar years. In large part, his argument hinges on reconstructing one of the severely effaced day signs in the lower-right compartment as 4 Movement, and in considering the year symbols as unrelated to the day signs.[16] Seler contends that from 4 Movement, which he interprets as "an initial day of the planet Venus period," to 1 Atl (one of the day signs in the central compartment), there are 1,752 days, or exactly three Venus cycles (584 x 3), and five solar years (365 x 5), minus 73 days.[17]

However, both of the day signs in the lower-right compartment are effaced, and Anthony Aveni, Abate José Lino Fábrega, Christine Hernández, Lord Kingsborough, and others disagree with Seler's reconstruction of the one at the far right as 4 Movement.[18] They argue that the extant

traces of paint reveal instead the coefficient 5. Karl Anton Nowotny, Gisele Díaz, and Alan Rodgers, in contrast, consider the coefficient in this day sign as irretrievable and thus unknown.[19] Seler does not provide a satisfactory explanation for the rest of the day signs on page 28, simply stating: "The other dates, the day signs featured between 4 Movement and 1 Water, could be considered as dates arbitrarily chosen, dates of transition, so to speak."[20]

More recently, Anthony Aveni analyzed the calendrical symbols on pages 25, 27–28, and 53–54 of the *Codex Borgia* with the goal of showing that they record "real-time astronomical events."[21] For page 28, Aveni reconstructs and correlates most of the calendrical symbols—except for one in each of the two lower compartments that are too effaced to be discernible—to "real time Christian date sets."[22] He uses Alfonso Caso's correlation of the year 1 Reed as corresponding to the year 1519.[23] Unlike Seler, Aveni considers the day signs in each compartment of page 28 as referring to dates that fall within the same year.[24] Whereas Seler interprets the second day sign in the lower-right compartment as 4 Movement, Aveni sees it as 5 Movement and identifies it as the initial date of the planet Venus's appearance. Because in the year 1 Reed, the day 5 Movement occurs twice, according to Aveni the intended date on page 28 correlates to either 21 May 1467 or 5 February 1468, and he chooses the latter because it "coincides . . . rather closely with a Venus EFIRST event," clarifying that "the event in question would have taken place on Feb. 11."[25]

Aveni attempts to reconstruct and convert all of the calendrical symbols on page 28 to dates in the fifteenth century, analyzing them in tandem with astronomical activity that he argues occurred in Central Mexico during that time. He thinks that thus studying the calendrical symbols can "offer a significant number of possibilities that match real sky events, specifically involving Venus disappearances and reappearances, but also including conjunctions with other

planets."[26] The nature of Central Mexican fifty-two-year cycles, however, as Aveni explains, endlessly repeat and thus betray no hint as to where in time a particular cycle fell.[27] Consequently, the calendrical symbols on page 28 do not necessarily record dates in the Late Postclassic period. Thus Aveni concedes the following: "It is virtually impossible to demonstrate statistically that every astronomical event I have suggested was in fact intended to match a tabulated date."[28] Aveni also points out that only one of the day signs on page 28 bears any relation to Venus movements. Perhaps most importantly, he does not attempt to explain the relationship between the calendrical symbols and the accompanying imagery.

Christine Hernández is the latest scholar to analyze pages 27 and 28, and she argues that the "principal theme of the pictures . . . is agricultural and meteorological, although an iconographic connection to astronomical cycles is present in both almanacs."[29] Instead of allowing the imagery to guide her analysis, however, she consistently returns her attention to how the day signs represent real time. Ultimately, Hernández does not explain how the dates and the iconography on the page support the Venusian or astronomical theory. She acknowledges that the imagery does not "indicate a reference to Venus" and that, other than 1 Reed 5 Movement (which she, following Aveni, accepts as the planet's heliacal rise) no other date "coincides with a station of Venus."[30] Conceding the dearth of iconographic and/or calendrical references to Venus, Hernández nonetheless attempts to link page 28 to astronomical themes by proposing that the date 13 Deer in the central compartment "falls within an eclipse season . . . during which time both a partial lunar and partial solar eclipse occurred."[31] However, as she herself attests: "neither were visible over central Mexico."[32]

Hernández uses Aveni's reconstructions of the day signs on page 27 as the basis for her own reconstructions of those on page 28. She notes that on page 27, the "four associated

tonalpohualli dates [are depicted] at 65-day intervals."[33] Her reconstructions of those on page 28 are motivated by her desire to find "a systematic pattern in the intervals of time between Day #2 and Day #3 signs under each of the five compartments" similar to that of page 27.[34] Hernández converts all of the legible calendrical symbols on page 28 to the Christian calendar, arguing that they depict five consecutive years from 1467 to 1471, and proposes that the other two day signs in each compartment denote a period sixteen to thirty-eight days apart. Using rainfall patterns in Puebla and Tlaxcala from the nineteenth and the twentieth centuries, Hernández contends that the sixteen to thirty-eight day periods in her reconstructions of the effaced day signs represent particular dates in the early summer. She adds, "It is at this very time of year, from the end of May to early July, when the first ears of corn are beginning to ripen and the rains are coming on a more regular basis," and that "young maize plants are particularly vulnerable to extremes of rain, wind, and drought at this time of the year."[35]

Hernández agrees with the prevalent opinion that the imagery on page 28 represents, for the most part, "distinct forms of extreme weather."[36] This leads her to wonder whether the flint knives in the lower-right compartment "could therefore signify aspects related to [the god] Itztlacoliuhqui [one of the guises of the god Tezcatlipoca],[37] the moon, and the north direction like extreme cold, frost, or barrenness as well as lightning."[38] Regarding the imagery in general, she concludes: "It is still unclear what the underlying logic (whether calendrical, numerological, or mythological) is for the order and association of these particular gods with the five consecutive years (1 Reed, 2 Flint, 3 House, 4 Rabbit, and 5 Reed) or with their accompanying dates."[39] She does not present any evidence that extreme variance in rainfall patterns (such as flood or drought) was common in the area. On the whole, therefore, Hernández assumes, rather

than proves, that the images on page 28 reflect a Mesoamerican agricultural almanac that records, or perhaps predicts, rainfall patterns and/or the planting season.

There are a number of limitations in the attempts to explain the calendrical markings on page 28. First, even the most creative work has been able to identify only one of the day signs (5 Movement) as correlating to any particular astronomical event. Significantly, as discussed above, not all scholars recognize that date as 5 Movement, and while some see it as 4 Movement others consider it irretrivable.

Second, the Mesoamerican calendar consisted of repeating 52-year cycles that betrayed no hint as to where in the Christian calendar a particular cycle may have fallen. Therefore, the calendrical symbols on page 28 do not necessarily record astronomical dates in the fifteenth or sixteenth century. As Aveni acknowledges, the dates could refer "to a base relatively far back in time, from which current events are intended to be updated, a possibility we cannot rule out."[40]

Third, as Hernández points out, the agricultural or rain almanac hypothesis does not account for much of the imagery on page 28. For example, clouds appear only in the central compartment; therefore, it seems that rain, or a lack thereof, is not necessarily the principal message. Also, each Tlaloc is additionally attired in the guise of another god, which indicates that the central message in the imagery may not necessarily pertain to rain prediction.

Fourth, Seler, Aveni, Hernández, and others may have erred in assuming that the calendrical symbols on page 28 refer to dates. Central Mexicans used day signs for a variety of reasons, including in naming gods, humans, eras (also known as "suns"), and even food items. Illustrating this point is the name of the goddess Chicomecoatl, 7 Snake, which Book 1 of the *Florentine Codex* reports was the name for maize and synonymous with sustenance. Chicomecoatl, it says, symbolizes "maize and men's sustenance of whatever sort; what is drunk,

what is eaten."[41] Ce Acatl (1 Reed), as Henry Nicholson notes, is one of the most common calendrical names for Quetzalcoatl.[42] Some Late Postclassic stone sculptures of Ehecatl-Quetzalcoatl represented as a coiled serpent feature a cartouche behind the serpent's head containing the calendrical sign 1 Reed.[43]

In the story of the earth's beginning in the *Annals of Cuauhtitlan*, each of the five eras or "suns" bears the name of a day sign:

> 4 Water is the day sign of the first sun that there was in the beginning. . . . 4 Jaguar is the day sign of the second sun. . . . 4 Rain is the day sign of the third sun. . . . 4 Wind is the day sign of the fourth sun. . . . 4 Movement is the day sign of the fifth sun, because it moves along and follows its course.[44]

And when describing "how the earth was established, how everything was established," the *Leyenda de los soles* names the human nourishment in each era, or "sun," as a day sign.[45] In the first sun, humans ate "7 Reed," in the second sun, they ate "12 Snake," in the third sun, they ate "7 Flint," and in the fourth sun, they ate "4 Flower."

Fifth, and finally, even if the calendrical symbols on page 28 do refer to dates, we cannot assume that the page depicts events that occurred on a specific date, as in the Western tradition.[46] One Reed, the year that begins page 28 in the lower-right compartment, is evocative of historical beginnings of great significance. The *Annals of Cuauhtitlan* reports "1 Reed [635]. This is when the Chichimecs came out of Chicomoztoc [Seven Caves], so it is told, so it is related in their narratives . . . the year count of the Cuauhtitlan Chichimecs began in the year 1 Reed."[47] Thus, the invocation of "1 Reed" could be a metaphor for a significant beginning, much as the phrases "In the beginning" or "Once upon a time" in Western civilization carry with them, and are understood to convey a notion far beyond the literal meaning.

In Postclassic Mixtec society, as Jill Furst explains, the combination 1 Reed (year), 1 Alligator (day), was a metaphor for beginnings. The extant Mixtec manuscripts are widely

understood to contain genealogical and historical records. But even the calendrical glyphs in these manuscripts cannot always be directly related to historical time as it is understood in the West. Jill Furst observes that "students of the [Mixtec] manuscripts have been concerned with attempts to correlate the native with the Christian calendar, to determine when, in the Western system of keeping time, the events in the native documents occurred, or else they have concentrated on the difficulties and inconsistencies in suggested correlations."[48] Furst notes: "none of the dates" in the *Codex Vindobonensis* (also known as the *Codex Vienna*) "may be read as literal and historical indicators of time."[49] After evaluating the calendrical symbols in the Mixtec manuscripts and comparing them to those in the *Codex Borgia*, she concludes,

> In *Codex Borgia,* the Year 1 Reed, day 1 Alligator [not a combination seen on page 28] is applied to the growth and prosperity of the maize plant. In the Mixtec genealogical manuscripts, the date is extended as a metaphor to the miraculous birth of people from the earth, and to the beginning of lineages. In *Borgia* there is no question of dates having a historical function, since that manuscript is concerned with divinatory matters. On the other hand, the dates in the genealogical manuscripts have long been interpreted as historical, and thus potentially translatable into the Christian calendar. The Year 1 Reed, day 1 Alligator does not, however, fit comfortably, or even plausibly, into a chronological framework.[50]

Moving past the discussion of the calendrical symbols, one contribution made by earlier scholars of the *Codex Borgia* is the recognition of the importance of cognates. A preliminary and effective approach to studying the imagery in the *Codex Borgia* is to compare and contrast it to similar imagery in other extant manuscripts. However, as Seler himself notes: "No other manuscript contains images resembling those presented on page 28 of the *Codex Borgia*."[51]

Notwithstanding Seler's observation, there are some basic similarities between pages 28 (fig. 3.1) and 27 (fig. 3.5) of the *Codex Borgia*. Each page features five compartments, one in each corner and one in the center. In each compartment, on both pages, a Tlaloc dressed in full regalia appears amid maize. But significant differences preclude the possibility that the two

pages relate the exact same message. The two that I address in this chapter, are the water emanating from the males (on page 27 the water streams run clear, but on page 28 they flow studded with icons), and the presence of naked females on page 28. These differences between page 27 and page 28 raise a number of questions that have not yet been addressed in the existing scholarship. Why do naked females appear amid maize and below male figures on page 28 of the *Codex Borgia*? The streams emanating from each of the males on page 28 flow with appended icons symbolic of gods associated with reproduction, fertility, and sexuality. Why do they fall onto the maize plants and the females below? What is the significance of representing imagery that suggests male-female coupling in relation to maize plants? Why is the god of wind evoked in the goddess's headdress in the lower-right compartment? To answer these questions, we must turn to the biology of the maize plant.

Nahua Understanding of Plant Sexuality and the Biology of the Maize Plant

To understand the iconographic references to wind and sexual reproduction on page 28 and its relevance to maize, we need to consider the morphology and physiology of the plant. As explained in Chapter 2, the maize plant has male and female parts and reproduces through pollination, with wind serving as the primary medium by which pollen transfer occurs from tassels to silks. The ethnohistoric record confirms that the Nahua were plant experts with knowledge about the morphology and physiology of flower-bearing angiosperms, including the maize plant.

The *Florentine Codex* reports specific information about the biology of the maize plant, suggesting that the Nahuas understood that plants reproduce sexually. The Nahua explained that a few days after planting and watering a kernel, "the grain of maize bursts; then it takes root.

Then it sprouts; then it pushes up; then it reaches the surface then it gathers moisture; it really flies. . . . Then the corn silk develops [*tzopilivi*]; then the corn tassels form [*miiaoati*]. . . . Then an embryonic ear forms. Then the green maize ear begins to form."[52] Furthermore, in describing the development of silks in the plant, the Nahua reported that it "spreads becoming coveted—spreads becoming desired," a statement that sexualizes the life cycle of the plant.

Book 11 of the *Florentine Codex*, completely devoted to a discussion of animals, plants, and minerals, reports that the *cempoalxochitl* (marigold) flower has male and female counterparts and that *chichic patli* (unknown) herbs "go in pairs; it is said there is the male, likewise there is the female."[53] With regard to the biological processes in flowers in general, the Nahua reported in the *Florentine Codex*:

> All the flowers. They begin to blossom in this manner: first they become fat; they fatten. Then they form a droplet. Then they swell; then they blossom; they burst. Then they open; they produce pistils, they form pistils. Then they are fully in bloom; they fill out. At this time they produce a pleasing odor, a fragrance, an aroma. At this time they are required, desired, coveted, needed. They are cherished, wonderful, meriting wonder, considered wonderful. They fade, shed petals, drop petals, darken, wither. They become verdigris-colored, turn verdigris-colored; they become blotched, dry; they drop. Pertaining to the blossoming of the flower are the fattening, the petals, the calyx, the pistil, the pistils, the seed, the seed of the flower, the ovary, the receptacle, the stamen of the flower, the stamens.[54]

Nahua horticulturists evidently spent a fair amount of time observing and learning about flowers because they knew specific details about their color, aroma, and physical changes. Flowers ensure the reproduction of plants and also encode genetic messages that determine different traits that will be passed on to the next generation of plants and fruit. This begins to explain why the Nahua held flowers in great esteem.[55] Other sources, for example, Fray Diego Durán, often complain about the indigenous people's devotion to flowers. Durán reports that among the Nahua, all their "joys and feasts they celebrate with flowers" and that "even hunger

they alleviated" by smelling them, adding that "they passed their lives among flowers, in such blindness and darkness, and, deceived and persuaded by the devil, who saw" how much they valued them.[56] Perhaps Durán's contempt pertained to the sexual connotations flowers had among the Nahua. The feast that Durán describes as one of their "most solemn" was held in honor of Xochiquetzal, who was, as will be further discussed below, a goddess of flowers and sexuality, and who was said to be a harlot and the mother of maize.[57]

Knowledge of the process of maize procreation is unequivocally stated in two of the most important early colonial written sources. In the *Histoyre du Mechique* (ca. 1543), the Nahua explain that maize was created through the sexual act between a goddess and the firstborn son of the first human couple, Piltzintecuhtli: "Piltzintecuhtli slept with a goddess Xochiquetzal, from whom a god Cinteotl [maize] was born."[58] The *Historia de los mexicanos por sus pinturas* relates a similar story as follows: "The grain that they eat is called maize, it was made in this manner: the gods descended, all of them, to a cave, where a god called Piltzintecuhtli was lying with a goddess called Xochipilli,[59] from whom was born a god called Cinteotl [maize]."[60]

Therefore, in Nahua thought, maize is the product of sexual intercourse, and the father of maize is Piltzintecuhtli, the son of the first human couple. The sexual aspect of maize's creation is further emphasized at the beginning of the *Historia de los mexicanos por sus pinturas*, which explains that because the gods recognized that there was no female for Piltzintecuhtli to couple with, they created a woman specifically for him: "and because he lacked a woman with whom he could be married, the gods made from Xochiquetzal's hair, a woman, with whom he was for the first time married."[61] That the female with whom Piltzintecuhtli copulates to create maize was made from hair is significant because she is thus recognized as the plant's female part, the silks.

I argue that the Nahua understood that plants have genitalia (i.e., tassels and silks in maize), and this would explain why they conceptualized creation as sexual. Many creator gods have a female partner or counterpart; for example, Tlaloc's was Chalchiuhtlicue (God and Goddess of Rain or Water), Mictlantecuhtli's is Mictlancihuatl (God and Goddess of the Underworld), and so on.[62] In his celebrated and extensive body of work on Nahua philosophy, Miguel León-Portilla has thoroughly discussed the supreme "God of Duality," thus called because it was both male and female, and made up of the god Ometecuhtli, "Two Lord," and the goddess Omecihuatl, "Two Lady."[63] The *Florentine Codex* describes the "God of Duality" as "Our Mother and Our Father whose name is Ometecuhtli lives in the nine heavens, which is the dwelling place of these two gods."[64] Significantly, the *Florentine Codex* says that pregnancy was "determined by the one that resides in heaven, a man and a woman, whose names are Ometecuhtli and Omecihuatl," but credits the god of wind: "Our Lord Quetzalcoatl, who is creator and maker" with procuring it, thus referencing pollination.[65] This explains why the Nahua did not necessarily or always link sexuality to wrongdoing. According to the *Florentine Codex*, Tlazolteotl, a goddess of "lust and debauchery," was held in great reverence in Mesoamerica (see Chapter 4):

> It is said that all worshipped Tlaçolteotl as a goddess—all who called themselves Mexicans; especially the Mixteca, the Olmeca guarded her as their true goddess. . . . And as for the Huaxteca, it is said that they specifically worshipped [the] Tlaçolteotl goddesses. However, they did no penance before them, nor did they confess, because they did not consider lust as a wrong.[66]

León-Portilla points out that the "concept of divine duality" is widespread in time and space in Mesoamerica, and that even modern-day indigenous groups continue to embrace that notion.[67] Regarding the Maya, J. Eric Thompson says the following: "this same concept of a divine pair who created the world with the assistance of other gods to whom they had probably

given birth was, one may conjecture, generally held in the Maya area."[68] The *Popol Vuh*, the Quiche creation story compiled in alphabetic text in the sixteenth century, discusses a "primeval pair" called E Quaholom "Begetter of Children," and E Alom, "Conceiver of Children," which as Thompson argues, "indicates that the creation deities are male and female."[69] Thompson adds, "In Lacandon belief, the various gods descend from the mating of the red and white *plumeria* flowers (in English, frangipani). These were well-established symbols of sex activity, licit and illicit, a fact which supports the idea of a male and female pair who gave birth to the gods."[70] A creation myth in the *Book of Chilam Balam of Chumayel*, dating from the sixteenth century and written in Yucatec Mayan, relates how a god becomes a bird (male) to "marry" a flower (female), thus explicitly referencing sexual reproduction and pollination:

> Then descended Ppizlimtec [god of song and poetry] to take the flower, he took the figure of a humming-bird with green plumage on its breast, when he descended. Then he sucked the honey from the flower with nine petals. Then the five-petaled flower took him for her husband. Thereupon the heart of the flower came forth to set itself in motion.[71]

In the twentieth century, a number of scholars have dismissed the notion that indigenous groups were knowledgeable about plant biology. For example, as discussed in the introduction, Paul Weatherwax, a leading mid-twentieth century biologist whose research focuses on maize, opines that "the Indian was a good corn breeder," but claims that the botanical concepts surrounding the biological processes of the plant were "only vaguely understood."[72] This is a surprising conclusion coming from Weatherwax, all the more so because he said that with regards to the genetic diversity of maize, "part of the credit must go to the genius of the Indian, a quality which has largely been unrecognized."[73] More recently, Wayne Smith writes of North American Indians: "These Amerindians had all of the germplasm subsequently used by European settlers to produce improved cultivars. That the Amerindians knew nothing about the sex of

plants may be accurate, but they did know the effects of planting two types too closely, that being the loss of phenotype purity."[74]

While it may be perfectly logical to credit botanists such as Sir Thomas Millington (1628–1704), Rudolph Jacob Camerarius (1665–1721), Carl Linnaeus (1707–78), and Christian Konrad Sprengel (1759–1816) with explaining plant sexuality to Europeans starting in the early eighteenth century, the concept was widely understood centuries earlier in pre-Columbian America.[75] Overlooking indigenous records, therefore, and crediting eighteenth-century puritan officials such as Cotton Mather and Paul Dudley, who noted how the wind affected the genetic progeny of maize plants, calling it "wonderful copulation," with providing the first "insights that fostered later research in cross-breeding and hybridization" is unjustified.[76] The Nahua understood that maize has male and female flowers and relies on wind and humans to reproduce, and as illustrated in the available archaeological and ethnohistoric record, took full advantage of it to produce cobs with a wide variety of characteristics.

Iconography of Page 28 of the *Codex Borgia*: What's Sex Got to Do with It?

Thorough analysis of the imagery on page 28 of the *Codex Borgia,* studied against available archaeological, ethnographic, and biological evidence, reveals that it conveys a sophisticated message pertaining to the sexual reproduction of the maize plant. The male and female figures associated with maize plants are the most salient iconographical feature on the page. As noted above, the male figures hovering above the females represent the male part of the maize plant: the tassel that bears the pollen grains, which, blown by the wind, land on the females below him. The females represent these receptive silks that will develop kernels.

Several iconographic elements support this interpretation: 1) the position of each male relative to that of the female mimics the physical structure of the maize plant as it exists in nature, with the tassel at the top and the silks below; 2) there is particular emphasis on the goddesses' femininity (the naked body, and bare breasts) and hair (representing the silks), which is adorned with the elaborate headdress of a god identified with wind, water, and/or flowers; and 3) as further explained below, each male also appears wearing and holding accouterments of gods associated with fertility, creation, sexuality, and maize. They do not hold agricultural instruments. The digging stick, for example, the quintessential implement of farming among pre-Columbian Nahuas, which could link the iconography to farming, is conspicuously absent.

Furthermore, from the Tlalocs' groin and wrists emanate streams flowing with icons appended to them—these are flint knives, "fungus," excrement and/or fire curls, Ehecatl-Quetzalcoatl serpents, and blooming flowers—and thus associate him with an additional god related to wind, agriculture, creation, fertility, and/or sexuality. These icons transported via the liquid emanating from the males express the idea that their essence is being disseminated. For example, in the lower-right compartment, the icons are small red and white flint knives that seem to fly about the space beneath the male, with some landing on the females and the maize plants. This interpretation is consistent with Eric Thompson's regarding Chac, the Maya god of rain, on page 37 of the pre-Columbian Maya *Codex Dresden*. Chac appears, as Thompson points out, "making water" or "urinating" because the emission emerges from his groin and "terminates in the head of a heron" (fig. 3.6).[77] Thompson speculates that this is "probably one of those Maya puns so often used," adding that "*bacha* means both 'heron' and 'to pour water from a narrow mouthed vessel,' in this case the penis."[78] Thompson also explains that among the general terms the Maya had for Chac were Ah Hoyaob, "the Sprinklers or Urinators," and Ah Tzenulob "Those

who Support or Provide Others with Food," which he interprets to be "in agreement with the early definition of the Chacs as providers of food through the fructifying rains."[79] I add that because Chac's emission materializes into a bird, a pollinator, the message conveyed is that penises are "pollinators."

In the first compartment, in the lower right, Ehecatl-Quetzalcoatl, the god of wind, is invoked by the female figure's headdress, which takes the form of the head of a large bird with a long, pointed beak (fig. 3.7). Her face is within its wide-open beak. This beak is the unmistakable identifying feature of the god of wind. I propose that Ehecatl-Quetzalcoatl is invoked here at the start of the page precisely because the imagery represents the dissemination of pollen via wind. According to the *Leyenda de los Soles*, after creating humans with the bones of the ancestors and blood from his penis, Quetzalcoatl attained maize from Food Mountain, then gave it to humans to reproduce and use.[80] This account shows that Quetzalcoatl was associated in Nahua thought with the procurement and reproduction of maize—he obtains maize grains and creates humans who will plant them.

In the same lower-right compartment of page 28, Tlaloc's face is depicted with Tezcatlipoca's alternating yellow and black bands across the face, although other typical identifying attributes of the god, such as the smoking mirror and the severed foot, are not included (fig. 3.7). Other pre-Columbian manuscripts show Tezcatlipoca with these bands across the face and associated with flint knives. On *Codex Fejérváry-Mayer* 24, for example, Tezcatlipoca appears with the twenty day signs of the Nahua calendar, yellow and black bands across the face, and with a flint knife on top of his pectoral, the latter doubling as a day sign. According to Seler, "Tezcatlipoca is the Itztli, the one who cuts, the flint-god."[81] Bodo Spranz agrees that Tezcatlipoca was associated with flint knives and reports that many pre-Columbian

manuscripts depict him with a flint knife as a headdress.[82] On page 19 of the *Codex Vaticanus B*, for example, a flint knife appears on Tezcatlipoca's headdress, and that flint knife in turn has another flint knife for a nose.

Furthermore, the streams flowing from Tezcatlipoca disseminate flint knives, as these have landed on the maize cobs, and the naked goddess. These small knives are roughly oblong, tapering at the ends into sharp points. Each has been meticulously painted: one end is white, the other red, and the middle, white with very fine red lines. Based on the premise that this page was used to predict rain or a lack thereof, scholars have agreed that the flint knives in this compartment represent hail, frost, or lightning.[83]

These ominous qualities, however, are more in keeping with current interpretations—or rather acceptance—of early colonial accounts that overemphasize Tezcatlipoca's menacing qualities and downplay his associations with creation and sexuality. These interpretations contradict the imagery in screenfolds—such as the depiction on this very page—that instead link Tezcatlipoca to his role in helping Quetzalcoatl in creative endeavors, a role that early written accounts clearly describe. For example, in the *Historia de los mexicanos por sus pinturas*, Quetzalcoatl and Tezcatlipoca say to each other upon seeing water, "It is necessary to make the earth," which they then proceed to create by sacrificing the goddess Tlaltecuhtli's body, declaring "that from her would emerge all fruit necessary to sustain the life of humans."[84] Book 3 of the *Florentine Codex* likewise informs us that Tezcatlipoca "was lord of the heavens and earth. All these in truth he made. And he gave men all, which they required, that by which there was living, that which was drunk. This one gave riches to men; this one made them prosper."[85] Moreover, Tezcatlipoca's presence here further associates the imagery with sexuality. Book 4 of

the *Florentine Codex* says of Tezcatlipoca: "when he walked on the earth, he quickened vice and sin," or "*tlaçolli*" (garbage), which the Nahua related to sexual promiscuity.[86]

The container depicted behind the female figure in the lower-right compartment further connotes sexual reproduction and sustenance.[87] This container is a boxlike vessel with a yellow exterior and a top that overlaps the upper sides like the lid of a box, as well as a red interior and two legs. The inner part of each leg has a stepped profile, one appearing on each side of the vessel. In the *Codex Borgia*, this vessel accompanies Tonacatecuhtli, "Lord of Our Sustenance," on pages 57 and 61 for example. On page 61, Tonacatecuhtli appears in a birth-giving pose, the vessel depicted between his open legs (fig. 3.8).[88] The vessel is adorned with a yellow circle bearing the *chalchihuitl* (precious stone) design in the center of its front side.[89] This *chalchihuitl* motif is not visible on Tonacatecuhtli's vessel on page 28, probably because the female figure's body obstructs our view.

Therefore, the container behind the female in the lower-right compartment is not just any generic vessel, but one with a specific significance. The vessel relates the imagery on page 28 to the creator god Tonacatecuhtli. Mary Miller and Karl Taube have summarized the attributes that the Nahua accorded Tonacatecuhtli, pointing out that he "was a Central Mexican form of the aged creator god . . . identified with the miracle of procreation, and in a number of scenes appears with copulating human couples."[90] *Codex Vaticanus A* conveys these very concepts in the depiction of Tonacatecuhtli on folio 13v, where the accompanying text identifies him with creation and sustenance (fig. 3.9). In front of Tonacatecuhtli appears a male and female couple facing each other, their bodies intertwined in sexual intercourse. The couple on folio 13v is depicted in the conventional manner of denoting "carnal relations" (sexual intercourse) in

Central Mexican manuscripts (e.g., the *Codex Mendoza* folio 70r).[91] Usually an object, for example a blanket, covers the couple's bodies, with only their feet and heads visible.

It is noteworthy that Tonacatecuhtli's crown and the mat on which he sits contain maize cobs, which associate him directly with maize and sexual reproduction. In the *Florentine Codex,* Tonacatecuhtli is linked specifically with pollination by the description of the god's abode:

> The house of the god whose name is Tonacatecuhtli, who lives in the gardens that are called Tonacaquauhtitlan, where there are all kinds of trees, flowers, and fruit, and there fly about some sort of *tzintzones* that are multicolored little birds that suck on the tree's flowers.[92]

Several sources, among them the *Codex Vaticanus A* and the *Codex Telleriano-Remensis*, credit Tonacatecuhtli with creating the world, providing sustenance, and engendering Quetzalcoatl by the act of blowing.[93] This shows again—clearly and unequivocally—that in the Aztec belief system, creation, sexual reproduction, and maize were linked to the creative powers of wind.

In the second compartment of page 28, in the upper right (fig. 3.10), the goddess represented is Xochiquetzal (Flower Quetzal) herself. She wears an elaborate headdress that consists of a fabric that covers her head and drapes over her shoulders and two yellow flowers that protrude above her temples. The fabric is white with two red bands (at the level of her shoulders) and the flowers release shoots that could symbolize new growth or even pollen. This same headdress is also seen on Xochiquetzal in *Codex Borgia* 37, where she offers a vessel during a ritual involving maize. Xochiquetzal is further referenced on page 28 by the nose ornament typically worn by maize goddesses. The two flowers on her headdress also appear on Xochiquetzal on folio 292v of Diego Duran's *Historia de las Indias de Nueva España e Islas de la tierra firme*.[94] In various textual sources, Xochiquetzal is associated with sexuality. Recall that in the *Histoyre du Mechique*, she has sex with Piltzintecuhtli, and from that union she conceives and gives birth to Centeotl, maize.[95] In Durán's account she is described as a "harlot" who lived

the life of a whore.[96] As a "harlot," she would be expected to copulate with numerous partners, just like in the most ideal circumstance, the female flowers in maize, the silks, do. The mestizo (of Nahua and Spanish descent) sixteenth century chronicler Diego Muñoz Camargo's discussion of Xochiquetzal, further corroborates the goddess's association with sexuality, pleasure, and plants. Muñoz Camargo writes:

> These nations [the Nahua] had a goddess whom they called the goddess of those in love, as in ancient times the gentiles called the goddess Venus. They called her Xochiquetzal, whom they said lived in the air and above the nine skies, and that she lived in delectable places of much leisure . . . They called the goddess's abode in the sky *Tamohuanichan Xochitlihcacan* . . . Of the tree *Xochitlicacan*, they said that those who reached its flower or were touched by it, were joyful and faithfully enamored where the cool air is delicate and cold, above the nine skies. To this goddess Xochiquetzal they celebrated a solemn feast every year at her temple, which was attended by many people. . . . They say that she was the wife of Tlaloc, the god of waters, and that Tezcatlipoca stole her from him, and took her to the nine heavens, making her the goddess of good love.[97]

The Tlaloc in the same upper-right compartment appears with attributes of Tlahuizcalpantecuhtli, the "Lord of Dawn," who appears in various screenfolds with vertical white and red stripes on his limbs and torso and white "stars" on his forehead, cheeks, nose, and chin. For example, page 80 through 84 of *Codex Vaticanus B* each features Tlahuizcalpantecuhtli with these very identifying features. Scholars have generally interpreted the imagery in this compartment as representing inclement weather harmful to maize.[98] Hernández argues that the small "red-spotted stones" that travel in the water streams emanating from the male, piercing the maize, and falling on the goddess are "representing hail, frost, or fungus."[99] Ferdinand Anders, Maarten Jansen, and Luis Reyes García also call the icons "red-spotted stones" and interpret them as representing "hail that cuts the maize" without explaining how they reached that conclusion.[100]

Indeed, in Book 7 of the *Florentine Codex*, the Nahua explain that hail (*teciuitl*) destroys maize plants.[101] However, the Nahua associated Tlahuizcalpantecuhtli with frost, not hail. The *Leyenda de los Soles* affirms: "This Tlahuizcalpantecuhtli is the frost."[102] According to the *Florentine Codex*, the Nahua regarded frost as a signal that the season for "sowing" and "planting" was at hand:

> The frost was called Itztlacoliuhqui. Once yearly the cold came. During the feast of Ochpaniztli the cold began. And for one hundred and twenty days—one hundred and twenty suns—this persisted and there was cold. And it ended and disappeared [during the feast] called Tititl. When [the month] came to an end, it was said: "For the frost hath departed. Now there will be sowing—it will be the time of sowing. Already land will be planted, so that [seeds] will be planted in the soil. Already it is warm, mild, calm. Already the season is good, the time is propitious; the hour is at hand; the time is ripe; the moment hath come." . . . Already off-shoots would be pruned and separated, and all would bear fruit.[103]

Therefore, frost was not a bad omen for plants; it was ultimately beneficial. The Nahua further report in the *Florentine Codex* that snow "was only the servant and companion, which followed, accompanied, and spread the frost over the earth. It was considered to be like the rain. And it was said that when there was snow, [crops] would be harvested; the crops would be good. It foretold, and was an omen of, [good] crops."[104] Furthermore, the *Florentine Codex* associates Tlahuizcalpantecuhtli with "fortune and favor."[105] Other sources report Tlahuizcalpantecuhtli's positive role in the development of agriculture. In the *Leyenda de los Soles*, for example, Tlahuizcalpantecuhtli and Xochiquetzal, with whom he is depicted in this compartment of page 28, team up to sacrifice themselves at Teotihuacan, along with other gods, to set the newborn sun moving, thereby creating the seasons and the corresponding agricultural cycles.[106]

In the third compartment, in the upper left, the female is depicted with the attributes of Chalchiuhtlicue, "She of the Jade Skirt," the water goddess (fig. 3.11). She wears a diadem consisting of white circles each decorated with a red dot that is unique to Chalchiuhtlicue in the

Codex Borgia. On page 43 of the *Codex Borgia*, for example, Chalchiuhtlicue wears this diadem, and she also has the two vertical lines drawn in her jawline, diagnostic of her iconography. Book 1 of the *Florentine Codex* reports that Chalchiuhtlicue was one of the most honored goddesses, for "they remembered that because of her we live. She is our sustenance. And thence come all things that are necessary."[107]

The Tlaloc in this same compartment is depicted with attributes of Xiuhtecuhtli, the god of fire, as indicated by the narrow bands across the eyes and mouth, and by the fire curls in the water emanating from him (see fig. 3.11). Bodo Spranz notes that Central Mexican manuscripts commonly depict Xiuhtecuhtli with black lines across the lower and/or upper part of the face at the level of the eyes and mouth.[108] Xiuhtecuhtli appears on page 1 of the *Codex Fejérváry-Mayer* with the same narrow bands across the eyes.

Fire and/or excrement curls emanate from the streams of water, piercing the god's left foot, the maize cobs, and the left hand and both feet of the goddess below him. These curls, painted mustard yellow, consist of one long and one short and more tightly wound curl. In some instances, these curls emerge from the symbol for excrement, depicted as a smaller, shorter, and more tightly wound curl resembling a question mark. Excrement curls are easily identifiable, for example on the maize cob at the far right and in the water streaming from the god's right wrist, but the rest of the curls appear to represent fire. According to Seler, among the Aztecs, the sun and excrement were closely related.[109] Cecelia Klein explains that Mesoamericans associated excrement with gold (*coztic teocuitlatl*), which when translated, is "yellow sacred excrement."[110] Postclassic Mesoamericans associated gold with the excrement that the sun deposited in its journey through the underworld every night.[111] Excrement was also a valuable commodity because it was used as a fertilizer.[112]

Hernández suggests that the fire curls in this compartment of page 28 are "flames representing drought."[113] However, because of the close association between fire and excrement, the purpose of including them here is not entirely clear. Given that behind the goddess, the Earth is depicted in the form of a crocodile, and that maize is involved, an alternative interpretation of the excrement and fire curls is that they are acting as fertilizers in the first case and as fire in the second. Both fire and excrement relate to maize agriculture. Fire was used to clear plots for cultivation, a practice that has continued to the present in parts of Mexico and Central America. In 1526, the Spanish chronicler Gonzalo Fernández de Oviedo, who from 1513 and 1532 traveled five times on official trips to America, wrote the earliest natural history of American flora and fauna, in which he explains that the Indians, after clearing the land of weeds, used fire to prepare it for maize cultivation, and that the resultant ashes from the burning fertilized the soil "better than manure."[114] The anthropologist John Clark points out that early Mesoamericans used fire to clear plots, and reports "pervasive evidence of large-scale forest burning and use of corn and manioc, indicative of slash-and-burn agriculture, about 2000 ca. B.C."[115] Thus, given the archaeological record, the flames may well represent not drought, but the fire used in the slash-and-burn agriculture that Clark reports as "pervasive" in Mesoamerica.[116]

The container behind the female in this compartment is rendered as the open jaws of a *cipactli* (crocodile), which according to the *Historia de los mexicanos por sus pinturas* was the symbol the Nahua used to represent the Earth.[117] It appears in this compartment probably because the male is featured as Xiuhtecuhtli, the god of fire, who played a significant role in both preparing the land for cultivation and cooking. Therefore, it is not surprising that the Earth appears as the container in this particular compartment. The *Florentine Codex* informs that Xiuhtecuhtli is one of the most ancient gods: "For many purposes was he useful . . . he burned

one . . . scorched the fields, warmed, things were cooked in an *olla* [pot]," and at his feast the emphasis is on cooking: "tamales [stuffed] with greens . . . [which were] prepared in each dwelling."[118] Therefore, the god is celebrated with cooking in ceramic containers, and the burning or scorching of the fields is described as "useful," not menacing.

In the fourth compartment, at the lower-left corner, the female is again identified with Chalchiuhtlicue, as indicated by her diadem and the two vertical black lines on her jaw, as explained earlier (fig. 3.12). In her left hand is a white rattle with two streamers decorated with black dots of rubber. The goddess on page 1 of the *Codex Telleriano-Remensis* holds a similar rattle with streamers, which Eloise Quiñones Keber has described as "rubber-spattered accessories usually borne by rain gods . . . [while] the black facial marking [is] typical of fertility gods."[119] Book 1 of the *Florentine Codex* reports that three goddesses—Chalchiuhtlicue (the water goddess), Chicomecoatl (the maize goddess), and Uixtociuatl (the salt goddess)—were celebrated during Tecuilhuitontli "because they said that these three goddesses maintained the people, which allowed them to live and multiply."[120] The container behind this, as well as the goddess in the upper-right compartment, is a ceramic vessel. Karl Taube has argued that in Mesoamerica, vessels and bowls are "symbolic wombs and birth passages through which the sun and other supernatural beings are born."[121]

Seler was the first to point out that the Tlaloc in the lower-left compartment of this page is depicted as Quetzalcoatl because of the yellow beard, an identifying feature of this god (fig. 3.12).[122] Quetzalcoatl appears with a beard and his diagnostic conch-whorl pectoral (*anauatl*) in the upper-right quadrant of page 28 of the *Codex Vaticanus B* (see also fig. 3.10, discussed above). As Miller and Taube have pointed out, "In Late Postclassic Central Mexico, Quetzalcoatl often takes the form of the god of wind, Ehecatl-Quetzalcoatl. In this context, Quetzalcoatl

appears as the life-giving aspect of wind."[123] The snakes with the red duck-beak buccal mask emanating from the water, the maize, and the vessel behind the goddess further evoke Quetzalcoatl in his guise as the wind god.

Hernández has argued that in this compartment the "Ehecatl sky-serpents [are] representing strong winds" and generally "distinct forms of extreme weather."[124] More recently, Susan Milbrath has disagreed with Hernández's interpretation, stating: "My research . . . indicates that these serpents are actually an agricultural pest known as the fall armyworm (*Spodoptera frugiperda*; *Lepidoptera noctuidae*), which is the caterpillar stage of a moth that lays eggs broadcast by the wind, helping to explain why these creatures bear the face of the wind god on Borgia 28."[125] However, Milbrath provides little evidence—iconographic, ethnographic, or scientific—in support of her contention, other than the disease is spread via wind and therefore would explain the presence of Ehecatl-Quetzalcoatl as wind personified in the iconography.

Yet these ominous characterizations are inconsistent with what is depicted on page 28 of the *Codex Borgia*, and by what the Nahua said about Quetzalcoatl's life-giving qualities, specifically his role in acquiring maize for humans. Snakes and wind were not ominous in Mesoamerican thought. The *Historia de los mexicanos por sus pinturas* relates the story of a flood in which the waters of the lake were so high that they inundated the first level of Huitzilopochtli's temple and knocked down adobe houses. Reportedly, the flood's water was full of snakes, and the Nahua characterized this as "miraculous," not frightening.[126] According to the *Florentine Codex*, Quetzalcoatl blew the wind from Tlalocan—Tlaloc's house, the place where "Never did the ears of green maize, the gourds, the squash blossoms, the heads of amaranth, the green chilis, the tomatoes, the green beans, the *cempoalxochitl*, fail."[127] It adds, "lightly did it

blow."[128] Therefore, instead of "extreme weather," Ehecatl-Quetzalcoatl's role in this compartment may represent the essential role that wind plays in pollination, as well as the benign role that it also plays in bringing rainclouds. That the naked goddess in this compartment is identified as Chalchiuhtlicue reinforces the idea of fertility, not inclement weather.

The goddess in the central compartment is identified again as Chalchiuhtlicue by her diadem of white circles with red dots unique to the water goddess in the *Codex Borgia* (fig. 3.13). Chalchiuhtlicue's importance in maize reproduction is emphasized in Durán's account, which states: "When I say they lived [with water], I mean that water helped them to grow the cornfields and seeds which they ate."[129] This explains Chalchiuhtlicue's presence three times on page 28. The Tlaloc in this central compartment is depicted with attributes of Xochipilli (Flower Prince), whose features typically include two semicircular red lines that wrap around the outer circumference of his face. Flowers, which were widely associated with Xochipilli, appear in this compartment as tiny, yellow, three-petaled blooms tagged to each of the three streams of water emanating from the god. Xochipilli's flowers have also landed on the naked goddess and the maize fields. According to the *Florentine Codex*, Xochipilli was associated with sexuality and also with some venereal diseases, which were considered to be the result of not observing sexual abstinence during certain annual celebrations.[130] But Xochipilli was also "a god of positive creative energies, and as such . . . a patron of flowers, dancing, feasting, painting, and game-playing."[131] Thus, in his association with flowers, Xochipilli represents in this page the tassel, its pollen traveling to the maize plants and the naked female below. This is the only compartment that scholars have argued connotes optimal conditions for farming.[132] I agree but reiterate that my contention is that the imagery rather than representing rainfall patterns reflects a sophisticated message pertaining to the sexual reproduction of the maize plant.

The container behind the goddess in the central compartment bears the design of the *chalchihuitl*, connoting preciousness and womb (fig. 3.13). In Aztec art the *chalchihuitl* motif often appears representing a womb giving birth. For example, a pre-Columbian Aztec stone sculpture with the carving in low relief of Tlaltecuhtli, the Earth Monster, features a *chalchihuitl* in the goddess's middle, from where emerges, as Cecelia F. Klein points out, "a small figure identifiable as the god Tezcatlipoca" (fig. 3.14).[133] Tlaltecuhtli appears with legs spread apart in a parturient position[134] and therefore, as Klein explains, represents "the creator goddess giving birth."[135] Page 47 of the *Codex Borgia* also features a birth from a *chalchihuitl*; here, of a female wearing the headdress of unspun cotton of earth and creator goddesses.[136]

Moreover, the *Florentine Codex* says that the *chalchihuitl* "attracts moisture," further evoking the womb because it alludes to female fertility, semen, and amniotic fluid.[137] The *Florentine Codex* describes the *chalchihuitl* as a precious stone widely used in making jewelry such as necklaces to indicate noble standing. Book 6 of the *Florentine Codex* repetedly equates offspring with necklaces, feathers, and preciousness. Not surprisingly, then, all of the goddesses on page 28 wear necklaces, as does Xochiquetzal on page 60 of the *Codex Borgia* (see figs. 3.1 and 3.10). According to the *Florentine Codex*, after a woman had given birth, the midwife[138] declares:

> The maiden hath cast forth the baby, our child. . . . it appeareth on earth—the precious necklace, the precious feather. . . . Here on your neck, in your bosoms, in your hands he [Quetzalcoatl] placeth a precious necklace, a precious feather, the incomparable, the wonderful, the precious, the priceless, the rare. In thy presence, in thy hands he placeth a broad, a precious feather, the well formed, the dark green.[139]

I therefore conclude that the *chalchihuitl* design on this page associates the female figure with the womb and maternity thus suggesting sexual reproduction. The *Annals of Cuauhtinchan* relates the story of a "female tribute collector" saying that, "between this woman's legs there was

polished jade [*chalchihuitl*] on her private parts."[140] In sum, the foregoing suggests that the container behind each female on page 28—Tonacatecuhtli's vessel, the Earth as a crocodile monster, ceramic pots, and the *chalchihuitl*—represents birth, emergence, and sustenance. That males appear above the females amid maize specifically evokes the sexual reproduction of the maize plant.

Conclusion

My objective in this chapter has been to open up the discussion of page 28 of the *Codex Borgia*. Starting with Edward Seler's pioneering study, the prevalent interpretation is that the imagery and calendrical glyphs reference divination and astronomy. Previous studies of this page have not explained the significance of the maize iconography, other than to suggest that the calendrical dates' objective is to predict rainfall patterns useful to farmers. Specifically, no study to date has addressed why maize plants appear in association with male-female couples. More recently, scholars have tried to figure out the historic events that motivated the inclusion of calendrical glyphs, but they continue to promote the idea that they pertain to astronomy. As I explained in the chapter, the Nahua used calendrical glyphs to denote names of persons or food, and/or calendrical dates. But even when calendrical dates are referenced, sometimes they indicate metaphorical time.

The core argument in this chapter is that focusing on the iconography reveals that the imagery represents a more significant message than rain prediction. Biology and ethnohistory offer evidence that helps to advance the scholarship on page 28. My study of this page introduces scientific concepts pertaining to the morphology and physiology of the maize plant. It also presents ethnohistoric evidence compiled in the early colonial period indicating that the Nahua

explained that the union of male with female produced maize, which is the equivalent of saying that they understood that the maize plant has male and female parts and reproduces sexually. Analyzing the iconography of page 28 with this evidence indicates that the messages encoded in the imagery correspond more closely to the biology of the maize plant than to soothsaying, astronomy and/or simple farming. As I try to establish in this dissertation, the iconography in the *Codex Borgia* records scientific information about the natural phenomena that occur in the life cycle of maize plants. Page 28 specifically pertains to the plant's sexual reproduction.

Therefore, the imagery on page 28 recounts the story of how gods and goddesses worked together to produce maize. The manner of the reproduction is sexual. The composition of each of the five compartments is eloquent. Streams emanate from the males, and they are intended for the females and maize plants below him. Each female appears in the position of a receiver, with open arms, open hands, and exposed breasts, accentuating her feminine gender. She is not submissive, but receptive, and her exquisitely constructed jewels and headdress demonstrate her importance in the story being told.

Endnotes:

[1] For a fuller discussion of the role that Quetzalcoatl, in his guise as the god of wind, plays in the reproduction of plants, see Chapter 4.

[2] Elizabeth Hill Boone, *Cycles of Time and Meaning in the Mexican Books of Fate* (Austin: University of Texas Press, 2006), 49. See also Eloise Quiñones Keber, "Tonacatecuhtli and Tonacacihuatl: Aztec Deities of Transcendence and Tonalli," *Latin American Indian Literatures Journal* 9, no. 2 (1993): 175.

[3] See Fray Diego Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 2 vols., ed. Ángel María Garibay Kintana (Mexico City: Editorial Pórrua, 1967), 1:81–82.

[4] Effigy vessels identical to those depicted in the pages of the *Codex Borgia* have been found in archaeological excavations in Puebla, which has led scholars to argue with more confidence that the screenfold has a Puebla-Tlaxcala Valley provenience. See Gabriela Uruñuela, Patricia Plunket, Gilda Hernández, and Juan Albaitero, "Biconical God Figurines from Cholula and the Codex Borgia," *Latin American Antiquity* 8 (1997): 63–70.

[5] See Ferdinand Anders, Maarten Jansen, Luis Reyes García, *Los templos del cielo y de la oscuridad, oráculos y liturgia: Libro explicativo del llamado Códice Borgia* (Graz, Austria: Akademische Druck- und Verlagsanstalt; Madrid: Sociedad Estatal Quinto Centenario; Mexico City: Fondo de Cultura Económica, 1993), 49–65; Christine Hernández, "The Fortunes of Maize in the Borgia Codex," *Ancient America* (Bernardsville, NC: Center for Ancient American Studies, 2006), 20; and Mary Miller and Karl Taube, *An Illustrated Dictionary of the Gods and Symbols of Ancient Mexico and the Maya* (London: Thames and Hudson, 1993), 143.

[6] Patricia Rieff Anawalt, "Costume Analysis and the Provenience of the Borgia Group Codices," *American Antiquity* 46 (1981): 209. She reports, "The loincloth was utilized by all groups except the Tarascans, and it appears in the full range of social contexts. It was the basic, indispensable male garment."

[7] These appear on gods' headdresses in the Aztec *Codex Borbonicus*, see for example page 30. On discussions of Tlaloc's heron headdress, see Bernardino de Sahagún, *Florentine Codex: The General History of the Things of New Spain*, trans. and ed. Charles E. Dibble and Arthur J. O. Anderson, 12 books in 13 vols. (Santa Fe: School of American Research and the University of Utah, 1953–82), bk. 1, ch. 4, For the year symbol, see Eduard Seler, *Comentarios al Códice Borgia*, 2 vols., trans. Mariana Frenk (Mexico City: Fondo de Cultura Económica, 1963), 1:263. And for the trapeze and ray symbol representing associations with fire as well as for its depiction in the *xiuhcoatl*'s tail, in a ball court on page 29 of the *Codex Fejérváry-Mayer*; on Tlaloc on page 38 of the *Codex Borgia*; and on Xiuhtecuhtli on page 61 of the *Codex Borgia,* see Bodo Spranz, *Los dioses en los códices mexicanos del Grupo Borgia* (Mexico City: Fondo de Cultura Económica, 1973), 468–69.

[8] Seler, *Comentarios al Códice Borgia*, 1:263–65; Anthony Aveni, "Astronomy in the Mexican Codex Borgia," *Archaeoastronomy* 24, *Supplement to the Journal for the History of Astronomy* 30 (1999): S1–S20; and Hernández, "The Fortunes of Maize in the Borgia Codex," 1–35.

[9] Hernández, "The Fortunes of Maize in the Borgia Codex," 20.

[10] Sahagún, *Florentine Codex*, bk. 4, appendix, 137. Early Mesoamerican societies developed a calendar system that became standard throughout Mesoamerica. For primary sources discussing the Mesoamerican calendar, see Sahagún, *Florentine Codex*, bk. 4 and 5; Diego Durán, *Book of the Gods and Rites and the Ancient Calendar*, ed. and trans. Fernando Horcasitas and Doris Heyden (Norman, OK: University of Oklahoma Press, 1971); and Toribio de Benavente, Motolinía, *Motolinía's History of the Indians of New Spain*, ed. and trans. Francis Borgia Steck (Washington, DC: Academy of American Franciscan History, 1951), 110–13. For secondary sources, see Johanna Broda, "Mesoamerican Astronomy and the Ritual Calendar," *Science Across Cultures: The History of Non-Western Science* 1 (2000): 225–67; Johanna Broda, "The Mexican Calendar as Compared to Other Mesoamerican Systems," *Acta Ethnologica et Linguistica* 15 (1969): 145–67; and Alfonso Caso, "Calendrical Systems of Central Mexico," in *Handbook of Middle American Indians*, ed. Robert Wauchope, Gordon F. Ekholm, and Ignacio Bernal (Austin: University of Texas Press, 1971), 10:333–48. The earliest known evidence of calendrical markings in on Monument 3, a stone carving from San José Mogote originating in the Valley of Oaxaca, which bears a shallow relief of a naked man, apparently defeated, and a glyph for the day 1 Motion, as well as the coefficient seventeen whose day sign is effaced. Joyce Marcus has dated this monument to 600 BCE, and remarks that the calendrical symbol could refer to either a date of conquest or a personal name. See Joyce Marcus, "The Origins of Mesoamerican Writing," *Review of Anthropology* 5 (1976): 35–67; and also Alfonso Caso, "Zapotec Writing and Calendar," in *Handbook of Middle American Indians*, ed. Robert Wauchope and Gordon Willey (Austin: University of Texas Press, 1965), 3:931–33; and Javier Urcid, "Zapotec Hieroglyphic Writing," *Studies in Pre-Columbian Art and Archaeology*, 34 (Washington, DC: Dumbarton Oaks, 2001).

[11] Mesoamerican societies, including the Nahua, were primarily agricultural, so they naturally devised a calendar based on the sun's movements. Early colonial sources report that the 365-day count was very much in use among the Nahua. For example, Sahagún's *Primeros Memoriales* and the *Codex Tudela* indicate that the solar year was useful in recording historic and other significant events, including people's ages. See Bernardino de Sahagún, *Primeros Memoriales*, photographed by Ferdinand Anders (Norman, OK: University of Oklahoma press, 1993), fol. 286r; and José Tudela de la Orden, *El Códice Tudela* (Madrid: Ediciones Cultura Hispánica, 1980), fols. 77v and 78v.

[12] Alonso de Molina, *Vocabulario de la lengua méxicana* (Leipzig, Germany: B. G. Teubner, 1880), 149v, 159v.

[13] "Días demasiados y sin provecho." Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 1:226.

[14] For further explanation and discussion of the Nahua calendar, as well as for bibliography on primary sources see: Ferdinand Anders, Maarten Jansen, and Peter van der Loo, *Calendario de pronósticos y ofrendas: Libro explicativo del llamado Códice Cospi*, (Graz, Austria: Akademische Druck- und Verlagsanstalt; Mexico City: Fondo de Cultura Económica, 1994), 87; and Rafael García Granados, "Observaciones sobre los códices pre-hispánicos de México y reparos que estas sugieren acerca de su clasificación," *El México Antiguo* 5 (1940–41): 43–44.

[15] Christine Hernández presents, in table 4 of her article "The Fortunes of Maize in the Borgia Codex," an excellent summary listing the various reconstructions of the effaced calendrical symbols in page 28 of the *Codex Borgia* proposed to date by scholars. Hernández does not include her own interpretations, but she agrees with Anthony Aveni's except for two of the day signs. Hernández reads one of the day signs accompanying the year 1 Reed (which Aveni could not interpret because the imagery is too effaced) as 9 Deer, and one of the day signs accompanying the year 4 Rabbit (also not reconstructed by Aveni because it is too effaced to interpret) Hernández reconstructs as 8 Serpent. See Hernández, "The Fortunes of Maize in the Borgia Codex," 16.

[16] Seler, *Comentarios al Códice Borgia*, 1:263. In other words, the day 4 Movement does not fall on the year 1 Reed even though they are in the same compartment. As Seler explains, "De ninguna manera debemos unir Ce ácatl y Nahui ollin y considerar como punto de partida el día *Nahui Ollin* en el año que empieza por *Ce ácatl*. Pues entonces esta ley no sería aplicable" (Under no circumstance must we combine 1 Reed and 4 Movement and consider as a starting point that the day 4 Movement falls within the year 1 Reed, otherwise this law [the one he devised for counting Venus cycles and solar years] would not be applicable).

[17] "Podríamos interpreter ese dia como dia inicial de un period del planeta Venus" and "Al contar los años a partir de *Nahui Ollin*—día inicial del primer periodo de Venus—, *Ce atl*, 1-Agua—día inicial del cuarto periodo de Venus—, cae en el año quinto. Tres periodos de Venus o 3 x 584 días equivalen, en efecto, a cinco años solares o a 5 x 365, menos 73 días." Ibid.

[18] For arguments that the day sign should be interpreted as 4 Movement, see Seler, *Comentarios al Códice Borgia*, 1:263–65. For opinions that it could be 4 or 5 Movement, see Anders et al., *Los templos del cielo y de la oscuridad, oráculos y liturgia: Libro explicativo del llamado Códice Borgia*, 49–65. And for scholarship arguing that the day sign is 5 Movement, see Lord Kingsborough, *Antiquities of Mexico, Comprising Facsimiles of Ancient Mexico Paintings and Hieroglyphics . . . the Whole Illustrated by Many Valuable Inedited Manuscripts by Lord Kingsborough*. *The Drawings, on Stone*, by Agostino Aglio, 9 vols. 1–7, 1831; 8–9, 1848 (London: Havel and Conlgaghi, Son, 1831–48); Abate José Lino Fábrega, *Códice Borgiano. Interpretación del Códice, Anales del Museo Nacional* vol. 5 (Mexico City: Museo Nacional, 1900, ca. 1792–97), 15; Aveni, "Astronomy in the Mexican Codex Borgia," S1–S20 (table 1); and Hernández, "The Fortunes of Maize in the Borgia Codex," 16 (table 4).

[19] Gisele Díaz and Alan Rodgers, *The Codex Borgia: A Full-Color Restoration of the Ancient Mexican Manuscript*, intro. Bruce E. Byland (New York: Dover Publications, 1993); and Karl Anton Nowotny, *Tlacuilolli: Style and Contents of the Mexican Pictorial Manuscripts*, trans. and

ed. George A. Everett Jr. and Edward B. Sisson (Norman, OK: University of Oklahoma Press, 2005), 263.

[20] "Las otras fechas, fechas de días, que figuran entre *Nahui olin* y *Ce atl* tendríamos que considerarlas como fechas arbitrariamente escogidas, fechas de transición, por así decirlo." Seler, *Comentarios al Códice Borgia*, 1:263.

[21] Aveni, "Astronomy in the Mexican Codex Borgia," S1. See also Victoria R. Bricker, "A Method for Dating Venus Almanacs in the Borgia Codex," *Archaeoastronomy* 26, *Supplement to the Journal for the History of Astronomy* 32 (2001): S21–S44.

[22] Ibid., S9.

[23] Ibid., S15. See also Caso, "Calendrical Systems of Central Mexico," 333–48.

[24] Ibid., S8.

[25] Ibid., S10 and S20, note 32.

[26] Ibid., S15.

[27] Ibid., S9.

[28] Ibid.

[29] Hernández, "The Fortunes of Maize in the Borgia Codex," 10.

[30] Ibid., 20.

[31] Ibid.

[32] Ibid.

[33] Ibid., 18.

[34] Ibid.

[35] Ibid., 20.

[36] Ibid., 21. See also Anders et al., *Los templos del cielo y de la oscuridad, oráculos y liturgia: Libro explicativo del llamado Códice Borgia*, 167–74; and Miller and Taube, *An Illustrated Dictionary of the Gods and Symbols of Ancient Mexico and the Maya*, 143.

[37] Hernández reports that "the god of frost and cold, Itzlacoliuhqui-Ixquimilli . . . is an aspect of Tezcatlipoca." Hernández, "The Fortunes of Maize in the Borgia Codex," 21. See also Sahagún,

Florentine Codex, bk. 2, ch. 30, 121, where Itzlacoliuhqui is identified as an aspect of Cinteotl, the god of maize.

[38] Hernández, "The Fortunes of Maize in the Borgia Codex," 21.

[39] Ibid.

[40] Aveni, "Astronomy in the Mexican Codex Borgia," S9.

[41] Sahagún, *Florentine Codex*, bk. 1, ch. 7, 13.

[42] Henry B. Nicholson, *Topiltzin Quetzalcoatl: The Once and Future Lord of the Toltecs* (Boulder: University Press of Colorado, 2001), 284.

[43] Henry B. Nicholson, "The Iconography of the Feather Serpent in Late Postclassic Central Mexico," in *Mesoamerica's Classic Heritage: From Teotihuacan to the Aztecs*, ed. David Carrasco, Lindsay Jones, and Scott Sessions (Boulder: University of Colorado Press, 2000), 147.

[44] John Bierhorst, ed. and trans., *History and Mythology of the Aztecs: The Codex Chimalpopoca* (Tucson: The University of Arizona Press, 1992a), 26.

[45] Ibid., 142.

[46] For further discussion of this issue see: Anthony Aveni, "Calendar, Chronology, and Cosmology in the *Mapa de Cuauhtinchan No. 2*," in *Cave, City, and Eagle's Nest: An Interpretive Journey Through the Mapa de Cuauhtinchan No. 2*, ed. David Carrasco and Scott Sessions (Albuquerque: University of New Mexico Press, 2007), 147–58; Henry B. Nicholson, "Native Historical Traditions of Nuclear America and the Problem of Their Archaeological Correlation," *American Anthropologist* 57, no. 3 (1955): 596–613; and Eleanor Wake and Phil Stokes, "Mixtec Manipulations: Pictographic History and Cultural Identity in the Art of Early Colonial Mexico," *Journal of Latin American Lore* 20 (2): 209–48.

[47] Ibid., 24.

[48] Jill Leslie Furst, "The Year 1 Reed, Day 1 Alligator: A Mixtec Metaphor," *Journal of Latin American Lore* 4, no. 1 (1978b): 93.

[49] Ibid.

[50] Ibid., 122. Emily Umberger, who has conducted extensive analysis of caledrical glyphs in Aztec sculpture, argues that the carvings of year dates in these artifacts "allude to important events in several time frames and to different levels of meaning." Emily Umberger, "Aztec Sculpture, Hieroglyphs, and History" (PhD diss., Columbia University, 1981a), 11. See also Emily Umberger, "The Structure of Aztec History," *Archaeoastronomy* 4, no. 4 (1981b): 10–18.

[51] "No hay en ningún otro manuscrito una imagen que se parezca a la de la lámina 28 del Códice Borgia." Seler, *Comentarios al Códice Borgia*, 1:263. Using cognates to study page 28 of the *Codex Borgia* is helpful only to an extent—for instance, in the identification of costume elements—because the rest of the iconography is unique, and is not represented in any of the extant Central-Mexican manuscripts (most were destroyed in the aftermath of the conquest, see Chapter 1).

[52] Sahagún, *Florentine Codex*, bk. 11, ch. 13, 283.

[53] Ibid., bk. 11, ch. 7, 186 and 200.

[54] Ibid., bk. 11, ch. 7, 214.

[55] There are several excellent studies on the symbolic significance of flowers in indigenous art, but these do not associate them with the biology of plants or to pollination as I have argued in this dissertation. See Doris Heyden, *Mitología y Simbolismo de la Flora en el México Prehispánico* (Mexico City, Universidad Nacional Autónoma de México, 1983); Jane H. Hill, "The Flower World of Old Uto-Aztecan," *Journal of Anthropological Research* 48 (1992): 117–44; Jane Hill and Kelley Hays-Gilpin, "The Flower World in material Culture: An Iconographic Complex in the Southwest and Mesoamerica, *Journal of Anthropological Research* 55 (1999): 1–37; Miguel León-Portilla, "Las Flores en la Poesía Náhuatl," *Arqueología Mexicana* 13, no. 78 (2006), 42–45; Karl A. Taube, "Flower Mountain: Concepts of Life, Beauty, and Paradise among the Classic Maya," *RES: Anthropology and Aesthetics* 45 (2004): 69–98; Karl A. Taube, "Climbing Flower Mountain: Concepts of Resurrection and the Afterlife in Ancient Teotihuacan," in *Arqueología e historia del Centro de México, Homenaje a Eduardo Matos Moctezuma*, ed. Leonardo López Luján, Davíd Carrasco, and Lourdes Cué (Mexico City: Instituto Nacional de Antropología e Historia, 2006), 153–70; Karl A. Taube "Gateways to Another World: The Symbolism of Flowers in Mesoamerica and the American Southwest," in *The Land Brightened with Flowers: The Hopi Iconography Project*, ed. Kelley Hays-Gilpin and Polly Schaafsma (Flagstaff: Museum of Northern Arizona Bulletin, 2010), 73–120; María Teresa Uriarte, "Flores en la Pintura Mural Prehispánica," *Arqueología Mexicana* 13, no. 78 (2006), 36–41; and Ana María Velasco Lozano and Debra Nagao, "Mitología y Simbolismo de las Flores," *Arqueología Mexicana* 13, no. 78 (2006), 28–35.

[56] "Todos sus regocijos y fiestas celebran con flores" and "Y así se les pasaba la vida en flores, con tanta ceguedad y tiniebla, que, engañados y persuadidos del demonio, viéndolos tan aficionados a flores." Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 1:151.

[57] Ibid., 1:151–58.

[58] Edouard de Jonghe, "Histoyre du Mechique, manuscript français inédit du XVIe siècle," *Journal de la Société des Américanistes. Noevelle Série* 2 (1905): 31: "Pieciutentli se estoyt couché avec une déesse nomée Choquijceli, de la quelle nacquist ung dieu Ciutentl." The

original to the document currently known as the "Histoyre du Mechique" was written in French by the royal cosmographer André Thevet from a now lost Spanish source.

[59] Xochipilli is usually male. Here, a female (regardless of her name) is likely intended. The *Historia de los mexicanos por sus pinturas* speaks of "Xochiquetzal, primera mujer de Piltzintecuhtli" (Xochiquetzal, Piltzintecuhtli's first wife) and reiterates, "En este tiempo había otro dios llamado Piltzintecutli y su mujer se llamaba Xochiquetzal" (At that time there was another god called Piltzintecuhtli and his wife was called Xochiquetzal). Furthermore, the text in the passage cited identifies her in the original Spanish as *una diosa* (a goddess) and therefore as female. In explaining her role as the mother of maize, the text specifies the article *la*, thus a female: *de la cual nació* as opposed to *del cual nació* "from whom was born." In: Ángel María Garibay Kintana, ed., *Teogonía e historia de los mexicanos: Tres opúsculos del siglo XVI*, 2nd ed. (Mexico City: Editorial Porrúa, Colección Sepan Cuantos, 1973), 34, 109.

[60] "El grano que comen que se llama maíz, fue hecho de esta manera: Los dioses descendieron todos a una caverna, donde un dios llamado Piltzintecutli estaba acostado con una diosa llamada Xochipilli, de la cual nació un dios llamado Cinteotl." Ibid., 110.

[61] "Y dicen que del primer hombre y mujer que hicieron, como está dicho, nasció, cuando estas cosas se comenzaron a hacer, un hijo, al cual dijeron Piltzintecuhtli, y porque le faltaba mujer con quien casarse, los dioses le hicieron de los cabellos de Xochiquetzal una mujer, con la cual fue la primera vez casado" (And they say that form the first man and woman that [the gods] made, as has been said, was born, when these things began to be made, a son, whom they called Piltzintecuhtli, and because he lacked a woman with whom he could be married, the gods made from Xochiquetzal's hair, a woman, with whom he was for the first time married). Ibid., 27.

[62] For primary sources and discussion, see: Miguel León-Portilla, "Ometeotl, el supremo dios dual, y Tezcatlipoca 'Dios Principal,'" *Estudios de cultura náhuatl*, 30 (1999): 148 (133–52).

[63] Miguel León-Portilla, *La Filosofía Náhuatl Estudiada en sus Fuentes* (Mexico City, Universidad Nacional Autónoma de México, 1993). Miguel León-Portilla's research on Nahua philosophy is a pioneering endeavor that he began with his doctoral thesis in the 1950s. In Chapter 4 I will address the argument that Ometecuhtli is formed with the Nahuatl words *omitl* (bone) and *tecuhtli* (lord) and thus should be translated as "Bone Lord," and not *ome* (two) and *tecuhtli* (lord), thus "Two Lord."

[64] "Nuestra madre y nuestro padre que se llama ometecutli y omecioatl, que vive sobre los nueve cielos que es el lugar de la habitación destos dos dioses." Sahagún, *Códice Florentino*, bk. 6, ch. 32, fol. 148v.

[65] "Alo determinado el que reside en el cielo, un hombre, y una muger, que se llama ometecutli y omecioatl," and "nuestro Señor Quetzalcoatl, que es criador, y hazedor os a hecho esta merced." Sahagún, Códice Florentino, bk. 6, ch. 25, fols. 120v and 120r. Miguel León-Portilla cites this passage from the *Florentine Codex* but does not link it to Quetzalcoatl's role in pollination. León-Portilla's point is that "el Dios dual, Nuestro Padre, Nuestra Madre, y asimismo de todos

los dioses, había determinado obrar en el mundo principalmente por medio de Tezcatlipoca," and not Quetzalcoatl ("the dual god, Our Father, Our Mother, and also of all gods, had determined to act in the world mainly through Tezcatlipoca). See León-Portilla, *Estudios de cultura Náhuatl*, 148.

[66] Sahagún, *Florentine Codex*, bk. 6, ch. 8, 34.

[67] "El concepto de la dualidad divina tuvo raíces muy profundas en el tiempo, así como una difusión muy amplia en el espacio." León-Portilla, "Ometeotl, el supremo dios dual y Tezcatlipoca 'Dios Principal.'" 149. See also his well-deserved celebrated work, a pioneering endeavor that he began with his doctoral thesis in the 1950s: León-Portilla, *La Filosofía Náhuatl Estudiada en sus Fuentes*.

[68] There is, actually, as Eric Thompson himself discusses, ample evidence supporting his "conjecture." Thompson notes that the Nahua associated the "divine pair" with "the sexual act" thus procreating other gods, but he argues that the "myths are confused." He does not link the additional creator gods to wind, birds, and other agents of pollination, which explains how all the elements—male-female couples, sexuality, and pollination—can interrelate (see discussion in Chapter 4). Of the male-female couple in the Popol Vuh, Thompson says, "as creators of the world, their names are followed by others . . . among them figures Gukumatz, whose name is the Quiche translation of Quetzalcoatl, 'Feathered Serpent.'" That Gukumatz sometimes appears to be the progeny of the "primeval pair" and sometimes the "primeval pair," confounds Thompson. He speculates that during the early colonial period when indigenous beliefs and way of life were under siege "little confusions concerning those obscure titles and relationships could have arisen," opining, "certainly that was what happened with regard to Nahuatl mythology." These relationships, however, would have been less "confusing," had Thompson considered the role that Quetzalcoatl (and his Maya counterparts) as wind play in pollination. J. Eric S. Thompson, *Maya History and Religion* (Norman: University of Oklahoma Press, 1970), 200–1. See also Karen Bassie-Sweet, *Maya Sacred Geography and the Creator Deities* (Norman: University of Oklahoma Press, 2008).

[69] Thompson, *Maya History and Religion*, 201. Thompson also reports that the Tzotzil of Chenalho also had a male-female creator called Totilme'il "Father-Mother" whose animal form was the hummingbird, a pollinator.

[70] Ibid., 202.

[71] Ralph L. Roys, *The Book of Chilam Balam of Chumayel* (Washington DC: Carnegie Institution, 1933), 53–54.

[72] Paul Weatherwax, *Indian Corn in Old America* (New York: Macmillan, 1954), 183.

[73] Ibid.

[74] Wayne C. Smith, *Crop Production: Evolution, History, and Technology* (New York: John Wiley & Sons, Inc., 1995), 16.

[75] Londa Schiebinger reports: "Carl Linnaeus, the greatest taxonomist of his age, imagined that plants have vaginas and penises and reproduce on marriage beds." Londa Schiebinger, "Gender and Natural History," in *Cultures of Natural History*, ed. Nicholas Jardine, James A. Secord and Emma C. Spary (Cambridge: Cambridge University Press, 1996), 163. For additional sources discussing European understandings of plant sexuality, see: Alfred W. Bennett, "Sir Thomas Millington and the Sexuality of Plants," *Nature* 13 (December 1875): 85–86; Patricia Fara, *Sex, Botany and Empire: The Story of Carl Linnaeus and Joseph Banks* (New York: Columbia University Press, 2003); and Nehemiah Grew, *The Anatomy of Plants* (London: W. Rawlins, 1682).

[76] John Staller, *Maize Cobs and Cultures: History of Zea mays L.* (New York: Springer, 2010), 97; and Henry Agard Wallace and William L. Brown, *Corn and Its Early Fathers* (Kalamazoo: Michigan State University Press, 1956), 47.

[77] Thompson, *Maya History and Religion* Thompson, 253, 211. See also Cecelia F. Klein, *The Face of the Earth: Frontality in Two-dimensional Mesoamerican Art*. *Outstanding Dissertations in the Fine Arts* (PhD diss., Columbia University, 1972), 244–45.

[78] Thompson, *Maya History and Religion* Thompson, 244–45.

[79] Ibid., 253.

[80] Bierhorst, ed. and trans., *History and Mythology of the Aztecs: The Codex Chimalpopoca*, 145–47.

[81] "Tezcatlipoca es el Itztli, 'el cortante, el dios-pedernal.'" Seler, *Comentarios al Códice Borgia*, 1:164.

[82] Spranz, *Los dioses en los códices mexicanos del Grupo Borgia*, 182.

[83] Anders et al., *Los templos del cielo y de la oscuridad, oráculos y liturgia*; Hernández, "The Fortunes of Maize in the Borgia Codex," 20; and Miller and Taube, *An Illustrated Dictionary of the Gods and Symbols of Ancient Mexico and the Maya*, 143.

[84] "Es menester hacer la tierra" and "que de ella saliese todo el fruto necesario para la vida del hombre." Garibay Kintana, ed., *Teogonía e historia de los mexicanos*, 108.

[85] Sahagún, *Florentine Codex*, bk. 3, ch. 2, 11.

[86] See Chapter 5. For discussion of Tezcatlipoca's associations with sexuality see: Cecelia F. Klein, "None of the Above: Gender Ambiguity in Nahua Ideology," in *Gender in Pre-Hispanic America*, ed. Cecelia F. Klein (Washington, DC: Dumbarton Oaks Research Library and

Collection, 2001), 183–253; Guilhem Olivier, *Mockeries and Metamorphoses of an Aztec God: Tezcatlipoca, "Lord of the Smoking Mirror*,*"* trans. Michel Besson (Boulder: University Press of Colorado, 2003), 11–44, 150; and Pete Sigal, "Queer Nahuatl: Sahagún's Faggots and Sodomites, Lesbians and Hermaphrodites," *Ethnohistory* 54, no. 1 (2007): 9–34.

[87] On page 60 (lower right corner) of the *Codex Borgia*, Tonacatecuhtli's vessel appears upside down, mirroring the human birth, which usually occurs headfirst (for further explanation of the headfirst position and examples, see Klein, *The Face of the Earth: Frontality in Two-dimensional Mesoamerican Art*, 34–35). Moreover, above Tonacatecuhtli's vessel appears Ehecatl-Quetzalcoatl with a maize cob in his headdress, indicating that the imagery is referencing the plant and wind pollination. In front of Ehecatl-Quetzalcoatl is a goddess that Seler has identified as Xochiquetzal, who often appears with her progeny, twins. The anthropologist David Wesbster has pointed out that not many people seem to know that the maize plant produces at most two cobs. Nevertheless, it appears that the Nahuas knew this because Xochiquetzal, whom as discussed above bore maize, often appears as the mother of twins (e.g., the pre-Columbian *Codex Laud*, page 36 and *Codex Vaticanus B*, page 39). Webster has noted that Europeans in the sixteenth century illustrated the plant as yielding several cobs and that Central Mexican Nahuas did as well. As will be further discussed in Chapter 4, the word "coatl," which is part of Quetzalcoatl's name means both snake as well as twin. See Seler, *Comentarios al Códice Borgia*, 2:155–56; and David Webster, "Backward Bottlenecks," *Current Anthropology* 52, no. 1 (February 2011): 77–104.

[88] Karl Taube and Henry B. Nicholson have explained this birth-like pose in depictions of Tlaltecuhtli, the earth monster. See Karl Taube, "The Womb of the World: The *Cuauhxicalli* and Other Offering Bowls of Ancient and Contemporary Mesoamerica," *Maya Archaeology* 1 (2009): 91; and Henry B. Nicholson, "A Fragment of an Aztec Relief Carving of the Earth Monster," *Journal de la Société des Américanistes* 56, no. 1 (1967): 81–94; and Susan Milbrath, "Birth Images in Mexica-Puebla Art," in *The Role of Gender in Pre-Columbian Art and Architecture*, ed. Virginia Miller, 153–77 (Lenham, MD: University Press of America, 1988).

[89] The *Florentine Codex* describes the *chalchihuitl* as precious green stones that nobles used and indicated high status. Bernardino de Sahagún, *Códice Florentino: El Gobierno de la República edita en facsimil el manuscrito 218–20 de la Colección Palatina de la Biblioteca Medicea Laurenziana Códice Florentino para mayor conocimiento de la historia del pueblo de México*, 3 vols. (Florence: Giunti Barbéra and the Archivo General de la Nación, 1979), bk. 11, ch. 8, fol. 205r. For further explanation see Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 1:151; Cecelia F. Klein, "Who Was Tlaloc?" *Journal of Latin American Lore* 6, no. 2 (1981): 165; Alfredo López Austin, *The Human Body and Ideology: Concepts of the Ancient Nahuas*, 2 vols., trans. Thelma Ortiz de Montellano and Bernard Ortiz de Montellano, (Salt Lake City: University of Utah Press, 1988), 1:29; and Molina, *Vocabulario de la lengua méxicana*, fol. 19r. The early colonial *Historia Tolteca-Chichimeca*, fol. 53r (accessible via Gallica, an important online library, cited below); and the *Matrícula de Tributos*, fol. 20, contain images of the *chalchihuitl*, see: Ferdinand Anders, *Matrícula de Tributos o Códice de Moctezuma* (Graz: Akademische Druck- und Verlagsanstalt, 1997); and *Historia Tolteca-Chichimeca*. Gallica, la bibliothèque numérique [digital library] de la Bibliothèque nationale de

France, Départment des Manuscrits. Available from: http://gallica.bnf.fr/ark:/12148/btv1b84559448/f61.image.r=.langES, 2013 [ca. 1549].

[90] Miller and Taube, *An Illustrated Dictionary of the Gods and Symbols of Ancient Mexico and the Maya*, 172.

[91] In *Codex Mendoza* folio 70r, a male and female face each other with their bodies in the same position as those on the *Codex Vaticanus A*, but here they are covered by a white blanket, not a vessel. The glosses indicate that this iconography symbolizes "carnal relations" (sexual intercourse), warning that those guilty of adultery would be stoned to death. See Frances F. Berdan and Patricia Rieff Anawalt, *The Essential Codex Mendoza* (Berkeley: University of California Press, 1997), 147, 236.

[92] "La casa de dios que se llama *Tonacatecutli*, que vive en los vergeles que se llaman T*onacaquauhtitlan*, donde hay todas maneras de árboles y flores y frutos, y andan allí como *tzintzones*, que son avecitas pequeñas de diversos colores que andan chupando las flores de los árboles." Sahagún, *Códice Florentino*, bk. 6, ch. 21, fol. 96r.

[93] Ferdinand Anders, Maarten Jansen, and Luis Reyes García, *Manual del adivino: Libro explicativo del llamado Códice Vaticano B* (Graz, Austria: Akademische Druck- und Verlagsanstalt; Madrid: Sociedad Estatal Quinto Centenario; and Mexico City: Fondo de Cultura Económica, 1993), fols. 15v and 16v; and Eloise Quiñones Keber, *Codex Telleriano-Remensis: Ritual, Divination, and History in a Pictorial Aztec Manuscript* (Austin: University of Texas Press, 1995), fol. 8v.

[94] Diego Durán, *Historia de las Indias de Nueva España e Islas de la tierra firme*. Biblioteca Digital Hispánica. Available from: http://bdh-rd.bne.es/viewer.vm?id=0000169486&page=1, 2005 [1579].

[95] Jonghe, "Histoyre du Mechique, manuscript français inédit du XVIe siècle," 31.

[96] Diego Durán, *Book of the Gods and Rites and the Ancient Calendar*, trans. and ed. Fernando Horcasitas and Doris Heyden (Norman, OK: University of Oklahoma Press, 1971), 68.

[97] "Tenían estas naciones á una diosa que llamaban la diosa de los enamorados, como antiguamente tenían los gentiles la diosa Venus. Llamábanla *Xochiquetzatl*, la cual decían que habitaba sobre todos los aires y sobre los nueve cielos, y que vivía en lugares muy delietables y de muchos pasatiempos . . . Llamaban el cielo donde esta diosa estaba *Tamohuanichan Xochitlihcacan* . . . De este árbol *Xochitlicacan*, dicen que el que alcanzaba desta flor ó de ella era tocado, que era dichoso y fiel enamorado, donde los aires son muy fríos, delicados y helados, sobre los nueve cielos. A esta diosa *Xochiquetzatl* celebraban fiesta cada año con mucha solemnidad, y á ella concurrían muchas gentes donde tenía su templo dedicado . . . Dicen que fué mujer del dios *Tlaloc*, dios de las aguas, é que se la hurtó *Tezcatlipoca*, é que la llevó á los nueve cielos é la convirtió en *diosa del bien querer*." Diego Muñoz Camargo, *Historia de Tlaxcala: Crónica del Siglo XVI*, ed. Alfredo Chavero (Mexico City: Editorial Inovación, 1978), 154–55.

[98] Miller and Taube, *An Illustrated Dictionary of the Gods and Symbols of Ancient Mexico and the Maya*, 143.

[99] Hernández, "The Fortunes of Maize in the Borgia Codex," 20.

[100] "La lluvia contiene granizo, que rompe la mazorca." Anders et al., *Los templos del cielo y de la oscuridad, oráculos y liturgia*, 173.

[101] Sahagún, *Florentine Codex*, bk. 7, ch. 6, 20.

[102] Bierhorst, ed. and trans., *History and Mythology of the Aztecs: The Codex Chimalpopoca*, 149.

[103] Sahagún, *Florentine Codex*, bk. 7, ch. 6, 19.

[104] Ibid., bk. 7, ch. 6, 20.

[105] Ibid., bk. 4, ch. 14, 54.

[106] Bierhorst, ed. and trans., *History and Mythology of the Aztecs: The Codex Chimalpopoca*, 149.

[107] Sahagún, *Florentine Codex*, bk. 1, ch. 11, 22.

[108] Spranz, *Los dioses en los códices mexicanos del Grupo Borgia*, 365. "Su pintura facial característica, raya negra de los ojos y mitad inferior negra del rostro, aparece en todos los manuscritos con algunas variantes."

[109] Seler, *Comentarios al Códice Borgia*, 1:265.

[110] Cecelia F. Klein, "Teocuitlatl, 'Divine Excrement:' The Significance of 'Holy Shit,' in Ancient Mexico" *Art Journal* 52, no. 3 (1993): 25.

[111] Ibid.

[112] Ibid., 21–22.

[113] Hernández, "The Fortunes of Maize in the Borgia Codex," 20.

[114] Gonzalo Fernández de Oviedo y Valdés, *Sumario de la Natural Historia de las Indias*, ed. Álvaro Baraibar (Madrid: Linkgua digital, Iberoamericana, 2010), 19: "mejor que si se estercolara." The full quote reads, "Lo que se hace primero es talar los cañaverales y monte donde lo quieren sembrar, porque la tierra donde nace yerba, y no árboles y cañas, no es tan

fértil, y después que se ha hecho aquella tala o roza, quémase, y después de quemada la tierra que así se taló, queda de aquella ceniza un temple a la tierra, mejor que si se estercolara."

[115] John Clark, "Mesoamerica Goes Public: Early Ceremonial Centers, Leaders, and Communities," in *Mesoamerican Archaeology Theory and Practice*, ed. Julia A. Hendon and Rosemary A. Joyce (Malden, MA: Blackwell Publishing, 2004), 44.

[116] Ibid.

[117] See Garibay Kintana, ed., *Teogonía e historia de los mexicanos*, 25. "Cipactli, que es como caimán, y de este peje hicieron la tierra, como se dirá" (Cipactli, which is like a crocodile, and from this fish they made the earth, as will be said [later in the account]); and Tudela de la Orden, *El Códice Tudela*, fol. 104r, which has a depiction of Tlatecuhtli as the open jaws of a *cipactli*.

[118] Sahagún, *Florentine Codex*, bk. 1, ch. 13, 29.

[119] See, e.g., Quiñones Keber, *Codex Telleriano-Remensis*, 139.

[120] "Porque dezian, que estas tres diosas: mantenjan, a la gente popular: para que pudiessen, viujr, y multiplicar." Sahagún, *Códice Florentino*, bk. 1, ch. 11, fol. 5r.

[121] Karl Taube, "The Womb of the World: The *Cuauhxicalli* and Other Offering Bowls of Ancient and Contemporary Mesoamerica," *Maya Archaeology* 1 (2009): 87. Page 59 of the *Codex Borgia* features a bowl holding two spindles; these are featured below a goddess that Seler has identified as Xochiquetzal, the mother of maize. As will be discussed in Chapter 4, for the Nahua, spindles represented pregnancy. See Seler, *Comentarios al Códice Borgia*, 2:154.

[122] Seler, *Comentarios al Códice Borgia*, 1:265.

[123] Miller and Taube, *An Illustrated Dictionary of the Gods and Symbols of Ancient Mexico and the Maya*, 142.

[124] Hernández, "The Fortunes of Maize in the Borgia Codex," 20–21.

[125] Susan Milbrath, *Heaven and Earth in Ancient Mexico: Astronomy and Seasonal Cycles in the Codex Borgia* (Austin: University of Texas Press, 2013), 35.

[126] Garibay Kintana, ed., *Teogonía e historia de los mexicanos*, 62. "Y dicen que venía el agua negra y llena de culebras, y que lo tuvieron por milagro" (And they said that the water flowed black and full of snakes, which they took as miraculous).

[127] Sahagún, *Florentine Codex*, bk. 7, ch. 4, 14.

[128] Ibid.

[129] Durán, *Book of the Gods and Rites and the Ancient Calendar*, 265.

[130] Sahagún, *Florentine Codex*, bk. 1, ch. 14, 31–32.

[131] Miller and Taube, *An Illustrated Dictionary of the Gods and Symbols of Ancient Mexico and the Maya*, 190.

[132] Anders et al., *Los templos del cielo y de la oscuridad, oráculos y liturgia: Libro explicativo del llamado Códice Borgia*; Hernández, "The Fortunes of Maize in the Borgia Codex," 20; Miller and Taube, *An Illustrated Dictionary of the Gods and Symbols of Ancient Mexico and the Maya*, 143; and Seler, *Comentarios al Códice Borgia*, 1:263–65.

[133] Klein, "The Devil and the Skirt," *Ancient Mesoamerica* 11, no. 1 (2000): 11.

[134] For discussion of the parturient or "hocker" position, which as Karl Taube explains "The term 'hocker' is widely used in Aztec studies to refer to the common parturition pose of Tlaltecuhtli; in German it signifies one who is in a squatting or crouching position." See Cecelia F. Klein, *The Face of the Earth: Frontality in Two-dimensional Mesoamerican Art*. Outstanding Dissertations in the Fine Arts. New York: Garland Publishing (PhD diss., Columbia University, 1972), 6, 55–57; Susan Milbrath, "Birth Images in Mixteca-Puebla Art," in *The Role of Gender in Precolumbian Art and Architecture*, ed. Virginia E. Miller, 153–77 (Lanham, MD: University Press of America, 1988); Eduard Seler, *Codex Vaticanus No. 3773 (Codex Vaticanus B)*, trans. Augustus Henry Keane (Edinburgh: T. and A. Constable, 1902), 23, 24, 265, 219; and Taube, "The Womb of the World: The *Cuauhxicalli* and Other Offering Bowls of Ancient and Contemporary Mesoamerica," 90.

[135] Ibid. See also Henry B. Nicholson, "A Fragment of an Aztec Relief Carving of the Earth Monster," *Journal de la Société des Américanistes* 56, no. 1 (1967): 81–94; Henry B. Nicholson, "The Birth of the Smoking Mirror," Archaeology 7, no. 3 (1954): 164–70; and Taube, "The Womb of the World: The *Cuauhxicalli* and Other Offering Bowls of Ancient and Contemporary Mesoamerica," 90.

[136] Scholars agree that this goddess is a Cihuateteo. However, the goddess, who is otherwise naked, appears wearing a headdress that is almost identical to the one that the Tlazolteotl on page 37 of the *Codex Borgia* wears (Tlazolteotl is below the birth scene from the *chalchihuitl*).

[137] Sahagún, *Florentine Codex*, bk. 11, ch. 8, 223.

[138] For midwife, the text has "the one in charge of childbirth." Sahagún, *Florentine Codex*, bk. 1, ch. 14, 31–32.

[139] Ibid.

[140] Bierhorst, ed. and trans., *History and Mythology of the Aztecs: The Codex Chimalpopoca*, 108. Regarding Quetzalcoatl's origin, the *Annals of Cuauhtinchan* says that: "his mother was

called Chimalman, and that when she conceived Quetzalcoatl in her womb was because she swallowed a *chalchihuitl* stone." Rafael Tena's paleography of the Nahuatl and translation into Spanish: "Auh mitoa yn inantzin catca ytoca Chimanan; yhuan yuh ytalhuillo ynic motlalli yn ytic ynantzin Quetzalcouatl chalchihuitl quitollo" ("También se dice que su madre se llamaba Chimalman, y que cuando concibió en su seno a Quetzalcoátl fue porque se tragó una cuenta de chalchihuite"). Rafael Tena, paleog. and transl. *Anales de Cuauhtitlan* (Mexico City: Cien de Mexico, 2011), 36–37.

CHAPTER FOUR

THE ROLE OF WIND IN MAIZE REPRODUCTION: REEVALUATING EHECATL-QUETZALCOATL'S SIGNIFICANCE

Just as one cannot think of maize reproduction without considering the role of wind, one cannot analyze maize imagery in the *Codex Borgia* without considering the role of Quetzalcoatl. For the Nahua, Quetzalcoatl was one of their most important gods, credited with a number of significant events surrounding the creation of the sun, humans, rain, maize, and the calendar. His name is made up of two Nahuatl words: *Quetzalli*, "rich feather, long and green"; and *Coatl*, "serpent or twin."[1] Consequently, his name suggests that he is part bird and part serpent, and is usually translated as Feathered Serpent, Plumed Serpent, or Precious Serpent. When the Nahua added the prefix Ehecatl, "wind or air," to form Ehecatl-Quetzalcoatl, it was to link Quetzalcoatl the creator god to that element.[2] Book 7 of the *Florentine Codex* discusses wind, explaining: "Ehecatl. That which was known as [the wind] was addressed as Quetzalcoatl. From four directions it came, from four directions it traveled."[3] This chapter addresses why the Nahua thought of wind as so significant that they made it an aspect of one of their most important gods.

In early colonial chronicles, Quetzalcoatl was described simultaneously as an actual historical figure (Quetzalcoatl and/or Ce Acatl Topiltzin Quetzalcoatl), and as a god associated with creation and wind (Quetzalcoatl and/or Ehecatl-Quetzalcoatl). The ambiguity of whether Quetzalcoatl was a historic figure or a god has caused much confusion. Scholars have analyzed what the Nahua said about Quetzalcoatl, trying to establish a clearer distinction between the two personas that he seems to have embodied simultaneously. To date, most studies have focused on whether he was in fact a historical figure. His association with wind, his role in the procurement of maize, and the concomitant development of agriculture, remains largely unexamined. I will

show in this chapter that the images and textual sources associating this god with creative endeavors, the development of agriculture, and the reproduction of maize refer to actual biological processes. Creation as the Nahua conceptualized it (see also Chapter 5) was based on human beings' manipulation of nature, particularly plants, and therefore, was an ongoing endeavor that was both real and historic. Consequently, I contend, the two entities and sets of themes that Quetzalcoatl embodies—human/god and history/creation—distinct as they may seem to us, were related because to the Nahua creation was historical.

In this chapter, I argue that the history of the development of agriculture is an integral part of the historical annals of the Nahua. Regardless of whether, and to what extent, the figure of Quetzalcoatl was or was not an actual historical person, by the time the *Codex Borgia* was painted, he was unquestionably an important character in Nahua thought, carrying strong associations not only with wind but also with agricultural production, sustenance, fertility, sexual reproduction, and plenty. To the Nahua, wind was associated with plant reproduction; therefore, Ehecatl-Quetzalcoatl's persona and actions represented real historic events, namely those pertaining to the history of agriculture. A wholesale reexamination of Quetzalcoatl and his association with the procreation of plants is necessary and, in many respects, long overdue.

Not surprisingly, the Nahuas linked Quetzalcoatl to a broad range of seemingly disparate themes, including creation, agriculture, reproduction, pregnancy, birth, male/female coupling, sustenance, wealth, flying, feathers, birds, maize, work, creative endeavors, and the arts. Although the Nahuas often gave one god multiple roles, the large number and diversity of themes related to Quetzalcoatl are unusual and impressive. What explains this? Here I will argue that in Nahua thought, Quetzalcoatl's many associations were not nearly as disparate as they

seem to us. Nahua philosophy and religious thought seems to be based on scientific principles pertaining to plants, and a thorough analysis of Quetzalcoatl sheds light on this issue.

The Nahua understood that wind is the primary agent involved in the procreation of maize, as well as of other plants they cultivated. In addition, they understood (as explained in Chapter 3) that plants have male and female parts, and that wind and pollinators united them to produce offspring. Wind, consequently, brought them food, sustained them, and created the agricultural surplus that enabled their civilization to flourish. When seen in this way, it is not surprising that the Nahua associated the god of wind with pollination, flying, and the development of agriculture. It also explains Quetzalcoatl's associations with flowers, pregnancy, birth, and male/female coupling, which will also be discussed in this chapter.

The chapter begins with a discussion of a few key works on Quetzalcoatl that reveal the difficulties in trying to clarify the ambiguities surrounding his persona. It continues with a review of his role in creative endeavors, particularly those pertaining to the establishment of agriculture. The next section analyzes a series of images of Quetzalcoatl in his guise as the god of wind, in which he is linked to birds, feathers, flowers, reproduction, travel, and bones. Each of these associations can be tied to pollination and related themes of maize reproduction and agricultural plenty. In the final section of this chapter, I discuss briefly how the Nahuas' understandings of Quetzalcoatl help explain, and in some ways encapsulate, the chasm of misunderstanding between them and the friars.

Key Discussions in the Literature of a Complex and Composite Figure

Quetzalcoatl's significance is difficult to ascertain for at least two related but distinct reasons. First, as is true with many (or perhaps all) of the gods of Central Mexico, he has multiple

attributes, aspects, appearances, associations, and characteristics. Quetzalcoatl is not simply the god of wind, the god of agricultural production, a god of sustenance, or a powerful feathered serpent, but simultaneously all of these things, and many more. Although the problem of organizing the available evidence regarding Mesoamerican gods into discrete categories, whatever we understand or desire these to be, is common in Mesoamerican studies, it is especially pronounced in the case of Quetzalcoatl.[4]

Second, both images and textual sources identify Quetzalcoatl simultaneously as a historical figure and one of the most important gods in the Mesoamerican pantheon. For example, the *Florentine Codex,* Book 1 declares: "This Quetzalcoatl, although he was a man, they considered him a god."[5] Many other early colonial sources report Ehecatl as being one and the same as Topiltzin Quetzalcoatl. Motolinía, for example, attests "This god of air they called in their language *Quetzalcoatl* . . . he was a native of Tollan,"[6] whereas Diego Durán reports, "The god Ehecatl was commemorated on this same feast [Huey Tecuihuitl]. He is also the one known as Quetzalcoatl . . . Ehecatl means wind."[7]

Numerous scholars have discussed the various aspects of Quetzalcoatl, but not his associations with wind as it relates to pollination. To date, the historian Henry Nicholson's meticulous research on and discussion of Quetzalcoatl, which began with his PhD dissertation in 1957, is the most thorough and the most comprehensive in scope. Nicholson collected, summarized and analyzed virtually every primary document pertaining to Quetzalcoatl, and when applicable, included the most pertinent archaeological information available as well. Subsequent generations of scholars continue to benefit from his systematic presentation and insightful analysis of what is often rich and very dense material.[8]

Even in his capacious oeuvre, however, Nicholson chose not discuss Quetzalcoatl's associations with wind, creation, and maize agriculture. Instead, he focuses on the historical aspects of this personage: "In line with the primary focus of this study, it is only the material relating to the latter figure [Topiltzin Quetzalcoatl, not Ehecatl-Quetzalcoatl] that will be considered here."[9] Nicholson's painstaking analysis of the large corpus of ethnohistoric material containing information on Quetzalcoatl does not, however, reveal a clearer distinction between the "historical" personage versus the god, nor does it provide a better understanding of who exactly the historical figure really was.[10] As Nicholson explains, "Topiltzin Quetzalcoatl was conceivably a genuine historical figure prominently involved with an early stage of Toltec history . . . If so, he later seems to have become blended and occasionally, to some extent confused with certain supernatural personalities, particularly an ancient fertility/rain/wind/creator deity, Ehecatl Quetzalcoatl."[11]

In a 2000 publication, Nicholson discusses the iconography of coiled feathered serpent sculptures carved by Nahua artists in the late Postclassic period. The article offers a very useful (although brief) survey of the iconography of the sculptures, their current physical condition, and their location, but provides only limited insight regarding their symbolism. Nicholson writes: "The deity known by this name [Quetzalcoatl] played a major role in the cosmogonic myths, particularly in the creation of mankind and human sustenance," and notes that "creativity is the most positive manifestation of fertility, and Quetzalcoatl—particularly in his aspect as Ehecatl ('wind')—epitomized this fundamental core of the late pre-Hispanic Central Mexican religious system, both conceptually and in propitiatory ritual."[12] Regarding the purpose of the stone sculptures, on the other hand, Nicholson admits, "The function of these coiled feathered serpents is uncertain."[13]

Susan Gillespie has advanced one of the most thought-provoking arguments concerning the ambiguity surrounding Quetzalcoatl's figure. In noting that Quetzalcoatl appears "as both a mortal, the king of Tollan, and a god, the 'Feathered Serpent,' associated with fertility, wind, and Venus," Gillespie points out that in colonial manuscripts such as the *Florentine Codex* and the *Codex Ríos*, Topiltzin Quetzalcoatl as "the king of Tollan is pictured wearing the deity attributes of Ehecatl."[14] Gillespie therefore proposes that the story of Topiltzin Quetzalcoatl the historical figure as recounted in early colonial sources is a post-conquest fabrication created to fit colonial cultural and political needs of both the Europeans and the Nahua.[15]

To date, however, most scholarly discussions have focused on Quetzalcoatl's associations with political history and institutions, including religious ones. Such discussions primarily seek a better understanding regarding the ways in which pre-Columbian and early colonial Nahuas conceived of and recorded history. The consensus seems to be that Mesoamerican annals, including records of the deeds of historical figures, are in great part suffused in myth. For example, Michel Graulich has devoted significant attention to the question of whether Quetzalcoatl is purely a mythological figure or a historical one. After an extensive comparative analysis of the mythological traditions, he concludes that existing Toltec history is constructed from Mexica creation myths, which they manipulated to serve their own socio-political goals.[16]

Similarly, David Carrasco has studied Quetzalcoatl's relationship to the famed city of Tollan, which he recognizes as "an actual earthly site," but one that "was also understood as a 'symbolic center.'"[17] Carrasco's contribution has been considered a pioneering endeavor that sheds light on the religious thought and political ideology embodied in the figure of Quetzalcoatl, guiding the development of the Nahua city. Carrasco focuses on the social and symbolic interplay between center and periphery.[18] His objective with this approach, as he

clearly states is "to present a new understanding of Quetzalcoatl's significance by emphasizing the urban setting of the ancient culture and the ways in which ancient Mexicans regarded their society as a cosmo-magical construct."[19] Ultimately, Carrasco argues that the figure of Quetzalcoatl is suffused in mythology and magic.

Debates pertaining to Quetzalcoatl's historicity, or lack thereof, have monopolized scholarly attention thus facilitating a reconstruction of Nahua sociopolitical development and clarifying how Central Mexicans may have conceptualized and recorded history. The intense focus on royal successions and the political development of urban centers, however, has detracted attention from Quetzalcoatl's role in the development of agriculture. Even when this is considered, it is usually discussed in relation to the establishment of political institutions—e.g., the creation of the state—which scholars argue obtained its legitimacy through myths of creation.[20] Thus Quetzalcoatl's role in the creation and procreation of maize is considered, at most, only a mytho-cosmological construction, and his role in agriculture is relegated to discussions pertaining to the realm of mythology. One of the unintended consequences of overemphasizing the importance of myth within the Mesoamerican cultural milieu is that it causes Mesoamericans to be perceived as being overly concerned with what Westerners consider to be magic and superstition, rather than knowledge of real-world facts and science.[21]

A thorough analysis of the images and textual references alluding to Quetzalcoatl as wind and the role that the element plays in plant reproduction has yet to be conducted. Only a few studies focus on Quetzalcoatl as wind, and these explain the association as having to do with religion and myth. Michel Graulich's brief essay regarding Ehecatl-Quetzalcoatl's qualities as "a life-bringer" offers no in-depth analysis of the evidence that he identifies of Quetzalcoatl's

associations with creative endeavors. Nor does Graulich analyze Nahua conceptions of creation in relation to Ehecatl-Quetzalcoatl and wind.

Karl Taube offers a comparative study of what he calls a "wind complex" that he argues developed in various societies in Mesoamerica (from the Olmecs to the Aztecs) and in what is today the United States southwest. He finds that "the degree of similarity in religious beliefs and practices" in these societies is "striking."[22] Although Taube acknowledges that the significance of wind is related to flowers, he does not link this to the role that the element plays in pollination. Instead, Taube equates wind with breath and its associations with life, arguing: "In Mesoamerica and the American Southwest, it is frequently difficult to distinguish between wind and breath . . . Both wind and breath are widely identified with the concept of the breath spirit instilled at birth and departing at death."[23] Ultimately, Taube concludes regarding the feathered serpent's iconography and symbolism: "Although the feathers of the Mesoamerican version have usually been interpreted as alluding to avian flight and preciousness, these feathers may also incorporate the concept of breath and the breath soul."[24] Therefore, Taube perceives a link between wind and life-giving qualities but does not explore the relationship that exists among wind, the dissemination of pollen, and the maize plant.

More recently, Enrique Florescano presented a study of the development of the cult of Quetzalcoatl in Mesoamerica from the Olmec (ca. 1500–300 BCE) to the Aztec (1335 CE–1521), in which he analyzes the god's three main manifestations: Quetzalcoatl, Ehecatl-Quetzalcoatl, and Ce Acatl Topiltzin Quetzalcoatl. Florescano summarizes Ehecatl's creative attributes as follows: "Ehecatl, the god of wind, to whom the cosmogonies attributed the foundation of the Fifth Sun, is one of the major deities of the Mexica. . . . Ehecatl's creative powers reside in his capacity to move the wind through the different paths and levels of the

cosmos. He is the force that transports air, the gust that moves the clouds and precipitates the rain on earth."[25] In addition, Florescano discusses Ehecatl-Quetzalcoatl's role in the creation of humans and of maize. However, he maintains that each of Quetzalcoatl's different manifestations—whether divine or historical—associate him with the founding of the city of Tollan, "the first Nahua kingdom," and that his cult was therefore associated mostly with "the myths that support political legitimacy."[26]

In sum, scholarly discussions to date have identified and explored Ehecatl-Quetzalcoatl's associations with creative endeavors. These have not, however, examined either the botanic reasons for wind's significance or Quetzalcoatl's role as personified wind in the dissemination of pollen in the reproduction of maize.

Quetzalcoatl's Role in Creative Endeavors and the Development of Agriculture

The Nahua conceived of creation as an ongoing and collaborative process, and they associated Quetzalcoatl with a series of creative endeavors leading up to the development of agriculture. To them it is wind that caused rain, sun, humans, and plants to exist and/or operate in their present form. Regarding rain, for example, the *Florentine Codex* states: "Quetzalcoatl—he was the wind; he was the guide, the roadsweeper of the rain gods, of the masters of the water, of those who brought rain."[27] As for the sun, it is Quetzalcoatl, as the god of wind, who made the sun move across the sky. The *Florentine Codex* reports, "When yet no sun had shown and no dawn had broken . . . the gods gathered themselves together and took counsel among themselves there at Teotihuacan," and asked "Who will carry the burden? Who will take it upon himself to be the sun, to bring the dawn?"[28] Nanauatzin, by jumping valiantly into the fire, sacrificed himself to become the sun, but once it rose, it could not follow its path across the sky. The gods knew that

life under those conditions could not exist. Several other gods sacrificed themselves to no avail. Ultimately, Quetzalcoatl as the wind "arose and exerted himself fiercely and violently as he blew. At once [the sun] could move, who thereupon went on his way."[29] Because he set the sun in motion, Quetzalcoatl was credited with establishing the seasons and agricultural cycles, and inventing the calendar. As set forth in the *Florentine Codex*, Quetzalcoatl also established the year cycles: "This table . . . is the year count, and is the most ancient thing. They say that Quetzalcoatl invented it."[30]

Quetzalcoatl also takes a leading role in creating human beings. The details in this story as well as Quetzalcoatl's role in it exude sexuality and pollination. In the *Leyenda de los Soles*, Quetzalcoatl goes to the land of the dead to retrieve bones to create humans. He tells the stewards of bones: "I've come for the precious bones that you are keeping. I've come to get them."[31] Then:

> The dead land lord replied, "Very well. Blow my conch horn and circle four times around my precious realm." But his conch horn was not hollow. Then he summoned worms, who hollowed it out. Then bumblebees and honeybees went in. Then he blew on it, and the dead land lord heard him.[32]

The "dead land lord" initially allows Quetzalcoatl to take the bones, but then changes his mind and sends "his messengers, the dead land people" to prevent Quetzalcoatl from taking them. But Quetzalcoatl succeeds, and the story continues: "The male bones are in one pile the female bones are in another pile. Then Quetzalcoatl takes them, wraps them up, and comes carrying them off."[33] Once more, the Lord of the Land of the Dead sends his messengers to stop Quetzalcoatl, and dig "a pit" into which he falls, breaking the bones. Fearing the bones "ruined," Quetzalcoatl once again picks them up to take to Tamoanchan, a paradise-like place, where the creator goddess Cihuacoatl[34] grinds up the bones and places them in a jade bowl. Quetzalcoatl sheds blood from his penis into the bowl, and the first humans come to life. That the bowl is of jade

(*chalchihuitl*) is also significant because as explained in Chapter 3, the *chalchihuitl* and bowls symbolize wombs. The bones and the blood are the material from previous generations that make possible, with the help of males and females, the creation of new life.

The Nahua based their explanation of the world, and consequently their philosophy and religious beliefs, on practical observations of nature. They correctly perceived the parallels between the sexual system of reproduction in plants and humans. This may explain why the cobs and/or the maize plant, the prototype of plant life, are often represented with anthropomorphic features in pre-Columbian Central Mexican manuscripts. For example, in the *Codex Borgia* the maize cobs often appear with eyes and mouth (fig. 4.1, left). In the *Codex Fejérváry Mayer*, the maize plant is part human; note how the main stalk emerges from the human's head and the roots from the buttocks (fig. 4.1, right). It is therefore understandable that Quetzalcoatl as wind personified, who creates plant life through pollination and seed dispersal, would be also credited with creating humans. The "seeds and pollen" that brought humans to life were the ancestors' bones and the blood from Quetzalcoatl's penis.

Additional elements in the story in the *Leyenda de los Soles* allude to sexual reproduction and childbirth. Bees—which are pollinators—assist Quetzalcoatl in his task of hollowing out the conch shell so he can "blow" on it. According to the glosses in folio 19r of the *Codex Telleriano-Remensis*, the Nahua likened conch shells to wombs, declaring: "as a snail comes out of the snail shell, so a man comes forth from the womb of his mother."[35] Page 42 of the *Codex Borgia* features the birth of a figure that Seler has identified as the god Xolotl-Nanauatzin, from a seashell.[36] Moreover, the lord of the dead land is hesitant to let go of the bones and attempts to bury Quetzalcoatl by digging a "pit" into which he falls. In Nahuatl, "pit" is *tlaxapotlalli*, which Molina defines as a "thing pierced or hollowed out, or corrupt virgin," further suffusing this

creative event with sexuality.[37] Quetzalcoatl recreates life from the remains of ancestors. Here, again, we see the analogy between the life cycle of plants and animals, including humans. Maize, for example, is an annual plant; it completes its entire life cycle—from birth, to reproduction, to death—in one planting season. But new life is created from seeds, which are the offspring of the dead plant.

In Nahua mythology, Quetzalcoatl is also tied to the development of human agriculture through the procurement of maize. The *Leyenda de los Soles* relates that while the gods wonder how to provide humans with a source of sustenance, Quetzalcoatl urges a black ant that gathers shelled maize (*tlaolli*) to reveal where he obtained it. Initially reluctant, the ant guides Quetzalcoatl to Food Mountain (*tonacatepetl*) and, the story continues, "thus introduces him (to the corn). They go out together. It is said that the red ant guided Quetzalcoatl . . . then Quetzalcoatl carries it on his back to Tamoanchan."[38] After the gods eat, they give the maize to humans so that "they [can] become strong."[39] The gods wonder what to do with Food Mountain, how to make it accessible to humans, "'For now it will only wish to remain where it is.' Quetzalcoatl pulls at it, but he cannot move it."[40]

To the Nahua, creation was a collaborative process. Quetzalcoatl fails in his attempt to carry Food Mountain by himself, but Oxomoco and Cipactonal, the first human couple in the last creation, and therefore, the ancestors, figure out that other gods can help, particularly the rain and the sun gods. The text continues:

> Quetzalcoatl went and tried to carry it [Food Mountain] . . . but he couldn't lift it. . . . Then Oxomoco and Cipactonal said, 'Nanahuatl [the sun] will strike Food Mountain . . . Then all the tlalocs [the rain gods] are summoned . . . and the foods are stolen by the tlalocs. The white, black, and yellow, the red corn, the beans, the amaranth, the chia . . . all the foods were stolen.[41]

Thus, Quetzalcoatl (wind) was fundamental in obtaining maize and developing agriculture, but only, as the text emphasizes, with the help of humans, sun, rain, and other elements in nature. Although a Nahua myth, this story reflects scientific history: human agency, aided by the elements (wind, sun, and rain), led to the development of agriculture and the maize plant.

Quetzalcoatl's Associations with Birds and Feathers as Reflecting Themes of Fertility, Reproduction, and Pollination

In numerous pages of the *Codex Borgia*, Ehecatl-Quetzalcoatl wears a bird's beak buccal mask, one of his most characteristic features.[42] As his name suggests, Quetzalcoatl was part bird, which is a pollinator—reinforcing thus the associations among Ehecatl-Quetzalcoatl, wind, pollination, and birds. According to the early colonial manuscript *Codex Tudela* (ca. 1540),[43] folio 42r, Ehecatl-Quetzalcoatl blew wind from his beak. The accompanying gloss describes him as a:

> Demon called Quetzalcoatl, which means feathered serpent, whom the Indians took for the god of wind, and the Indians painted half his face from the nose down with a wooden snout from where he blew wind.[44]

The gloss in folio 60v of the *Codex Magliabechiano* (which was, along with the *Codex Tudela* made from a common prototype manuscript thought to date to ca. 1528, now lost), reiterates that Quetzalcoatl had a beak "below his nose like a trumpet, through which he blew the wind, the god of which they said he was."[45]

Another prominent related feature of Quetzalcoatl's iconography is his headdress, which includes bones (discussed in a later section of this chapter), feathers, flowers, and pollinating birds. For example, the Spanish gloss in the same folio of the *Codex Tudela* indicates that Quetzalcoatl's headdress features "a bone from which hung much duck plumage . . . and attached at the end is a bird called *huitzitzitl*," probably a hummingbird.[46] In the accompanying image, we

see a bird precisely in the act of pollinating the flower in his headdress (fig. 4.2). Other costume elements and accouterments that Quetzalcoatl wears and holds are not even mentioned in the gloss, suggesting that the primary message conveyed is plant reproduction.

In other early colonial depictions, Ehecatl-Quetzalcoatl also appears wearing the buccal mask and the headdress featuring a bird pollinating a flower. For example, in the *Selden Roll*, a sixteenth century document from the Coixtlahuaca Valley, Oaxaca, a bone tipped with a flower protrudes out of Ehecatl-Quetzalcoatl's headdress. A bird again appears with its beak inside the flower, showing the process of pollination (fig. 4.3). Similarly, in folio 60v of the *Codex Magliabechiano* the image of Quetzalcoatl is (not surprisingly) almost identical to its cognate in the *Codex Tudela*.[47] In the *Codex Magliabechiano*, the bone ends in a flower from which hangs a string of feather balls ending in another flower that is being pollinated by a bird (fig. 4.4). The gloss explains that Quetzalcoatl wears a headdress from which "issued as a panache a bone from which hung many feathers of native ducks that they called xomotl."[48] Images of Quetzalcoatl therefore emphasize the associations of birds and feathers with wind and flowers, all of which allude to pollination.

Page 30 of the pre-Columbian Central Mexican *Codex Laud* features a bird "pollinating" a human,[49] suggesting that the Nahuas likened human reproduction with pollination. The page shows a bird with outstretched wings descending to place its beak in the mouth of the figure that Pete Sigal identifies as "a naked pregnant woman."[50] The naked figure does not have breasts, but because there are no explicit references indicating maleness (e.g., a penis or male clothing), it appears that a female is intended. Her enlarged abdomen is what suggests pregnancy, and this was presumably caused from her interaction with the pollinating bird (fig. 4.5). Moreover, she appears with her head tilted upward as if to enable and summon the bird's visit. All of the

elements on the page, therefore, allude to sexual reproduction through iconographic references connoting pollination.

The addition of feathers in Quetzalcoatl's headdress in the *Codex Tudela* and the *Codex Magliabechiano* images is especially significant. The Nahua generally associated birds, flying, and particularly feathers, with reproduction and the creation of new life. For example, the *Florentine Codex*, Book 6, titled "Rhetoric and Moral Philosophy," explains a number of "figures of speech called metaphors (*machiotlatolli*)."[51] The first one pertains to feathers, which is said to be a metaphor for offspring. When a recently wedded woman became pregnant, the sages in the community credited Quetzalcoatl, whom they addressed as "in tlacatl in tlopiltzin in Quetzalcoatl in teiocoani, in techioani" (the Lord, Our Prince, Quetzalcoatl, the Creator, the Author), with having caused the pregnancy, telling the woman: "Within thee he wisheth to place a life . . . he wisheth to provide thee with a precious feather."[52] Midwives addressed the woman's kin as follows: "Ye who are possessors of precious feathers, ye who have offspring."[53]

Book 6 of the *Florentine Codex* presents one of the best examples of this association of Quetzalcoatl with sexual reproduction. Regarding a woman's pregnancy, the *Florentine Codex* reports that it is Quetzalcoatl, whom the text describes as "Our Lord, whose name is also Yaolli Ehecatl, which means darkness and wind," who should be credited with placing the baby inside the womb. The assertion is reiterated several times throughout the passage discussing marriage rites and pregnancy: "our Lord wishes to place inside her a precious stone and a rich feather, because the young woman is already pregnant; and it seems as if our Lord has placed offspring inside her."[54] Later, when the pregnancy was certain, the family declared: "we have received from our Lord god . . . riches . . . which is the offspring that is in the womb of the young woman."[55]

The association of feathers with impregnation is a central theme in one of the most important Nahua stories involving the goddess Coatlicue, the mother of Huitzilopochtli, "Hummingbird on the Left," the tutelary god of the Aztecs.[56] The story explains how Coatlicue, while sweeping at Mount Coatepetl, collects a flying feather ball, which she places in her belly, causing her to become pregnant with Huitzilopochtli. Book 3 of the *Florentine Codex* relates that

> Once, when Coatlicue was sweeping, feathers descended upon her—what was like a ball of feathers. Then Coatlicue snatched them up; she placed them at her waist. And when she had swept, then she would have taken the feathers, which she had put at her waist. . . . Thereupon by means of them Coatlicue conceived.[57]

The *Historia de los mexicanos por sus pinturas* corroborates the story that Coatlicue conceives Huitzilopochtli because "she took a few white feathers and placed them in her bosom."[58] In the accompanying image in the *Florentine Codex*, Coatlicue's hair is adorned with feather balls (fig. 4.6). As discussed in Chapter 3, hair is associated with the silks of the maize plant, which contain the female sex cells where, after pollination, the kernels begin to form on the cobs. Thus, the feathers that impregnate Coatlicue directly lead to reproduction.

Nahuas also associated flying, or the state of floating in the air, with sexuality and reproduction. Book 10 of the *Florentine Codex*, devoted to the identification and discussion of animals, plants, and minerals known and used by the Nahua, includes a discussion of turkeys. Although the text specifies that in spite of their feathers, these birds cannot fly, the accompanying image depicts a male and female turkey copulating in midair. The pair hover above two female turkeys firmly planted on the ground, one laying eggs and the other sitting on a nest warming her eggs (fig. 4.7).[59] In this image, the air or sky is associated with coupling, sexual reproduction, and procreation. The sexual act of these birds that reportedly "do not fly" is depicted in midair just as, in pollination, male sex cells fly through the air to unite with females.

The association between flying and reproduction appears again in Book 10 of the *Florentine Codex* when it reports that "when babies were conceived they were dropped [i.e., they fell in droplets] [from the heaven] their souls came from there; they entered into their [mother's] wombs."[60] Therefore, women figuratively became pregnant from things "dropping" from the sky, a further allusion to pollination and the parallel between sexual reproduction in plants and animals (here humans). On page 11 of the *Codex Borbonicus*, a baby "drops" onto the head of Tlazolteotl, literally "Goddess of Filth," who appears wearing her characteristic headdress of unspun cotton (fig. 4.8).[61] Footprints indicate the trajectory that the baby (in the upper-right corner) she is about to conceive will take, leading directly towards her head. Therefore, Tlazolteotl and the maize plant conceive in exactly the same manner. But by no means did the Nahua think of this as an "immaculate" conception. According to the *Florentine Codex*, Tlazolteotl was identified with "filth" because she was very much given to sexual promiscuity, and correspondingly ruled over "lust and debauchery."[62] On a subsequent page, Borbonicus 30, which depicts the autumnal feast Ochpaniztli when the birth of maize is reenacted (discussed in Chapter 5), a retinue of men whose overextended erections indicate unequivocally that the scene is intended as sexual, march towards Tlazolteotl (fig. 4.9). To the Nahua, Tlazolteotl simultaneously represented sexuality and childbearing. A Nahua song celebrated her maternal qualities as follows:

> Our mother has arrived,
> The goddess has arrived, Tlazolteotl . . .
> The maize god is born,
> In the house of birth . . .
> At the place of the rain and the mist,
> Where the children of men are made,
> At the place where they fish for jewel fish.[63]

On Borbonicus 11, Tlazolteotl appears squatting with her legs wide open (assuming what scholars unanimously accept is a parturient position),[64] with a baby's head emerging from her womb. Tlazolteotl is therefore depicted as simultaneously conceiving and giving birth, thus referencing her role as a prodigious creator (see fig. 4.8).

Page 39 of the pre-Columbian *Codex Laud* features Ehecatl-Quetzalcoatl linked to Tlazolteotl, thus explicitly associating Quetzalcoatl in his guise as wind with sexual reproduction. Ehecatl-Quetzalcoatl is rendered as a personified body of water[65] (note the similarity with the water day sign depiction in the upper right corner, as well as the fish swimming in it), and he points to Tlazolteotl who stands before him dressed but with her breasts fully exposed (fig. 4.10). The goddess is depicted with spindles of unspun cotton, one in her right hand and one on her headdress. Spools of unspun cotton are one of Tlazolteotl's most recognizable costume elements. To the Nahua, spindles connoted pregnancy, which explains why these were ornaments for the goddess of sex. A Nahua riddle asks, "What is that which becomes pregnant in only one day? The spindle."[66] Tlazolteotl is depicted as well (note that the two females on page 39 appear with the exact same headband, nose ring, and earrings) below Ehecatl-Quetzalcoatl, where she appears naked and with her legs wide open in a parturient position (fig. 4.10). Her breasts and vulva are clearly visible, indicative of sexuality and reproduction.[67] To the Nahua, Tlazolteotl simultaneously represented a sexually promiscuous and maternal figure.

Clearly, the Nahua associated wind, and therefore Ehecatl-Quetzalcoatl, with creating life. Recall that in the *Codex Telleriano-Remensis*, folio 8v, the creator god Tonacatecuhtli, who himself reportedly lived in the "heavens" or air, engendered Quetzalcoatl through the act of blowing. The text explains: "This Quetzalcoatl was the one they say made the world. And thus

they call him lord of the wind, because they say that this Tonacatecuhtli, when it seemed right to him, blew and engendered this Quetzalcoatl."[68] Therefore, Quetzalcoatl was created from wind, and as wind personified he created human and plant life.

Furthermore, Quetzalcoatl was part bird but also part serpent, and certain types of serpents in Nahua thought and iconography had associations with flying and wind. Book 11 of the *Florentine Codex*, titled "Earthly Things," discusses more than thirty species of serpents native to Mesoamerica as well as information on their habitat, eating habits, and whether they are poisonous. The text describes the movements of a type of serpent known as the *tleuacoatl*, as follows: "It is a slitherer; wherever it slithers, it flies over the grass, it goes erect, it just goes erect on its tail. It blows much."[69] For "blows much" the *Florentine Codex* uses the word *iehecaio*, which Molina defines as "something airy or full of wind, or rainfall that comes with wind."[70] Interestingly, the *Florentine Codex* also includes in its discussion a serpent called *quetzalcoatl*, a species that is more abundant in the hot lands of Totonacapan. This serpent and its "flying" properties are described as follows:

> It is given the name *quetzalcoatl* because the flesh on its back is just like precious feathers. Also the base [of the feather] is blackish, and that which forms its shaft is just like the shaft of a quetzal feather, blackish. These protrude along its spine. And what forms the quill is quite green. It lies already along its side as if heaped up or colored. And on its neck they are like Mexican trogon feathers, and its tail, its rattles, are like lovely cotinga feathers; and on its belly they are quite chili-red . . . in order to bite one, first it flies, quite high up; well up it goes . . . And when it flies or descends, a great wind blows. Wherever it goes, it flies.[71]

The image features a huge serpent that instead of slithering on the ground, appears suspended in the air, perhaps by means of the green feathers all along its back (fig. 4.11).

The analogy that the Nahua drew between plant and avian reproduction is also seen in their description of the emergence of maize cobs as "hatching." In the *Florentine Codex* the Nahua express the emergence of maize cobs as "the hatching of the green maize ear."[72]

According to Molina, both *tlapana* and *cueponi* mean "to hatch" and are used to explain the appearance of cobs in the maize plant.[73] The *Codex Magliabechiano*, folio 46v, explains that during Xochilhuitl, the Feast of Flowers in honor of the goddess Chicomexochitl (Seven Flowers), people saved the eggshell remains after chicks had hatched to scatter "on the roads and streets in memory of the mercy of their god in having given them chickens."[74] In the accompanying image a man wearing a bird headdress sits before a flowering plant (fig. 4.12).[75] Eggshells appear scattered near the plant. Here, again, new plant life is associated with new animal life.

The association of birds with reproduction appears in the numerous portrayals of birds pollinating plants in Book 11 of the *Florentine Codex*. For example, folio 201r describes the *tziuactli* as "a small maguey . . . that has silks . . . Its silk is sweet," and the accompanying image shows a bird pollinating the plant's flower (fig. 4.13a).[76] Folio 24r depicts hummingbirds pollinating flowers, and the gloss explains, "Its [the hummingbird's] food is flower honey, flower nectar" just like bees (fig. 4.13b).[77] Other types of plants are also depicted with pollinators; for example, the *cacauaxochitl*, folio 188v (fig. 4.14a), and the *uitztecolxochitl*, folio 190r (fig. 4.14b) both include birds and butterflies in their blooms. The text also describes their respective fragrances and bloom shapes.[78] Folio 197v features the *quiiosuchitl* flower with birds pollinating it, which the text explains: "is the blossom of the maguey. It is like a cluster, yellow, fuzzy-centered. It is honey-like; it exudes. The different birds suck it" (fig. 4.15).[79]

In sum, the key to understanding the diverse associations of Quetzalcoatl with birds, flying, serpents, creation, and agriculture rests with the role that he plays as wind personified in the pollination of maize and other plants. The unifying principle is pollination. Wind and birds are agents of pollination, and whether carried by animals or wind, the pollen flies through the air

as part of the process by which plants reproduce and new life is created. The Nahua understood the parallel between plant and animal reproduction, and therefore associated Quetzalcoatl and his feathers with pregnancy and fertility.

Quetzalcoatl and Pollination in pages 29 through 46 of the *Codex Borgia*

Numerous scholars have analyzed the eighteen-page section spanning pages 29 through 46 of the *Codex Borgia*, proposing varying interpretations.[80] The section is unique in terms of length, organizational structure, and the preponderance of a single character, Quetzalcoatl, moving from page to page. The orientation of the section is perpendicular to the rest of the manuscript, which should be turned ninety degrees to be viewed. Whereas the rest of the manuscript is read right-to-left, this section reads from top-to-bottom. Absent are the dividing red lines that compartmentalize the images in most of the other pages of the manuscript.[81] Some of the pages, however, feature imagery set within quadrilateral frames formed by the elongated torsos of skeletonized supernaturals. Elongated torsos of goddesses with skeletal jaws also create horizontal "strips" that occupy the whole width of the top and/or bottom of some pages.[82] The quadrilateral and "strip gods," however, have openings in the center of their torsos, which allow unrestricted passage from page to page.[83]

Attempts to interpret this section of the manuscript have been ongoing for well over a century. In the 1790s, José Lino Fábrega suggested that it features astronomical cycles pertaining to zodiac signs.[84] In 1904–9, Eduard Seler proposed a detailed astronomical interpretation, arguing that Quetzalcoatl represents Venus on its journey through the sky and the underworld.[85] Karl Anton Nowotny disagreed with Seler's interpretation, arguing instead that the section depicts instructions for cult rituals that took place in real temple precincts.[86] He concludes that

the personages featured in the eighteen-page section do not represent celestial bodies or gods, but priests conducting rituals.

In 1993, Ferdinand Anders, Maarten Jansen, and Luis Reyes García concurred with Nowotny's interpretation, adding that the main actors are impersonators who reenact rituals under the influence of hallucinogenic drugs.[87] In 1994, Bruce Byland and John Pohl argued that the scenes depicted in this section of the *Codex Borgia* resemble investiture rituals in Mixtec manuscripts.[88] They stressed the similarities in ideology and investiture rituals that existed between the Mixtec and Central Mexican nobility during the Postclassic period.

In 2004, William Ringle, following Byland and Pohl, argued that pages 29 through 46 record investiture rituals corresponding to those he claims to have detected in the architecture and iconography of Chichén Itzá, a Maya site that thrived during the late Classic to early Postclassic periods in the Yucatán Peninsula. As Ringle explains it, an ideology rooted in Quetzalcoatl and Tollan, the fabled city of primordial emergence, which dates back to Teotihuacán if not earlier (ca. 100 CE), spread throughout Mesoamerica, encompassing Central Mexican (including the Nahua and the Mixtec), and Maya areas. Ringle contends that investiture rituals were held in ceremonial centers in the various "Tollans" throughout Mesoamerica as part of a network intended to forge alliances facilitated by the spread of the "cult of Quetzalcoatl." Noting Byland and Pohl's contention that pages 29–32 depict the Underworld and pages 33–46 the Earth, Ringle interpreted the section as "death and rebirth" of a ruler represented as Quetzalcoatl. He concludes: "On one level, this section of the *Codex Borgia* is a paradigmatic explanation of the mystery of divine kingship, reconciling human mortality with the persistence of that office through the reincarnation of the spirit of kingship in successive rulers."[89]

In 2006, Elizabeth Hill Boone contended that this section of the *Codex Borgia* represents a creation narrative, a "cosmogony," adding that it "generally parallels but does not coincide with creation stories that have survived for the Aztecs, Mixtecs, and Maya."[90] She argues that the section features numerous birth and emergence scenes, which, along with "the nearly constant actions of Quetzalcoatl, who is supremely a creator god for both the Aztecs and the Mixtecs," follows the structure and iconography of Central Mexican and Maya creation narratives.[91]

Juan José Batalla Rosado argued in his 2008 commentary on the *Codex Borgia* that the eighteen-page section records events taking place in the underworld, basing his contention on the numerous skeletal figures that he sees as either Mictlantecuhtli, "Lord of the Underworld," or Cihuacoatl, "Woman Snake." Following Anders et al., Batalla Rosado further theorized that the section portrays the sun's journey through the underworld from the perspective of a "spirited priest," who conceived these scenes while under the influence of psychotropic drugs. According to Batalla Rosado, the imagery portrays "hallucinations that the author(s) [of the manuscript] had to reach in their exercise of priestly duties."[92] So committed was Batalla Rosado to his interpretation of the eighteen-page section in the *Codex Borgia* that it inspired the title that he gave his commentary, "A guide to a hallucinogenic trip through the underworld."[93]

More recently, in 2014, in an effort to extract historical information pertaining to astronomy and other natural phenomena from the *Codex Borgia*, Susan Milbrath has proposed "Borgia 29–46 is an astronomical narrative structured according to a sequence of eighteen *veintena* festivals."[94] The *veintena* festivals were celebrated throughout the solar year (the 365-day cycle), and were held every twenty days, hence the name "*veintena*" (Spanish for twenty units). Milbrath argues that the "imagery on Borgia 29–46 involves not only the 'big three' of

Central Mexican astronomy (the Sun, the Moon, and Venus), but also the planet Mercury," contending that Quetzalcoatl represents Venus.[95]

My purpose in this chapter is not to attempt to resolve this debate but to call for a reevaluation of this section of the *Codex Borgia* based on Quetzalcoatl's associations with plants and flying. In my approach, I build on Boone's interpretation that the central message in the section pertains to creation. Other interpretations proposed to date—that the section portrays a Venus passage through the underworld, a "supernatural journey" that nevertheless underlies real events pertaining to the investiture of a ruler, the death and resurrection (in the successor) of a ruler, and even a "hallucinogenic trip" caused by the use of psychotic drugs—do not address the significance of the plants or their emphasis on flying.[96]

Most of the pages in this section feature passages or openings through which figures fly in or out to enter or exit a new page or scene (fig. 4.16). Ringle argues, following Seler, that all of these figures "can be shown to be versions of Quetzalcoatl," and that "rather than being distinct actors, they probably represent various stages in the death and regeneration of that deity."[97] On page 43, for example, Quetzalcoatl flies out of the page with a bundle of maize on his back (fig. 4.17).[98] I agree with Boone, Ringle, and others who see the eighteen-page section of the *Codex Borgia* as representing a journey.

Quetzalcoatl appears in every single page of the eighteen-page section of the *Codex Borgia*. In more than half of the pages, he specifically appears as wind. The section opens on page 29 with numerous Ehecatl-Quetzalcoatl figures—twenty-eight in all, some of which are serpents from whose wide-open beaks emerges an additional Ehecatl-Quetzalcoatl with an anthropomorphic body (fig. 4.18). Seven emerge from a foamy substance overflowing the anthropomorphic pot in the center of the page. The foam is dark gray with black semicircles,

black spirals made with two concentric semicircles, and "stars" or "eyes" that are small white and red circles. This foamy substance, which appears in twelve pages of the section as Ehecatl-Quetzalcoatl's serpent body, probably represents wind.

That the section opens with personified wind emerging from a pot is significant. Diego Durán reports that pots represent the idea that food, namely plants, particularly maize and beans, would be widely available in the coming year. Every year at the beginning of June, which he says is when the rains began and "corn and other plants were growing and were beginning to bear fruit," the Nahua celebrated a feast they called Etzalcualiztli the "Day of Eating Cooked Corn and Beans."[99] Durán explains that his image representing this feast shows

> [A] hand holding a cornstalk in the water . . . [while] another hand held a small pot, which meant that the people could eat without fear of that food of beans and corn. There was to be no hunger, since the year was proceeding in a satisfactory way. It also meant that there was a general permission to eat corn and beans in the same plate as one dish. This is considered costly, and not all can afford it (fig. 4.19).[100]

In light of Ehecatl-Quetzalcoatl's association with maize pollination—a process that, quite literally, fed the Nahua—it is not surprising that he would be tied to notions of sustenance, plenty, and riches. For example, in Book 3 of the *Florentine Codex*, abundance and variety in agricultural production are both attributed to Quetzalcoatl, who is described as being "very rich" and as providing all that was necessary to eat and drink:

> This Quetzalcoatl they considered as a god. . . . he was prayed to in olden times there at Tula. . . . And the Tolteca, his vassals, were highly skilled. . . . Indeed these [crafts] started, indeed these proceeded from Quetzalcoatl—all the craft work, the learning. . . . It is said that the gourds were exceedingly huge; some were quite round. And the ears of maize were each indeed like hand grinding stones, very long. They could only be embraced in one's arms. And the palm-tree-like amaranth plants: they could climb them . . . And also the varicolored cotton grew: chili-red, yellow, pink, brown, green, blue, verdigris color, dark brown, ripening brown, dark blue, fine yellow, coyote-colored cotton, this. All of these came forth exactly so; they did not dye them. . . . And these Tolteca were very

> rich; they were wealthy. Never were they poor. They lacked nothing in their homes. Never was there famine.[101]

Throughout the eighteen-page section spanning pages 29 through 46, Quetzalcoatl is linked to wind, plants, and flying. On page 29, a blooming plant with anthropomorphic features emerges from his beak (fig. 4.20). On page 30, four Ehecatl-Quetzalcoatl figures appear in the center of the page while four others fly off to the next page. Further alluding to wind, the figures in the center of page 30 are depicted within a large red circle with an outer fringe of the *quetzalli*, which in the *Codex Borgia* represent the feathers that adorn Quetzalcoatl's headdress (fig. 4.21). Outside the circle, and completely surrounding its circumference, are the twenty day signs of the Mesoamerican calendar in sequential order, beginning in the lower right with Cipactli (Crocodile) and following a counterclockwise direction to end with Xochitl (Flower). In each of the four corners of the page stands a male figure with Tlaloc-like dentition and claws (instead of hands and feet) with which he holds a white pouch and a bone awl used to point to the day sign immediately in front of him.[102] Each of the male figures bears on his back a plant. Boone speculates that these plants are "a (probable) copal, maguey, ceiba (*pochote*), and a calabash tree."[103] Therefore, the two pages opening the section invoke wind, plants, and the calendar.

Quetzalcoatl personified as wind and appearing amid plants connotes the process of pollination and seed dispersal. The *Primeros Memoriales*, folio 282v, states that Quetzalcoatl was the wind and depicts him wearing the avian buccal mask and holding a digging stick alluding to plant cultivation (fig. 4.22, right).[104] Quetzalcoatl appears amid tiny black dots that I argue likely represent wind dispersing pollen. The *Codex Telleriano-Remensis*, folio 43r, which discusses historic events about the Mexica conquering Tototepec, features a maize plant surrounded by the same tiny dots as surround Ehecatl in the *Primeros Memoriales* (fig. 4.22, left). The plant includes a tassel, two cobs, and a pot on its leaves, and the gloss alludes to birds:

"The ancient ones say that at that time there were so many birds flying from east to west that they obscured the sun."[105] The allusion to birds flying, the pot symbolizing food (as reported by Durán), and the image of the plant with cobs connotes pollination. That the plant is depicted with cobs with silks and a tassel that appears to sway in the wind further supports my interpretation.

Seler first noted that in extant Late Postclassic Maya manuscripts, birds are depicted with "a small circle surrounded by dots on the side of the bill about in the middle," which he explains indicate a hummingbird.[106] For example, pages 34 and 57 of the *Codex Madrid* and page 6 of the *Codex Dresden* show hummingbirds with these dots around their respective beaks (fig. 4.23). Moreover, the one on Madrid 57 is pollinating a flower. A Maya vase with polychrome painting, dating from the Classic period (ca. 250–1000 CE) features a hummingbird with these dots around its beak, indicating that by the Late Postclassic period this was a standard artistic convention (fig. 4.24). Karl Taube points out that the bird in this vase also has "serpent wings," and suspects that "the serpent wing is a phonetic device providing a reading for 'sky.'"[107] Taube adds: "It is well known that the words for 'sky' and 'serpent' are generally homophonous in Mayan languages, and there are frequent substitutions between their respective signs in Classic Maya hieroglyphic texts."[108]

Ehecatl-Quetzalcoatl's associations with plant reproduction can be seen vividly on *Codex Borgia* 36–38. The substance on page 29 reappears in the center of page 36 in the shape of a ball that produces another plethora of Ehecatl-Quetzalcoatl figures and small birds (fig. 4.25). Maize and maguey emerge from the beaks of two of the Ehecatl-Quetzalcoatls (fig. 4.26). The maguey was an important plant for which the Nahua found many important uses, including the making of a fermented drink, *octli* (also known as *pulque*).[109] Like maize, maguey features prominently in stories relating the origin of plants. For example, in the *Historia de los mexicanos por sus*

pinturas, the gods wish to produce something to make humans joyous and desirous of dancing and venerating the gods. The story relates that upon hearing this, Ehecatl thinks of a virgin named Mayahuel, and goes out to tell her: "I have come to take you to the world." To this she immediately agrees, and thus they both descend, with Ehecatl carrying her on his back. As soon as they arrive on earth they become a double-branched tree."[110] After their branches fall, "Ehecatl . . . gathers the virgin's bones, which he buries and from them emerges a tree called *metl* [maguey]"[111]

On pages 36 through 38 wind—personified as Ehecatl-Quetzalcoatl—is a serpent represented as a path transporting symbols alluding to pollination and sustenance, including flowers, birds, butterflies, vessels, and Quetzalcoatl figures (see fig. 4.25).[112] The "path" begins its trajectory around the perimeter in a counterclockwise direction on page 36, traveling through the left margin on page 37, and ending on page 38, where from its beak emerges an additional Quetzalcoatl figure. A fragment of an Aztec sculpture features a serpent whose body carries maize cobs, which are carved with their husks and silks (fig. 4.27). This sculpture was excavated in Mexico City near the site of the so-called Templo Mayor, the most important public precinct of the Aztec nation. It is not possible to determine whether the sculpture represents Ehecatl-Quetzalcoatl, or any other elements its body may have transported because only the tail remains. Nevertheless, the sculpture indicates that the Nahua conceptualized serpents as mediums that transported maize and plant elements like the serpent featured on pages 36 through 38 of the *Codex Borgia*.

On page 36 of the *Codex Borgia*, a bundle sits wrapped in white cloth with black diagonal lines forming a crisscross pattern (fig. 4.28). Tonacatecuhtli's vessel is superimposed on the bundle. Fire curls, white paper banners, and fifteen feather balls adorn its surface. In

Nahuatl, the concept of burning was linked to notions of flowers blooming. Book 11 of the *Florentine Codex* describes blooming as follows: "nima chipini, niman totomolivi, niman cueponi, tlatzini; nima xotla" (first they drip, then they burst, then they hatch, then they burn), and this process allows them to "open" and "produce a pleasing odor, a fragrance, an aroma," at which time "they are required, desired."[113] Molina indicates that "*xotla*" refers to the earth or charcoals burning, but also to flowers blooming.[114] When ignited, fire emits a plume of smoke rising into the air. I think, therefore, that likening smoke to blooming further connotes the dispersal of pollen through the air. The plumes of smoke around the bundle on page 36 of the *Codex Borgia* probably refers to pollination, all the more so because the bundle appears amid flowers, birds, wind, and other items associated with plants and sustenance.

According to the *Annals of Cuauhtitlan*, when Quetzalcoatl died, his body was cremated at Tlatlayan "the Land of Burning," and he consequently turned into all the birds and "entered the sky." The text states this as follows:

> As he burned, his ashes arose. And what appeared and what they saw were all the precious birds, rising into the sky. They saw roseate spoonbills, cotingas, trogons, herons, green parrots, scarlet macaws, white-fronted parrots, and all the other precious birds . . . And so they knew he had gone to the sky, had entered the sky. The old people said he was changed into the star that appears at dawn. Therefore they say it came forth when Quetzalcoatl died, and they called him [Tlahuizcalpantecuhtli] Lord of the Dawn.[115]

As discussed in Chapter 3, the Nahua associated Tlahuizcalpantecuhtli with planting and sowing. The *Annals of Cuauhtitlan* also says that as Tlahuizcalpantecuhtli, Quetzalcoatl appears at dawn and "shoots" at various people during certain day signs. This "shooting" has generally been interpreted as malevolent and Quetzalcoatl as Venus inflicting harm on people. However, the text in the *Annals of Cuauhtitlan* specifies that: "each of these [day signs] was venerated by the old men and the old women of former times."[116]

In sum, the eighteen-page section of the *Codex Borgia* supports my thesis that the Nahua associated Quetzalcoatl's power over wind with pollination. In this section, Quetzalcoatl as wind personified flies from page to page among plants and other symbols of agriculture and plant reproduction. His path through these pages mimics the journey of pollen as the mechanism of reproduction in plants.

Bones in Quetzalcoatl's Headdress Representing Prior Generations

In the *Codex Borgia*, pages 19, 23, and 62 feature Ehecatl-Quetzalcoatl's headdress with a bone tipped by a yellow bloom. On page 23, for example, his headdress includes a bone tipped by a flower from which emerges a "plume" alluding to either pollen dispersal or new growth (fig. 4.29). What does the bone represent?[117] In this section I argue that Quetzalcoatl's headdress includes bones because these represented for the Nahuas the genetic material from prior generations out of which Quetzalcoatl created new ones. Bones evoked rebirth or regeneration.

Pages 56 and 73 of the *Codex Borgia* feature Ehecatl-Quetzalcoatl and the death god Mictlantecuhtli sitting back-to-back and surrounded by the twenty day signs. Scholars usually see these two pages as representing life (Quetzalcoatl) and death (Mictlantecuhtli), and interpret the relationship as conveying "the duality of existence, the joining of opposites and the inevitable relationship of life and death."[118] But if bones represent not death but a material necessary for the creation of life, as they do in the *Leyenda de los Soles*, these two figures are not "opposites" but complements. On page 73 they connote the continuation of life because in Nahua thought bones and wind are creative (fig. 4.30). Supporting this idea is Ehecatl-Quetzalcoatl's wind-shell pectoral, which as we have seen, the Nahua likened to a womb giving birth (discussed above). On page 56 of the *Codex Borgia*, Mictlantecutli holds a staff painted with the white with red dots

motif also featured in depictions of conch shells, and Ehecatl-Quetzalcoatl holds the digging stick symbolic of planting (fig. 4.31). As Richard Haly has pointed out, following Jill Furst, in Nahua philosophy skeletal figures did not represent the "Grim Reaper," but connoted creation and regeneration.[119] Consequently, the association of Quetzalcoatl with bones—whether paired with the Lord of the Land of the Dead or located in Ehecatl-Quetzalcoatl's headdress—further alludes to procreation (whether of plants, animals, or humans).

Scholars including Louise Burkhart, Jill Furst, Richard Haley, Cecelia Klein, Alfredo López Austin, Leonardo López Luján, and Debbie Nagao have convincingly argued that the Nahua regarded bones as the material that generates life.[120] Haly, for example, calls attention to the Nahuatl word for marrow *omiceyotl*, arguing that it derives from the word for semen *omicetl*.[121] Klein notes that both *omiceyotl* (marrow) and *omicetl* (semen) relate to *omitl* (bone) and *omio* (skeleton).[122] Numerous ethnohistoric sources, among them the *Leyenda de los Soles*, the *Florentine Codex*, and the *Codex Magliabechiano*, mention the creative power that bones had when combined with Ehecatl-Quetzalcoatl's semen or blood from his penis. López Austin adds that the Nahua "believed that vital force resided in the bones. Not only that, they thought that part of the supernatural force of human-gods remained in their bones after death."[123] Klein points out that the *Historia de los mexicanos por sus pinturas* explains that Huitzilopochtli "nació sin carne, sino con los huesos" (was born without flesh, but with the bones).[124] This is significant. That Huitzilopochtli is born "with the bones" further indicates that bones hold the material that makes life possible.

The Maya in the Postclassic period had similar conceptions regarding the nature of bones and their life-giving properties. In the *Popol Vuh*, the K'iché-Maya sacred book of creation compiled in alphabetic text in the mid sixteenth century, Hun Hunahpu is sacrificed and his head

placed on a tree, which as a consequence begins to bear fruit for the first time.[125] The story relates that the maiden Xquic, "Maiden Lady Blood," approached the tree and had the following interaction with Hun Hunahpu's skull:

> Ah! What is the fruit of this tree? Is not the fruit borne by this tree delicious? . . . Then spoke the skull there in the midst of the tree: 'What is it that you desire of this? It is merely a skull, a round thing placed in the branches of trees' . . . 'You do not desire it' . . . 'But I do desire it,' said the maiden.

After their physical interaction, which consisted of the maiden receiving saliva from Hun Hunahpu, the skull impregnates the maiden, and she carries twins.[126]

The *Codex Magliabechiano*, folio 61v, and its later cognate, the *Codex Ixtlilxochitl*, folio 103v, associate *mictlan*, the Nahua land of the dead—the place containing ancestral bones—with the reproduction of flowers. A story in these manuscripts relates how Quetzalcoatl "while washing [and] touching with his hands his virile member made semen within, and he let it [the semen] drop on top of a rock."[127] A bat is born at that spot. The gods send the bat to take from Xochiquetzal, a goddess of flowers, "in one bite what she has inside her feminine member."[128] This "feminine part" evidently refers to her womb, and therefore, what the bat takes is her offspring, which the gods wash, and thus emerge malodorous flowers. But then the bat delivers one of Xochiquetzal's flowers (the text indicates "a rose"), to *mictlan*, where Mictlantecutli, Lord of the Dead washes it, and the water produces fragrant flowers.[129] Consequently, the text concludes, "they [the Nahua] believe that the fragrant flowers came from the other world, from the house of this idol whom they call Mictlantecutli."[130]

This account presents a number of significant details about Nahua thought concerning how Quetzalcoatl (wind), flowers, bats, washing, and bones interrelate. First, from the god of wind's semen comes a bat, which is a pollinator. Second, the gods ordain that the bat should interact with Xochiquetzal's womb, thereby acting out the process of pollination. Third, washing,

or the water falling from the washing, creates more flowers.[131] In nature, flowers symbolize the coming of fruits and seeds, and so here it is the combination of pollination and washing that creates more offspring. And fourth, it is the gods of bones, those at *mictlan*—specifically those gods—whose washing creates fragrant flowers. Thus, through the combined efforts of the god of wind, pollinators, gods, and bones, life continues with the creation of new and fragrant flowers.

That bones could have life-giving qualities confounded the friars in the early colonial period. Consider Diego Durán's report about two Nahua feasts celebrated in April. Durán explains that Tozoztontli (roughly translated as piercing) was celebrated first, followed by Huey Tozoztli (translated as *la gran punzada*, the great piercing).[132] The first feast was "small" and the second "great" because the waters, or rains, generally began with Tozoztontli at the start of April and increased through Huey Tozoztontli in late April. Durán reports that during these feasts the Nahua expressed "reverence" for a bird, "since they paint in the sky a bird with a bone transversing its middle" to symbolize these feasts (fig. 4.32).[133] Durán admits not being able to explain the "barbarity" of depicting these feasts in such manner, imagining that "the sign of Taurus" is what the Nahua intended to evoke:

> I confess that I cannot find words to be able to explain it in Spanish, to be sure—although confusedly—I understood it being some stars that in the sky appeared as a bird transversed with a bone. This conception recalls that of poets or astrologers who imagined the Taurus sign composed of so many stars, thus these [Indians] imagine this sign in the sky and they call it by its diminutive and small piercing.[134]

But Durán's ensuing explanation for why the Nahua represented these two feasts with bones and birds floating in the sky has nothing to do with stars or constellations. Durán reports that during Tozoztontli the Indians offered the gods the first flowers, and adds "you will see in the image an Indian sitting making flowers, in their manner."[135] He continues: "there were and are now great masters" accomplished in this craft.[136] In Durán's chronicle, the image for

Tozoztontli features a bird pierced by a bone in the sky and a man sitting below in an empty field holding a blooming branch (fig. 4.32, left). During Huey Tozoztontli the man holds a maize plant with a tassel, whose cobs have not yet emerged (fig. 4.32, right). Therefore, the two feasts celebrated the reproduction of plants in connection with the beginning of the rainy season in April, according to Durán's report. This would explain why during Tozoztontli a man holds flowers, whereas during Huey Tozoztli, a man holds a full-grown maize plant.

Quetzalcoatl as Heresy: Nature and the Elements Versus God as Source of Life and Sustenance

Nahua beliefs about creation stood in stark contrast to those of Europeans. For the Nahua, the continuation of the world could only be guaranteed through reciprocity and bargaining with nature and the elements. Indeed, this conviction represented one of the most formidable blocks to Catholic officials' proselytizing efforts. Sahagún lamented that the Nahua who refused conversion did not recognize the direct influence that God exerted in the functioning of the world, but instead credited nature, the elements, and *diablos* ("devils") with such control:

> Vain are all men in whom is not found God's science; and that the good things that are seen, they could not know that which is, nor in considering the oeuvre, recognized who was the architect. Instead, they had for governing gods of the universe, either fire, or spirit, or stormy wind, or the movement of stars, or excessive water, or the sun and the moon. . . . Unhappy are they, and in dead things is their hope, who call gods the works of men's hands, gold and silver, the artistic inventions, the likeness of animals, or stone (engravings or monuments) that are the work of ancient hands.[137]

In the early colonial period, Catholic friars considered ancient Nahua writings and teachings to be the root of idolatry. The Nahua of Tenochtitlan, Tlaxcala, and Cholula, and even the Tarascans are reprimanded as follows in the *Florentine Codex*: "Very great was the darkness and the confusion, the unbelief, the idolatry in which your fathers, your grandfathers left you, as is evident in your ancient picture writings."[138] Again and again in the *Florentine Codex* and

elsewhere, Catholic officials condemned the Nahua for not regarding a single God as sole creator and overseer of the world, and for thinking of the elements and of humans as co-creators and administrators of an ongoing, continuous process. Sahagún laments: "Because they esteemed and know creatures they should have known that He existeth, that He is the Creator, the Creator of man—God, Who is not seen . . . Only they were in confusion as to God's creatures; they worshipped as gods the fire, the water, the wind, the sun, the moon, the stars."[139]

In the *Florentine Codex*, the Nahua are mocked for professing that the rain gods "make trees, grasses, and indeed all our sustenance sprout, bloom, grow . . . thus were the ancients greatly in confusion and greatly they offended God."[140] The Catholics tried to remedy this "confusion" that the rain causes plants to spout and provides humans with sustenance by invoking Leviticus 26, which says: "Our Lord God speaketh; he saith, 'I shall give you rain, each year, in its good time (if you will live by My commandments, if you do nothing idolatrous). And at My word the earth will sprout, will bear fruit.' . . . Your forefathers knew nothing."[141]

Sahagún tried to clarify for the Nahua that Quetzalcoatl was a mere mortal whose deeds were deified: "The ancients worshipped Quetzalcoatl, who was ruler at Tula. And you named him Topiltzin. He was a common man; he was mortal. . . . He is no god. . . . What he did which was like miracles we know he did only through the command of the devil."[142] And he reasoned that Cihuacoatl, "a devil in the guise of a woman" whose countenance "terrified," gave humans "poverty, misery, the digging stick, the tump-line, weeping."[143] The digging stick refers to agriculture, and the tump-line or *macapalli* to the "looped cord," useful in carrying things, but metaphorically alluding to blood ties and genealogy (see Chapter 5).[144]

The differences between the friars and the Nahua with regard to the digging stick—the implement of agricultural work—are stark. In the Judeo Christian creation story in the first three

chapters of Genesis, humans are placed in a "Garden of Eden," where God provides all that is necessary, including plants, and the first human couple need not work; only after they are forced out of paradise, caused by their sin, are they punished with hard work. In contrast, in the Nahua tradition hard work is regarded as the blessing that allows humans to attain riches, which are associated with Quetzalcoatl and wind. The *Florentine Codex* reports that the Nahua associated Quetzalcoatl with wealth: "it is now said of him who quickly gains goods that he is a son of Quetzalcoatl, that he is Quetzalcoatl's son."[145] In Book 6 of the *Florentine Codex*, grooms are warned against laziness and admonished to be like the wind: "be very diligent, and light, do not be lazy, you must be as light as the wind."[146] The *Historia de los mexicanos por sus pinturas* says that Oxomoco and Cipactonal, the human couple, were instructed to till the land and told that "they would engender the *macehuales* [plebeians, or common people],[147] and not to be indolent, but to always work."[148] Because the digging stick gave the Nahua agriculture, maize, and lineage, it was embraced as a boon, not a curse.

Diego Durán echoes the same sentiments as Sahagún does in regard to Nahua attitudes towards creation. According to Durán, in dealing with the elements, the Europeans turned to God. They "fight the ravages of frost, drought, excessive rainfall, or other catastrophes, trusting only in God. They place all their hope in Him," Durán observes, whereas "these Indians awaited a specific date to the exact day and moment, and all at once, first in the mountains and then in valleys to plant, they give the impression that they did it for idolatry and superstition, and for lack of respect, since in all things they formed some sort of superstition, witchcraft and idolatry."[149] Durán criticizes this Nahua penchant for venerating the elements. Regarding their respect for the water goddess, he remarks: "The reverence that these Indians had for this element was such that it was strange; and they were persuaded and taught by their priests to realize how

much they owed water, as we realize how much we owe our Lord God, for having us made, and to Jesus Christ, his only Son who redeemed us with his precious blood."[150] Inherent in European monotheism is a strong belief in God's power over nature, but in Nahua thought, the elements were to be studied through observation and appeased through a combination of knowledge and ritual. The Nahua philosophy of creation was therefore anchored in practical observations of nature, forming the basis for their religious beliefs. Nahua philosophy embraced the thought that humans and all things in it lived in symbiosis.

The Europeans, furthermore, believed that all creation was going to end apocalyptically with Armageddon, or judgment day, upon the second coming of Jesus Christ, but the Nahua thought of creation as ongoing. The *Annals of Cuauhtitlan*, originally written in Nahuatl, includes a passage that reads: "Auh yn yuh conitotihui yn huehuetque ypan in yn mochihuaz tlalloliniz mayanaloz ynic tipolihuizque," which has traditionally been translated as "And from what the old people say, there will be earthquakes in its time [the fifth sun, or current creation], and famine, and because of this we will be destroyed."[151] This translation, however, reflects a European bias and tells us more about the Catholic belief system than the Nahuas'. For instance, the word *mochihuaz*, which means to do or to make something, to plant, to prepare, or to engender another, seems to have been simply left out of the Spanish and English translations.[152] When this word is incorporated, the original text in Nahuatl conveys a different message that is less apocalyptic and has more to do with the actions of humans and their care for agricultural endeavors. This explains their emphasis on the maize plant. I therefore propose a new translation:

> And thus the ancients say that if we do not work (create, engender, or plant) in the future, there will be a change on earth and there will be famine and we shall all be destroyed or die.

This coincides more closely with the central concerns of Nahua: agricultural endeavors, the wellbeing of the maize plant, and the role of sustenance in continuing the cycle of life through reproduction. The Nahua concept of creation involves a type of "destruction" that is more like fundamental transformation or evolution, not necessarily an apocalyptic ending. As explained in Chapter 2, maize is completely dependent on humans for reproduction. Without human work (horticulture and agriculture), maize would quite literally cease to exist, and that in and of itself would cause a cataclysmic change in the Nahua world—namely famine. Based on the Nahua view of creation as an evolutionary process (see Chapter 5), however, a new type of plant would have to be created to feed humans and thus usher in a new sun.

The friars were therefore correct in perceiving a deep division between their religion and that of the Nahua. Catholic officials viewed creation as a single event, and nature, sustenance, and all good as the product of God's work. The Nahua in contrast, viewed creation as a continuous process with sustenance the result of the combined efforts of natural forces (personified as Quetzalcoatl and other gods) and human effort.

Conclusion

Ehecatl-Quetzalcoatl, the god of wind, controls the life-giving process of pollination, through which plants reproduce sexually, create new life, and provide food for humans. Through his role as wind god, Quetzalcoatl is associated with creation, agriculture, fertility, sustenance, wealth, creative endeavors, and many other related themes. Ehecatl-Quetzalcoatl imagery captures more than mere myth and legend; it encodes botanical concepts pertaining to pollination and, consequently to the biology of the maize plant.

For decades, scholars have debated the historicity of Quetzalcoatl—whether he was a man, a god, or both—and his role in the creation of cities and rulership. I have not set out to answer those questions, but I have argued that the historicity debate is missing an equally important, and related question. Do images of Quetzalcoatl capture real, historic, scientific events regarding the development of agriculture, including the domestication of maize in Central Mexico by the Nahuas' ancestors? The answer, I contend, is unequivocally yes.

In sum, the imagery of Quetzalcoatl in the *Codex Borgia* and other manuscripts establishes a close association with birds, feathers, wind, pollination, and reproduction as well as themes of creation, sustenance, and plenty. The unifying principle for these apparently disparate themes is the role that Ehecatl-Quetzalcoatl, as the personification of wind, plays in the pollination of maize and plants in general. Pollination is the means by which plants reproduce and food is created, explaining the broad range of Quetzalcoatl's associations.

Endnotes:

[1] "Quetzalli.pluma rica, larga y verde," and "Coatl.culebra, mellizo, o lombriz de estomago." Alonso de Molina, *Vocabulario de la lengua mexicana* (Leipzig, Germany: B. G. Teubner, 1880), fols. 89r and 23r. A quetzal is a bird. The *Oxford English Dictionary* defines quetzal as "Any of several Central and South American trogons of the genus *Pharomachrus*, the males of which are noted for their iridescent green plumage with red or yellow underparts; *esp.* (more fully **resplendent quetzal**) *P. mocinno* of Central America, the male of which has extremely long tail coverts, and which was venerated by the Aztecs." See www.oed.com/view/Entry/156380?redirectedFrom=quetzal#eid, accessed April 21, 2014.

[2] "Eecatl.viento, o ayre." Alonso de Molina, *Vocabulario de la lengua mexicana*, fol. 28r.

[3] Bernardino de Sahagún, *Florentine Codex: The General History of the Things of New Spain*, trans. and ed. Charles E. Dibble and Arthur J. O. Anderson, 12 books in 13 vols., (Santa Fe: School of American Research and the University of Utah, 1953–82), bk. 7, ch. 4, 14.

[4] As Scott O'Mack notes, "concise and unequivocal descriptions of individual deities is nonexistent," but he points out nevertheless that, "the method of deity comparison, accepting that the very unit of analysis is ambiguous, remains a fundamental approach in the study of Aztec religion." Scott O'Mack, "Yacateuctli and Ehecatl-Quetzalcoatl: Earth-Divers in Aztec Central Mexico," *Ethnohistory*, 38, no. 1 (Winter 1991): 1–2.

[5] "Este Quetzalcoatl, aunque fue hombre, teníanle por dios." Bernardino de Sahagún, *Códice Florentino: El Gobierno de la República edita en facsimil el manuscrito 218–20 de la Colección Palatina de la Biblioteca Medicea Laurenziana Códice Florentino para mayor conocimiento de la historia del pueblo de México*, 3 vols. (Florence: Giunti Barbéra and the Archivo General de la Nación, 1979), bk. 1, ch. 5, fol. 2r.

[6] Toribio de Benavente Motolinía, *Motolinía's History of the Indians of New Spain*, ed. and trans. Francis Borgia Steck (Washington, DC: Academy of American Franciscan History, 1951), 137–38.

[7] Diego Durán, *Book of the Gods and Rites and the Ancient Calendar*, ed. and trans. Fernando Horcasitas and Doris Heyden (Norman, OK: University of Oklahoma Press, 1971), 437.

[8] Henry B. Nicholson, *Topiltzin Quetzalcoatl: The Once and Future Lord of the Toltecs* (Boulder: University Press of Colorado, 2001), 291.

[9] Nicholson, *Topiltzin Quetzalcoatl: The Once and Future Lord of the Toltecs* 5. In 1978 Nicholson wrote an article that discusses the material on Ehecatl-Quetzalcoatl in the Mixtec manuscripts, which he says that he did not discuss previously because it was Alfonso Caso's research area. See Henry B. Nicholson, "The Deity 9 Wind 'Ehecatl-Quetzalcoatl' in the Mixteca Pictorials," *Journal of Latin American Lore* 4, no. 1 (1978): 61–92.

[10] Nicholson, *Topiltzin Quetzalcoatl: The Once and Future Lord of the Toltecs*, 289.

[11] Ibid., 291.

[12] Henry Nicholson, "The Iconography of the Feather Serpent in Late Postclassic Central Mexico," in *Mesoamerica's Classic Heritage: From Teotihuacan to the Aztecs*, ed. David Carrasco, Lindsay Jones, and Scott Sessions (Boulder: University of Colorado Press, 2000), 145.

[13] Ibid., 148.

[14] Susan Gillespie, *The Aztec Kings: The Construction of Rulership in Mexica History* (Tucson: University of Arizona Press, 1989), 143. More recently, Gillespie continues to hold her position that the Toltec "story" in the scholarship is "a modern construction." She clarifies that the accusations that her arguments call for "the documentary material [to] be dismissed as irrelevant" is, as she states it: "a position I strongly oppose." Rather, Gillespie calls for a more rigorous analysis of ethnohistoric sources in relation to the available archaeology. Susan Gillespie, "Toltecs, Tula, and Chichén Itzá: The Development of an Archaeological Myth," in *Twin Tollans: Chichén Itzá, Tula, and the Epiclassic to Early Postclassic Mesoamerican World*, ed. Jeff Karl Kowalski and Cynthia Kristan-Graham (Washington, DC: Dumbarton Oaks Research Library, 2007), 84–127.

[15] Ibid., 185–201.

[16] Michel Graulich, *Quetzalcóatl y el espejismo de Tollan* (Anvers, Belgium: Instituut voor Amerikanistiek, 1988b), 44–9.

[17] David Carrasco, *Quetzalcoatl and the Irony of Empire: Myths and Prophecies in the Aztec Tradition*, revised edition (Boulder: University Press of Colorado, 2000), 64.

[18] Ibid., 6.

[19] Ibid., 1.

[20] E.g., Carrasco, *Quetzalcoatl and the Irony of Empire*; Enrique Florescano, *Quetzalcóatl y los mitos fundadores de Mesoamérica* (Mexico City: Santillana Ediciones Generales, Taurus, 2012); Enrique Florescano, *El Mito de Quetzalcóatl* (Mexico City: Fondo de Cultura Económica, 1993); Enrique Florescano, "La Serpiente Emplumada, Tlaloc y Quetzalcoatl," *Cuadernos Americanos* 2 (1964): 121–66; Michel Graulich, "Quetzalcoatl-Ehecatl, The Bringer of Life," in *Ancient America: Contributions to New World Archaeology* ("Oxbow Monograph" 24), ed. N. Saunders (Oxford, England: Oxbow Books, 1992), 33–38; Graulich, *Quetzalcóatl y el espejismo de Tollan*; and Michel Graulich, "Montézuma et le souvenir de Tollan, ou la remémoration inevitable," in *La commemoration. Colloque du centenaire de la section des sciences religieuses de L'École Pratique des Hautes Études*, ed. P. Gignoux (Louvain, Belgium: Peeters, 1988a), 287–98; and Patrick Johansson K., "La mort de Quetzalcoatl: Un modèle exemplaire pour les obsèques des seigneurs mexicains," *Cahiers du monde hispanique et luso-brésilien (Caravelle)* 78 (2002): 5–36; Maarten Jansen, "La serpiente emplumada y el amanecer de la historia," in *Códices,*

Caciques y Comunidades, vol. 5, edited by Maarten Jansen and Luis Reyes García, 11–63 (Ridderkerk, the Netherlands: Asociación de Historiadores Latinoamericanistas Europeos (AHILA), 1997); and Maarten Jansen and Gabina Aurora Pérez-Jiménez, *Encounter with the Plumed Serpent: Drama and Power in the Heart of Mesoamerica* (Boulder: University Press of Colorado, 2007).

[21] Illustrating this point is the interpretation of myths involving birds, bees, and other pollinators that have been analyzed purely as mythological. Scholars have yet to analyze how these myths may reflect reflect real events in the life cycle of plants that have to do with plant reproduction or pollination. See, for example, the discussions that have taken place regarding "paradise lost" and the myths involving hummingbirds: Oswaldo Chinchilla Mazariegos, "Of Birds and Insects: The Hummingbird Myth in Ancient Mesoamerica," *Ancient Mesoamerica* 21 (2010): 45–61; and Michel Graulich and Doris Heyden, "Myths of Paradise Lost in Pre-Hispanic Central Mexico [and Comments and Reply]," *Current Anthropology* 24, no. 5 (1983): 575–88.

[22] Karl Taube, "The Breath of Life: The Symbolism of Wind in Mesoamerica and the American Southwest," in *The Road to Aztlan: Art From a Mythic Homeland*, ed. Virginia M. Fields and Victor Zamudio-Taylor (Los Angeles: Los Angeles County Museum of Art, 2001), 102.

[23] Ibid., 105.

[24] Ibid., 121.

[25] "Ehécatl, el dios del aire, a quien las cosmogonías antiguas le atribuyen la fundación del Quinto Sol, es una de la deidades mayores de los mexicas. Sin embargo, hasta ahora era un dios sin relieve en el panteón de ese pueblo. . . . Los poderes creativos de Ehécatl residen en su capacidad de mover los vientos por los distintos rumbos y niveles del cosmos. Es la fuerza que transporta el aire, el soplo que empuja las nubes y precipita la lluvia en la tierra." Florescano, *Quetzalcóatl y los mitos fundadores de Mesoamérica*, 237, see also 213–14.

[26] "Los cantos, mitos e imágenes que rememoran a Topiltzin Quetzalcóatl le confieren la condición de fundadore del reino de Tula. . . . Sus funciones y atributos están vinculados a Tollan, el primer reino náhuatl. . . . O sea que en el imaginario mexica, Ehécatl, el emblema de la Serpiente Emplumada, Ce Ácatl Topiltzin Quetzalcóatl y Tollan, son los mitos sustentadores de la legitimidad política." Ibid., 242.

[27] Sahagún, *Florentine Codex*, bk. 1, ch. 5, 9.

[28] Ibid., bk. 7, ch. 2, 4.

[29] Ibid., bk. 7, ch. 2, 8.

[30] Sahagún, *Códice Florentino*, bk. 7, ch. 5, fol. 21v.

[31] John Bierhorst, ed. and trans., *History and Mythology of the Aztecs: The Codex Chimalpopoca* (Tucson: University of Arizona Press, 1992a), 145.

[32] Ibid.

[33] Ibid.

[34] Cihuacoatl, roughly translated as Woman Snake, was one of the principal creator goddesses in Nahua religion. See Diego Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, ed. Angel María Garibay Kintana (Mexico City: Biblioteca Porrúa, 2006), 1:125–133; and Sahagún, *Florentine Codex*, bk. 1, ch. 6, 11.

[35] Eloise Quiñones Keber, *Codex Telleriano-Remensis: Ritual, Divination, and History in a Pictorial Aztec Manuscript* (Austin: University of Texas Press, 1995), 261.

[36] Eduard Seler, *Comentarios al Códice Borgia*, trans. Mariana Frenk, 2 vols. (Mexico City: Fondo de Cultura Económica, 1963), 2:45–47. The figure, however, is adorned with insignia of Quetzalcoatl (god of wind; e.g., the cross motif on headdress), Tlaloc (god of water; i.e., the thunder he holds), and Macuilxochitl (god of flowers, sex, and games; i.e., the mouth across his face). In addition, the very opening of the seashell on page 42 of the *Codex Borgia*, from where emerges the human figure, is lined with a band featuring the same color and design of lines and dots as the three ceramic vessels behind the goddesses on page 28 (i.e., behind the goddesses in the upper right, lower right, and central compartment).

[37] "cosa agujerada, o horadada, o virgen corrompida." Molina, *Vocabulario de la lengua méxicana*, fol. 145v.

[38] Selma E. Anderson, "The Discovery of Corn," *Estudios de cultura náhuatl* 2 (1960): 182.

[39] Ibid.

[40] Ibid.

[41] Bierhorst, ed. and trans., *History and Mythology of the Aztecs*, 146–7.

[42] For study of genus and species of Central Mexican waterfowl to evaluate the origin of Ehecatl-Quetzalcoatl's buccal mask, see O'Mack, "Yacateuctli and Ehecatl-Quetzalcoatl: Earth-Divers in Aztec Central Mexico," 13–20.

[43] Juan José Batalla Rosado, *El Libro Escrito Europeo del Códice Tudela o Códice del Museo de América* (Madrid, España: Itinerarios, 2009), 9:84.

[44] And the glosses describe him as: "esta figura es de un demonio llamado quetzalcouatl que quiere dezir culebra hecha de pluma este tenian los yndios por dios del ayre y pintanle los yndios la media cara de la nariz abaxo de palo como una tronpa por do soplava el ayre y ençima de la

cabeça le ponian una coroça como mitra de cuero de tigre y della salia por penacho un hueso del qual colgaba muncha pluma de patos de la tierra q(ue)llos llaman xumutl y en fin del esta atado un paxarico q(ue) se llama huitzitzitl." Batalla Rosado, *El Libro Escrito Europeo del Códice Tudela*, 9:101.

[45] Elizabeth Hill Boone, *The Codex Magliabechiano and the Lost Prototype of the Magliabechiano Group* (Berkeley: University of California Press, 1983), 205.

[46] José Tudela de la Orden, *El Códice Tudela* (Madrid: Ediciones Cultura Hispánica, 1980), fol. 42r. Molina defines uitzitzilin as "cierto paxarito" (a certain small bird). Molina, *Vocabulario de la lengua méxicana*, fol. 157v.

[47] See Batalla Rosado, "El Libro Escrito Europeo del Códice Tudela," 83–115; and Boone, *The Codex Magliabechiano and the Lost Prototype of the Magliabechiano Group*, 129–134.

[48] Ibid.

[49] I think that this person is neither male nor female, but of ambiguous gender. There are many examples of gender ambiguity in Nahua material culture as well discussions of men dressing in women's clothing (during certain official celebrations, e.g., Tititl) in the ethnohistoric record. I have been writing an article arguing that the morphology of the maize plant can help to elucidate various misunderstood aspects of gender ambiguity. Maize has separate male and female flowers (it is diclinous); however, the plant is also monoecious (bisexual). This has significant implications for how Central Mexicans conceptualized gender. I presented my idea on gender ambiguity to my adviser Cecelia F. Klein via email (February 10, 2013), and she agreed that this argument is viable, although she said "You cannot propose a new interpretation of the transvestism in Codex Borbonicus, for example, without discussing and refuting all previous interpretations of it." This is a vast topic that I cannot address in this dissertation; that is why I am dealing with it elsewhere.

[50] Pete Sigal, "Imagining Cihuacoatl: Masculine Rituals, Nahua Goddesses and the Texts of the Tlacuilos," *Gender and History* 22, no. 3 (November 2010), 554. See also Oswaldo Chinchilla Mazariegos, "Of Birds and Insects: The Hummingbird Myth in Ancient Mesoamerica," *Ancient Mesoamerica* 21 (2010): 53.

[51] Sahagún, *Florentine Codex*, bk. 6, ch. 25, 241.

[52] Ibid., 141.

[53] The full quote is: "aquí estáis, viejos y viejas, padres y madres, y parientes de estas piedras preciosas y de estas plumas ricas, que han nacido y tenido principio de vuestras personas" (and ye who are here, ye who are seated here, ye who are our progenitors, who are already the old mothers, the old fathers whom our lord hath set up as gods, who already have become Oxomoco, who already have become as Cipactonal). Sahagún, *Floretine Codex*, 153. See also Sahagún, *Códice Florentino*, bk. 6, ch. 27, fol. 130v.

[54] Ibid., bk. 6, ch. 24, fols.114r, 115v, and 122v.

[55] "Nuestro señor, el cual se llama Yaolli Ehécatl, quiere decir tiniebla y ayre," "quiere nuestro señor hacerla misericordia y poner dentro de ella una piedra preciosa y una pluma rica, porque ya está preñada la mozuela; y parece que nuestro señor ha puesto dentro de ella una criatura," and "havemos recibido de nuestor señor dios, un thesoro, y una riqueza . . . que es la criatura que está en el vientre de la moça." Ibid., bk. 6, ch. 24, fols.114r, 115v, and 122v.

[56] Ibid., bk. 3, ch. 1, 1–9.

[57] Ibid., bk. 3, ch. 1, 2.

[58] Ángel María Garibay Kintana, ed., *Teogonía e historia de los mexicanos: Tres opúsculos del siglo XVI*, 2nd edition (Mexico City: Editorial Porrúa, Colección "Sepan cuantos"), 43.

[59] Sahagún, *Florentine Codex*, bk. 3, ch. 3, 53. See also text and image in Sahagún, *Códice Florentino*, bk. 3, ch. 3, fols. 56v and 57r.

[60] Sahagún, *Florentine Codex*, bk. 10, ch. 29, 169.

[61] For primary sources with images and explanation of Tlazolteotl's iconography and associations see: Sahagún, *Florentine Codex*, bk. 1, ch. 12, 23–27; and Quiñones Keber, *Codex Telleriano-Remensis: Ritual, Divination, and History in a Pictorial Aztec Manuscript*, fol. 3r. For discussion and further bibliography see: Louise M. Burkhart, *The Slippery Earth: Nahua-Christian Moral Dialogue in Sixteenth-Century Mexico* (Tucson: University of Arizona Press, 1989); Cecelia F. Klein, "Teocuitlatl, 'Divine Excrement:' The Significance of 'Holy Shit,' in Ancient Mexico" *Art Journal* 52, no. 3 (1993): 20–27; and Thelma Sullivan, "Tlazolteotl-Ixcuina: The Great Spinner and Weaver," in *The Art and Iconography of Late Post-Classic Mexico*, ed. Elizabeth Hill Boone, 7–35 (Washington DC: Dumbarton Oaks, 1982).

[62] Sahagún, *Florentine Codex*, bk. 1, ch. 12, 23.

[63] Eduard Seler, "The Religious Songs of the Ancient Mexicans," in *Collected Works in Mesoamerican Linguistics and Archaeology*, edited by J. Eric Thompson and Francis B. Richardson (Culver City, CA: Labyrinthos, 1992b), 3:278. Here is the original Nahuatl:
Yecoc ye tonan yecoc, yeteutl tlaçolteutla
Oaya oovayaye.
Otlancatqui çenteutl tamiyoanichan . . .
Otlacatqui centeutl, atl, yayavicani
Tlaca pillachivaloya chalchimichva-
Can, yyao, yantala, yantanta
Ayyao, ayyave, tililiyao, ayyave
Oayyave.

[64] For discussion of the parturient position (also discussed in Chapter 3), see Cecelia F. Klein, *The Face of the Earth: Frontality in Two-dimensional Mesoamerican Art*. Outstanding Dissertations in the Fine Arts. New York: Garland Publishing (PhD diss., Columbia University, 1972), 6, 55–57; Susan Milbrath, "Birth Images in Mixteca-Puebla Art," in *The Role of Gender in Precolumbian Art and Architecture*, ed. Virginia E. Miller, 153–77 (Lanham, MD: University Press of America, 1988); and Eduard Seler, *Codex Vaticanus No. 3773 (Codex Vaticanus B)*, trans. Augustus Henry Keane (Edinburgh: T. and A. Constable, 1902), 23, 24, 265, 219.

[65] Water is a pollinator (see Chapter 2), and in Chapter 3, I explain how this process was represented on page 28 of the *Codex Borgia*.

[66] Sahagún, *Florentine Codex*, bk. 6, ch. 42, 239.

[67] The *Codex Laud* does not have glosses, but the spool of unspun cotton indicates her associaitions with Tlazolteotl, who is discussed later in Chapter 4 as well as in Chapter 5.

[68] Quiñones Keber, *Codex Telleriano-Remensis: Ritual, Divination, and History in a Pictorial Aztec Manuscript*, 258, fol. 8v.

[69] Sahagún, *Florentine Codex*, bk. 11, ch. 5, 77.

[70] "Eecayo. cosa ventosa o llena de ayre, oaguacero que viene con toruellino [*torbellino* is whirlwind] de viento." Molina, *Vocabulario de la lengua méxicana*, fols. 28r.

[71] Sahagún, *Florentine Codex*, bk. 11, ch. 5, 85.

[72] Ibid., bk. 11, ch. 13, 283. In the original Nahuatl, the text is: "in quil moxilotlapana [the cob hatches]: niman ie nenepilquiça, niman xiloti, cueponi [to hatch]."

[73] Molina, *Vocabulario de la lengua méxicana*, see fols. 26r and 131r.

[74] Boone, *The Codex Magliabechiano and the Lost Prototype of the Magliabechiano Group*, 200. The Spaniards brought chickens to America, but the pre-Columbian Nahua raised turkeys. Perhaps "chickens," refers to any fowl that the Nahua raised. The point is that the Nahua valued birds in general and associated them and their mode of reproduction with plants and humans.

[75] See Fray Bernardino de Sahagún, *Primeros Memoriales by Bernardino de Sahagún: Paleography of Nahuatl Texts and English Translations*, eds, Thelma D. Sullivan and Henry B. Nicholson (Norman, OK: University of Oklahoma Press, 1997), fols. 74r, 74v, 77v, and 78v.

[76] Sahagún, *Florentine Codex*, bk. 11, ch. 7, 218.

[77] Ibid., 202–203. In the facsimile of the *Florentine Codex*, the reference to bees is in the Spanish text. See Sahagún, *Códice Florentino*, bk. 11, fol. 24r.

[78] Sahagún, *Florentine Codex*, bk. 11, ch. 7, 202–203.

[79] Ibid., 213.

[80] For example, José Fábrega, Eduard Seler, Karl Anton Nowotny, Ferdinand Anders, Maarten Jansen, Luis Reyes García, Bruce Byland, John Pohl, William Ringle, Gordon Brotherston, Elizabeth Boone, Juan José Batalla Rosado, Susan Milbrath, and Samantha Gerritse.

[81] See Chapter 1.

[82] Karl Anton Nowotny coined the name "strip gods." Karl Anton Nowotny, *Tlacuilolli: Style and Contents of the Mexican Pictorial Manuscripts, with a Catalogue of the Borgia Group*, ed. and trans. George A. Everett Jr. and Edward B. Sisson (Norman: University of Oklahoma Press, 2005), 268.

[83] As Samantha Gerritse has remarked, "The narrative element, according to the scholars who interpret the sequence as a sort of narrative, seems to lie in the reoccurrence of characters and the movement through the strip goddess." Samantha Gerritse, "Narrative and Ritual in the Codex Borgia: A Structural Analysis of Pages 29 to 46 of This Postclassic Mexican Manuscript" (Master's thesis, Universiteit Leiden, 2013), 96.

[84] José Lino Fábrega, *Códice Borgiano. Interpretación del Códice, Anales del Museo Nacional*, 5 vols. (Mexico City: Museo Nacional, 1900 [ca. 1792–97]), 5:5.

[85] Eduard Seler, *Comentarios al Códice Borgia*, trans. Mariana Frenk, 2 vols. (Mexico City: Fondo de Cultura Económica, 1963), 2:9–61.

[86] Karl Anton Nowotny, *Codex Borgia (Cod. Borg. Messicano 1) Kommentar* (Graz: Akademische Druck- und Verlagsanstalt, 1976, 20).

[87] Ferdinand Anders, Maarten Jansen, Luis Reyes García, *Los templos del cielo y de la oscuridad, oráculos y liturgia: Libro explicativo del llamado Códice Borgia* (Graz, Austria: Akademische Druck- und Verlagsanstalt; Madrid: Sociedad Estatal Quinto Centenario; Mexico City: Fondo de Cultura Económica, 1993), 175. The dramatic shift in the section's orientation, the authors theorize, "parece indicar que salimos de la secuencia normal del discurso para entrar en un centro ceremonial donde los edificios y algunos elementos geográficos se ubican de acuerdo con su posición relativa en el espacio" (seems to indicate that we are outside the normal sequence of the discourse to enter a ceremonial center where the buildings and some geographic elements are located according to their relative position in [real] space).

[88] Bruce Byland and John M. D. Pohl, *In the Realm of 8 Deer: The Archaeology of the Mixtec Codices* (Norman: University of Oklahoma Press, 1994).

[89] William M. Ringle "On the Political Organization of Chichen Itza," *Ancient Mesoamerica*, 15, no. 2 (July 2004): 172.

[90] Elizabeth Hill Boone, *Cycles of Time and Meaning in the Mexican Books of Fate* (Austin: University of Texas Press, 2007), 171.

[91] Ibid., 178, and 173.

[92] Juan José Batalla Rosado, *El Códice Borgia: Una guía para un viaje alucinante por el inframundo* (Madrid, España: Biblioteca Apostólica Vaticana, Testimonio Compañía Editorial, 2008), 441.

[93] "Por ello, atendiendo a esta sección, hemos subtitulado nuestro estudio del *Códice Borgia* como *Una guía para un viaje alucinante por el inframundo*, pues suponemos que se trata de una plasmación pictórica de las alucinaciones que su/s autor/es tenían que alcanzar para ejercer su oficio sacerdotal. . . . Nuestra opinion casi es favorable a esta hipótesis, pues las páginas 29 a 47 del documento no solo son 'extrañas' por el cambio de dirección de expresión de la información, sino por su propio contenido." Batalla Rosado, *El Códice Borgia: Una guía para un viaje alucinante por el inframundo*, 412.

[94] Susan Milbrath, *Heaven and Earth in Ancient Mexico: Astronomy and Seasonal Cycles in the Codex Borgia* (Austin: University of Texas Press, 2013), 35.

[95] Ibid., 72–73.

[96] For the arguments that the eighteen-page section of the *Codex Borgia* reflects activities taking place under the influence of drugs, see: Anders et al., *Los templos del cielo y de la oscuridad, oráculos y liturgia*, 188, 196, 199; Batalla Rosado, *El Códice Borgia: Una guía para un viaje alucinante por el inframundo*, 412. Regarding investiture rituals, see Bruce Byland and John M. D. Pohl, *In the Realm of 8 Deer*, 158; and Ringle "On the Political Organization of Chichen Itza," 173. On Quetzalcoatl as Venus in the underworld, see Seler, *Comentarios al Códice Borgia* 2:9–61.

[97] Ringle "On the Political Organization of Chichen Itza," 173.

[98] As Boone has already explained, page 43 depicts the creation of maize. She bases her discussion on the *Leyenda de los Soles* account. Boone, *Cycles of Time and Meaning in the Mexican Books of Fate*, 183.

[99] "y el maíz, y todas las legumbres, iba crecido y empezaba echar su mazorca." Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 1:259.

[100] "Con una caña de maíz en la mano, denotando fertilidad, y metido en el agua . . . y en la otra mano, una olleta, que era decir que bien podían comer sin temor de aquella comida de frisol y maíz, que no había que tener hambre, pues el año iba bueno, y lo otro, que ya se daba licencia general de comer de aquel género de comida. . . . Y para que sepamos la causa, es de saber que

comer maíz y frisol todo junto hecho un manjar, para los indios es costoso, y no todos lo alcanzan para poderlo hacer, y más si tienen hambre." Ibid.

[101] "Y mas dizen, que era muy rico, y que tenja todo, quanto era menester, y necesario, de comer, y bever: y que el mahis era abundantissimo, y las calabaças muy gordas, de una braça en redondo: y las maçorcas de mahiz, eran tan largas que se lleuauan abraçadas: y las cañas de bledos, eran muy largos y gordos, y que subian por ellas, como por arboles. Y que sembrauan, y cogian algodón de todos colores: que son colorado y encarnado, y amarillo, y morado, blanquecino, y verde, y açul, y prieto, y pardo, y naranjado, y leonado: y estos colores de algodon, eran naturales, que asi se nacian." Sahagún, *Códice Florentino*, bk. 3, ch. 3, fol. 2r; Sahagún, *Florentine Codex*, bk. 3, ch. 3, 13–14.

[102] Boone, *Cycles of Time and Meaning in the Mexican Books of Fate*, 57; and Seler, *Comentarios al Códice Borgia*, 2:37.

[103] Boone, *Cycles of Time and Meaning in the Mexican Books of Fate*, 183.

[104] Sahagún, *Primeros Memoriales*, 156, and fol. 282v.

[105] Quiñones Keber, *Codex Telleriano-Remensis: Ritual, Divination, and History in a Pictorial Aztec Manuscript*, 275 and fol. 43r.

[106] Eduard Seler, "The Animal Pictures of the Mexican and Maya Manuscripts," in *Collected Works in Mesoamerican Linguistics and Archaeology*, ed. J. Eric Thompson and Francis B. Richardson (Culver City, CA: Labyrinthos, 1996a), 5:231–37. See also discussion by Oswaldo Chinchilla Mazariegos, who discusses the "hummingbird myth," and although he discusses the "representation of the mythical union of a woman with an insect," he does not tie this event to pollination. Chinchilla Mazariegos instead concludes with a more general idea: "The iterations of themes such as weaving magic, insects and poisonous creatures, the magical transformations of the suitor, and the in-laws' contempt toward him reinforce essential points of congruence that underline the nodal subject of the myth: the hierogamy that variously resulted in the birth of the sun, the moon, and human sustenance." Chinchilla Mazariegos, "Of Birds and Insects: The Hummingbird Myth in Ancient Mesoamerica," 46.

[107] Karl Taube, *A Representation of the Principal Bird Deity in the Paris Codex* (Washington, DC: Center for Maya Research, Dumbarton Oaks, 1987), 2–3.

[108] Taube, *A Representation of the Principal Bird Deity in the Paris Codex*, 2; and Stephen D. Houston, "An Example of Homophony in Maya Script," *American Antiquity* 49 (1984): 790–805.

[109] Molina, *Vocabulario de la lengua méxicana*, fols. 55v and 75v.

[110] "'Te vengo a buscar para llevarte al mundo.' En lo que ella convino en seguida, y así descendieron ambos llevándola él sobre sus espaldas. Y tan luego como llegaron a la tierra se

mudaron ambos en un árbol que tiene dos ramas . . . Ehecatl . . . reunió los huesos de la virgen, los enterró y de ahí salió un árbol que ellos llaman *metl*." Garibay Kintana, ed., *Teogonía e historia de los mexicanos: Tres opúsculos del siglo XVI*, 107.

[111] Ibid.

[112] To see how the Nahua depicted the butterfly motif, see Sahagún, *Primeros Memoriales by Bernardino de Sahagún*, fols. 72r, 74r, 74v, and 77v. Karl Taube has argued that the scene on the right side of page 38 of the *Codex Borgia* "is an explicit representation of the creation of man from maize and penitential blood." See: Karl Taube, "The Teotihuacan Cave of Origin: The Iconography and Architecture of Emergence Mythology in Mesoamerica and the American Southwest" *Res: Anthropology and Aesthetics* 12 (1986): 62.

[113] Sahagún, *Florentine Codex*, bk. 11, ch. 7, 214.

[114] "Xotla. abrasarse la tierra, o encenderse los carbones o brotar las flores. Pre. oxotlac." Molina, *Vocabulario de la lengua méxicana*, fol. 161r.

[115] Bierhorst, ed. and trans., *History and Mythology of the Aztecs: The Codex Chimalpopoca*, 36.

[116] Perhaps the reference to the "Lord of the Dawn" pertains to the well-known fact among scientists and maize farmers who genetically manipulate the plant and therefore closely observe pollination patterns that the optimal time for pollen dispersal (by the tassels) and reception (by the silks) is mornings.

[117] The bone in Ehecatl-Quetzalcoatl's headdress is most likely a femur, the thighbone. I will take up this issue in Chapter 5, where I discuss thighs and their symbolic relationship to grass and ancestry.

[118] Gisele Díaz and Alan Rodgers, *The Codex Borgia: A Full-Color Restoration of the Ancient Mexican Manuscript*, (New York: Dover Publications, 1993), xxviii. See also Seler, *Comentarios al Códice Borgia* 2:137–40. For discussion of the belief in the creative power of bones among the Mixtec and the Maya see: Jeffrey P. Blomster, "Bodies, Bones, and Burials: Corporeal Constructs and Enduring Relationships in Oaxaca, Mexico," in *Living With the Dead: Mortuary Ritual in Mesoamerica*, ed. James L. Fitzsimmons and Izumi Shimada (Tucson: University of Arizona Press, 2011), 102–61; James L. Fitzsimmons, "Perspectives on Death and Transformation in Ancient Maya Society: Human Remains as a Means to an End," in *Living With the Dead: Mortuary Ritual in Mesoamerica*, ed. James L. Fitzsimmons and Izumi Shimada (Tucson: University of Arizona Press, 2011), 53–77; and Stephen D. Houston, David Stuart, and Karl Taube, *The Memory of Bones: Body, Being, and Experience among the Classic Maya* (Austin: University of Texas Press, 2006).

[119] Richard Haly, "Bare Bones: Rethinking Mesoamerican Divinity," *History of Religions*, 31, no. 3 (February, 1992): 290.

[120] Louise Burkhart, "Flowery Heaven: The Aesthetic of Paradise in Nahuatl Devotional Literature," *RES: Anthropology and Aesthetics* 21 (1992): 89–109; Jill Leslie Furst, "Skeletonization in Mixtec Art: A Re-evaluation," in *The Art and Iconography of Late Post-Classic Central Mexico*, ed. Elizabeth Hill Boone (Washington, DC, Dumbarton Oaks, 1982a), 207–25; Haly, "Bare Bones: Rethinking Mesoamerican Divinity," 269–304; Cecelia F. Klein, "The Devil and the Skirt," *Ancient Mesoamerica*, 11, no. 1 (1972): 1–26; Leonardo López Luján, *The Offerings of the Templo Mayor of Tenochtitlan*, trans. Bernard R. Ortiz de Montellano and Thelma Ortiz de Montellano (New Mexico: University of New Mexico Press, 2005), 63–80, 131–226; and Debra Nagao, "Symbolism of the Two-Horned God in Offerings from the Templo Mayor," *RES: Anthropology and Aesthetics* 10 (1985): 5–27.

[121] Ibid., 289.

[122] Klein, "The Devil and the Skirt," 22.

[123] Alfredo López Austin, *Tamoanchan, Tlalocan Places of Mist*, trans. Bernard R. Ortiz de Montellano and Thelma Ortíz de Montellano (Niwot, CO: University Press of Colorado, 1997), 205–6. See also Alfredo López Austin, *Hombre-dios. Religión y política en el mundo náhuatl* (México DF: UNAM-IIH, 1973), 123–24.

[124] Klein, "The Devil and the Skirt," 22

[125] Allen Christenson, *Popol Vuh: The Sacred Book of the Maya* (Norman: University of Oklahoma Press, 2003), 126.

[126] Christenson, *Popol Vuh: The Sacred Book of the Maya*, 128–9.

[127] Boone, *The Codex Magliabechiano and the Lost Prototype of the Magliabechiano Group*, 206. Boone interprets the imagery on page 44 of the *Codex Borgia* as representing aspects of this myth. See Boone, *Cycles of Time and Meaning*, 204.

[128] "De vn bocado lo que tiene dentro del miembro femineo." Boone, *The Codex Magliabechiano and the Lost Prototype of the Magliabechiano Group*, 206.

[129] Ibid.

[130] "Y ansi tienen q las Rosas olorosas. vinieron del otro mundo. de casa deste ydolo. q ellos llaman mictlantecutli." Ibid.

[131] I am in the process of writing an article that further discusses this episode in the *Codex Magliabechiano*. The article discusses the parallels that the Aztecs seem to have perceived between washing plants and newborns, and also considers the implications of using water in funerary rituals.

[132] Durán translates *tozoztontli* as "cosilla pasada con alguna cosa de una parte a otra" (thing passed with something from one place to another, or traversing). Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 1:247.

[133] "Y la mesma figura lo demuestra, pues pintan en el cielo un pájaro con un hueso atravesado por medio." Ibid.

[134] "Para declaración de esta barbaridad, aunque confieso que yo no hallo vocablos para poderlo explicar en español, es de saber que, aunque confusamente, entendí ser unas estrellas que en el cielo se mostraban como pájaro atravesado con un hueso. A cuya imaginación acude la de los poetas y astrólogos que imaginaron el signo de Taurus, compuesto de tantas estrellas, así estos imaginaban en el cielo este signo y llámanle por nombre diminutivo y punzadura pequeñita." Ibid.

[135] Ibid., 248.

[136] Ibid.

[137] "Infelices autem sunt, et inter mortuos spes illorum est, qui appellauerunt deos opera manuum hominum, aurum et argentums, artis inventionem, et similitudines, animalium, aut lapidem inutilem opus manus antique" (my own translation). Sahagún, *Códice Florentino*, bk. 1, fol. 25v.

[138] Sahagún, *Florentine Codex*, bk. 1, Appendix, 55.

[139] Ibid., 56.

[140] Ibid., 68.

[141] Ibid., 68–9.

[142] Ibid., 69.

[143] Ibid.

[144] "*Macapalli*" pertains to blood ties, and is composed of the words "*meca*" from *mecatl* meaning cord or rope and *palli* meaning "black clay to dyed cloth," but the composed-word *macapalli* means "looped cord." Molina, *Vocabulario de la lengua méxicana*, fols. 55r and 79r. See also Chapter 5 for the associations the Nahua perceived between rope and descent.

[145] Sahagún, *Florentine Codex*, bk. 10, ch. 29, 170.

[146] "Se muy diligente, y muy ligero, no seas perezoso, as de ser como el ayre ligero." Sahagún, *Códice Florentino*, bk. 6, ch. 22, fol. 102v.

[147] "Macehualli.vasallo" (*macehualli*, subject). Molina, *Vocabulario de la lengua Mexicana*, 50v.

[148] "Que de ellos nacerían los macehuales [plebeians, or the common people], y que no holgasen, sino que siempre trabajasen." Garibay Kintana, ed., *Teogonía e historia de los mexicanos: Tres opúsculos del siglo XVI*, 25.

[149] "Estos indios al aguardar que aguardaban de tal y tal tiempo, sin faltarles día ni punto y, todos a una, primero en los montes, y después en los llanos para sembrar, dan a entender que lo hacían por idolatría y superstición, y por mal respecto, pues en todas las cosas formaron superstición, hechicería e idolatría." Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 1:227.

[150] "Fue tanto lo que los indios reverenciaron a este elemento que fue cosa extraña la reverencia que le tenían, porque, persuadidos y enseñados por los sacerdotes, para encarecerles lo mucho que al agua debían, como nosotros encarecemos lo mucho que debemos a nuestro Señor Dios, por habernos criado, y a Jesucristo su único Hijo que nos redimió con su preciosa sangre." Ibid., 1:171.

[151] Bierhorst, ed. and trans., *History and Mythology of the Aztecs: The Codex Chimalpopoca*, 26. For Nahuatl version, see: John Bierhorst, ed. and trans., *Codex Chimalpopoca. The Text in Nahuatl with a Glossary and Grammatical Notes* (Tucson: The University of Arizona Press, 1992b), 5.

[152] "Mochihuaz" is composed of "mo" (we) and "chihuaz" (to do, or to plant "hazer algo" or "engendrar a otro"). See also "Chiua.nite.engendrar a otro. Preterito. onitechiuh" ("Chiua.nite" to engender another; past "onitechiuh"). Molina, *Vocabulario de la lengua méxicana*, fol. 21v.

CHAPTER FIVE

GRASS AS THE PROGENITOR OF MAIZE IN THE CODEX BORGIA

The Nahua held a common grass in great esteem. In this chapter, I turn to two aspects of grass imagery in the *Codex Borgia* that have not yet been examined. First, the twelfth day sign in the Nahua calendar was a common grass. In the *Codex Borgia* and other pre-Columbian and early colonial Central Mexican manuscripts, it is represented as a plant (grass), jawbone (or skull), or a combination of the two. Many depictions of this day sign consist of grass growing out of a jawbone (fig. 5.1). Often, it appears simply as a jawbone with teeth (fig. 5.2). These forms of representing grass have puzzled generations of scholars. More than a century ago, Eduard Seler himself wondered about the glyph's peculiar iconography: "The day sign is designated by a gory jaw with a row of teeth. . . . How the gory jaw can be a representation for the word *malinalli* is hard to imagine."[1] Seler's question remains unanswered: what relationship did the Nahuas perceive between grass and jawbones?

Second, depictions of grass in the *Codex Borgia* are strikingly similar to those of the maize plant. For example, on page 20, grass and maize are rendered with the same botanical elements. Particularly salient is the rendition of the tassels, which are even painted with a similar palette, with the result that they appear virtually indistinguishable (fig. 5.3). This is also puzzling. In nature, the maize (*Zea mays* L.) plant does not look like grass. The maize plant consists of a single stalk with long, graceful leaves growing at regular intervals along the stalk, a single tassel, and one or two large cobs enclosed in soft, light-green husks (fig. 5.4). In contrast, the strain of grass that scientists have identified as maize's progenitor, teosinte (*Zea mays* ssp. *parviglumis*), endemic to Central Mexico, is an unkempt grass consisting of multiple branches

with slightly thinner and shorter leaves, each branch with its own tassel and numerous tiny cobs with seeds enclosed in a stony case (fig. 5.4). Why, then, in the *Codex Borgia* do the maize plant and *malinalli* grass look so similar?

I propose that both sets of questions can be answered by considering the scientific history of the maize plant. As explained in Chapter 2, over 8,000 years ago, the indigenous people of Central Mexico domesticated a wild grass and transformed it into modern maize. Grass is therefore the ancestor of maize. Also, as set forth in Chapter 4, the Nahua associated bones with the life-giving qualities of ancestors. That grass is the ancestor of maize explains both the association of grass with bones, and maize with grass. This chapter will show that these conclusions, although novel, find support in Nahua iconography, ritual, mythology, science, and the ethnohistoric record.

The Twelfth Day Sign of the Nahua Calendar and the Relationship Between Grass and Bones

In Central Mexican manuscripts the twelfth day sign is represented with plant and/or bone elements. Page 18 of the *Codex Borgia* depicts it as a plant with a root system and several tassels protruding from thick foliage (fig. 5.5). Similarly, in the *Florentine Codex* it appears simply as a short and leafy grass without tassels or roots (fig. 5.5). In Diego Durán's chronicle, the day sign is a short leafy plant with a number of tassels depicted as yellow blooms adorning the tips of each blade (fig. 5.5).

In contrast, as discussed above, some pre-Columbian manuscripts omit the grass aspects of the glyph altogether and depict it simply as a jawbone with teeth (e.g., *Codex Féjerváry-Mayer* page 44 and *Codex Laud* page 2, see fig. 5.2).[2] Still other depictions of the day sign include a combination of plant and bone elements (see fig. 5.1). On pages 23 and 52 of the

Codex Borgia, for example, it consists of grass blades growing out of a skeletal mandible with teeth (fig. 5.6). Early colonial manuscripts, for example, the *Codex Borbonicus*, and the *Codex Vaticanus A*, depict it as a plant growing out of what appears to be a skull with eyes. The grass blades resemble hair and end in tear-shaped yellow flowers, which seem to represent tassels (fig. 5.7). At times, the glyph is depicted with a very conspicuous tassel protruding above the blades of grass, implying that the plant is wind pollinated (fig. 5.8).

The *Codex Borgia*, like other pre-Columbian Central Mexican manuscripts, does not contain any alphabetic text or glosses[3] providing the Nahuatl name for the twelfth day sign. We know, however, from early colonial chronicles and painted manuscripts—which do include glosses—that the twelfth day sign bore the name of a grass (*malinalli*) or of a product made of grass (*escoba*, broom). Father Toribio de Motolinía, who arrived in Mexico in 1523, was one of the first Catholic officials to write about the Nahua calendar. Regarding the symbols for the days of the calendar, he reports: "They indicated [the calendrical dates] by the following signs or figures, . . . the twelfth [day sign] by twelve broom."[4] Similarly, the Spanish glosses in the Aztec *Codex Borbonicus*, identify the day sign as *escoba* (broom), but the glyph looks nothing like a broom (see fig. 5.7).[5]

Book 4 of the *Florentine Codex*, which discusses the Central Mexican calendar, reports that the twelfth day sign is called *malinalli*, which is translated into Spanish as *heno* (grass).[6] According to the *Diccionario de la Real Academia Española*'s definition, *heno* belongs to a family of grasses called *Gramineae* (or *Poaceae*) to which both maize and its progenitor, teosinte grass, belong.[7] Diego Durán also reports that the Nahua called the twelfth day sign *malinalli*, which he translates into Spanish as *matorral* (uncultivated plant). His explanation: "The twelfth day sign that they called *matorral* . . . means in their tongue *malinalli*."[8] According to the

Diccionario de la Real Academia Española, *matorral* derives from *matorro* (plant), which means "uncultivated field full of plants and wild grasses."[9]

For some time, scholars have attempted to identify the family of grasses to which the plant called *malinalli* belongs. They have used a number of tools, including pre-Columbian and early colonial images, discussions of *malinalli* grass in the ethnohistoric record, and modern-day botanical studies of endemic grasses in Central Mexico. For example, folio 12v of the *Codex Badianus* (ca. 1552) includes the entry of a plant that the Aztec physician Martín de la Cruz identifies in Latin as *herbae malinalli* (*malinalli* grass). A depiction of the grass with roots, dense foliage, and five tall tassels in the process of disseminating pollen accompanies the entry (fig. 5.9). The Nahua doctor identifies *malinalli* as a medicinal plant used in the treatment of eye ailments, throat infections, and difficult childbirths. Although he offers no further details regarding its botanical identity and significance, scholars have been able to extract some botanical information based on the image.[10]

Blas P. Reko, for example, classifies the *malinalli* grass in the *Codex Badianus* with the genus *Epicampes Macroura* of the *Gramineae* (also known as *Poaceae*) family, to which maize also belongs. Reko reports that to this day, the people of Sinaloa call the grass *zacate malinalli* (*malinalli* grass).[11] In her seminal article on *malinalli*, Jeanette Peterson concurs that the grass belongs to the *Gramineae* family. Nonetheless, in her study of the etymology of the Nahuatl word *malinalli*, she finds that it had a "broad application" among the pre-Columbian Nahua, which continues in modern Mexico and Central America.[12] She concludes: "The Precolumbian taxonomic system labeled several related species of grasses as *malinalli* much as today in many regions of Mexico, they are given the generic name of *zacatón*" [big grass].[13]

Putting these elements together, we are presented with a day sign named *malinalli*; a name that refers to one or more species of wild grass; and images of it that sometimes depict a grass, a jawbone, or a combination of the two. What, as Peterson asks, explains the "elevated status" of a common, wild grass to the point that the Nahua chose it to represent one of the day signs of their calendar?[14] As Peterson has observed, it remains "one of the most enigmatic" of the twenty day signs in the Nahua calendar, and the "linguistic and iconographic variations in the *malinalli* day sign are only one of several problems posed by the glyph."[15]

Peterson conducted a thorough botanical and iconographic evaluation of the *malinalli* grass, concluding that its importance pertained to the Nahua association of grass with the earth: "The Aztecs used *malinalli* grass as a metaphorical substitute for the skin covering and hair of the earth. As such, it appeared in contexts of sacrifice and death and could petition the earth on behalf of the suppliant."[16] Peterson also discusses the economic value that the common grass represented within Nahua society, where it was the raw material for a wide variety of products including rope, roofs, nets, brooms, brushes, and baskets.

Building on Peterson's work, I propose a broader—although not necessarily contradictory—answer to Seler's question regarding the association of a wild grass and bones in the twelfth day sign, as well as the significance that the Nahua accorded the wild grass. My answer is that the Nahua understood that a common grass was the progenitor of maize, and consequently grass and bones represented lifegiving and venerated ancestors. Bones represented ancestors—those who had come before and died and who also were the basis for future life (see Chapter 4). This association with ancestry links wild grass to bones and explains, I contend, why the Nahua elevated what to us appears as a common grass to a powerful symbol.

In her analysis of skeletal imagery in Mixtec manuscripts, Jill Furst convincingly demonstrates that bones represent "not death, but life-giving and life-sustaining qualities."[17] She points out that early colonial as well as modern-day associations of bones with death and doom generally come from European art and its *memento mori* (literally, "remember that you must die" in Latin) motif that usually consisted of a skull intended to provoke contemplation. Skeletal iconography in European art, Furst explains, symbolizes "all that is transient and tragic in man's brief earthly existence."[18] Based on that observation, Furst argues regarding the iconography of bones in indigenous artifacts: "Death deities and grim lords of the underworld . . . may not reflect indigenous thought so much as the experience of Western culture. . . . Among the Mixtecs . . . skeletal figures were the antithesis of death gods. Indeed, they were deities with generative and life-sustaining functions."[19] For example, she points out that in the pre-Columbian Mixtec screenfold *Codex Vindobonensis Mexicanus I* (also known as the *Codex Vienna*), creator gods are often depicted with skeletal features. The figures with skeletal jaws on page 51 of the *Codex Vienna*—a male and female couple, each individually identified by the calendrical name 1 Deer—appear with an abundant progeny, conducting a ritual involving smoke and tobacco (fig. 5.10).

Furst also points out that in other pages of the Mixtec *Codex Vienna* (for example on pages 34, 35, 49, and 50), the ritual with smoke and tobacco appears in association with marriage and/or birth celebrations. The "couples carrying out this rite are skeletonized, suggesting that the fleshless jaw is not an attribute of death deities, but rather is an insignia of life-generating gods and goddesses."[20] Furst cites a Mixtec creation story from Cuilapa, in the Oaxaca Valley recounted in the *Orígen de los indios de el Nuevo Mundo e Indias Occidentales*, a chronicle by the Dominican Fray Gregoria García (1554–1627), as further evidence that the couple on page

51 of the *Codex Vienna* represents a life-generating pair, and not death gods. Fray García's chronicle identifies a pair of gods with the calendrical name 1 Deer as "Father and Mother of all the gods."[21] From her analysis of skeletal imagery in Central Mexican manuscripts, Furst concludes: "The Post-Classic period in Mesoamerica might better be characterized as a time when the fertility of the earth became an obsession. . . . Thus, the supposed emphasis on death in the Post-Classic may well be ours, and not that of the Pre-Hispanic peoples of Mesoamerica."[22]

Interestingly, most of the figures that Furst discusses are specifically depicted as fully fleshed, with only their jaws skeletonized. For the Nahua, there was something unique about the jawbone—for some reason it was represented without flesh. Furst does not address this point, and here I will only suggest that beyond indicating life and ancestry, the skeletal jaw of the creator gods links them to the *malinalli* grass day sign, thus evoking filial ties.

Although in Western thought there is no immediate link between wild grass, bones, and ancestors, this association existed among the Nahua. Folio 71v of the *Codex Magliabechiano* reports that "the Indians remembered their dead in the feast called Tititl" and relates that this particular memorial revolved around a deceased noble whose attire includes a "*yacaxihuitl*, which means nose of grass . . . and on the head as a headdress they put some grass that they call *malinalli*."[23] As Amos Megged has observed in his study of Nahua rituals pertaining to the remembrance of ancestors, "In Nahua death rites the tying of *malinalli* grass knots and paper knots on the skulls of the dead is a practice intimately connected with acts of commemoration, as well as to the journey into the afterlife, with its accompanying fate."[24]

The etymology of the word *malinalli*, and the ways in which the Nahua used *malinalli* grass, provide further support for the association of grass with ancestry. Although the dictionary that Alonso de Molina began compiling in the 1550s does not include the word *malinalli*, the

word is similar, or at least related etymologically, to words that he did include, among them *malina*, "to twist cord above the thigh"; *onitlamalin*, the past tense of *malina*; and *malinqui*, "twisted object as a rope."[25] While the rope or cord aspect is understandable because these were manufactured from grass, the reference to the thigh is perplexing. Nevertheless, the Nahua perceived a close association between thigh, rope, and apparently, plants. Book 10 of the *Florentine Codex* identifies each part of the body and its characteristics, describing the leg (*icxitl*) as "like a cord," and "twisted," and the thigh (*mêtztli*) as "like a plant."[26] It says also that "the thigh [is] an old hilled plant."[27]

Cecelia F. Klein has pointed out that "the thigh was associated with military aggression in general by the Aztecs."[28] The *Historia Tolteca-Chichimeca* (ca. 1547), a manuscript from Cuauhtinchan (modern-day Puebla) that records with images and text the history of Chichimec tribes (ancestors of the Nahuas), their migrations, and eventual settlement in Central Mexico, relates plants to military aggression. The manuscript says that when the Chichimecs emerged from Chicomoztoc, the cave of primordial emergence, on the date 7 *Mazatl* (7 Deer), they struck trees and plants with their arrows.[29] Heinrich Berlin and Silvia Rendon translate the Nahuatl glosses corresponding to the imagery on folio 23r as: "Then they cast arrows onto the *nopal* [a type of cactus] and the *malinalli*. Then they bled, and they pretended that thus they gained strength."[30] Folio 23r features a *malinalli* grass and a *nopal* that bleed because warriors have shot them (fig. 5.11).[31] Dana Leibsohn explaines that the image "both depicts their assault [on the plants] and makes visible the connection between sacred warfare and Chichimeca military prowess."[32]

The Ochpaniztli ("Sweeping") Feast: Reenacting Maize's Birth From Grass in Ritual

I argue that the relationship among the thigh, military aggression, maize, and *malinalli* grass (including rope) can be understood in the context of Ochpaniztli, translated as "Day of Sweeping," an Aztec feast celebrated in September that Diego Durán reports was an "ancient rite."[33] The performances reenacted during Ochpaniztli, I contend, allude to grass giving birth to maize. According to the *Florentine Codex*, during Ochpaniztli, the goddess Toci (Our Grandmother), also known as Teteo innan (Mother of the Gods), and her attendants, staged a mock combat with an opposing force. The skirmish is called "'They fight with grass'; because it was indeed grass, it was indeed straw [brooms] that each of them went carrying in their hands."[34] Ochpaniztli culminates with the goddess's death and the birth of her progeny, Cinteotl (maize).[35] Toci was flayed and the skin of her thigh made into a mask for her offspring to wear.[36] Masks, particularly those made of skin, as Klein observes, served as the "new face" for the wearer.[37] Therefore, maize has grass-like qualities by virtue of wearing a mask made from its mother's thigh skin.

For the Nahuas, thighbones or femurs symbolized genealogical bonds.[38] As discussed in Chapter 4, the bones in Ehecatl-Quetzalcoatl's headdress represent previous generations that make new life possible. Thus, the bones in his headdress could very well be femurs.[39] According to the *Florentine Codex*, during the Aztec feast of Tlacaxipehualiztli, "Flaying of People," those who had been taken captive in battle were sacrificed, flayed, and their flesh ritually eaten, but the captors kept the thighbones. The *Florentine Codex* explains: captors "wrapped the thigh bone thoroughly in paper; he provided it a mask; and this was called the god-captive."[40] During Tlacaxipehualiztli, warriors refused to eat the flesh of the sacrificed captive, asking "Shall I perchance eat my very self?" because, the *Florentine Codex* explains that "when he took [the

captive] he had said: 'He is as my beloved son.'"[41] This implies a fictive familial tie of father and son between captor and captive.

Furthermore, the Aztecs equated childbearing with fighting in battle and with seizing captives. Significantly, Toci's attendants during Ochpaniztli were the *huey ticitl* (great physicians or midwives), which recalls that the Nahua doctor Martín de la Cruz recommended that *malinalli* be used during difficult labors.[42] According to the *Florentine Codex*, midwives "gave war cries" when a woman had successfully delivered a baby to indicate that the new mother "had fought a good battle, had become a brave warrior, had taken a captive, had captured a baby."[43] Therefore, I contend, grass's role as the progenitor of maize evoked during Ochpaniztli explains why the feast is suffused with, as Johanna Broda has already discussed, both martial and agrarian undertones.[44] Catherine DiCesare has complained that there is "a common assumption" in the literature that "Ochpaniztli was an agrarian rite . . . interpreted as the harvest festival," which she attributes to an unjustifiable reliance on the *Codex Borbonicus*.[45] She notes correctly that there are "numerous other representations, pictorial and textual alike, that focus consistently on a goddess who is linked with human sexuality, midwifery, parturition, and healing and cleansing rites. This deity is identified in the texts as Toci, Teteoinnan, and Tlazolteotl."[46] If, however, as I contend, Ochpaniztli is a performance underscoring grass's filial relation to maize, the feast would necessarily and naturally evoke both agrarian and childbearing themes.

Michel Graulich has observed that page 11 of the *Codex Borbonicus* depicts the culminating "result of the ritual"—that is, a performance of the goddess giving birth.[47] There, Tlazolteotl's progeny emerges from her womb holding two intertwined ropes (fig. 5.12a). Subsequently, on page 30 of the *Codex Borbonicus*, Cinteotl appears wearing her progenitor's

skin (evident by the lifeless hands that hang from her own) as well as an elaborate headdress featuring a maize plant with a yellow tassel rendered to resemble rope (fig. 5.12b).[48] In Mesoamerica, rope was an important visual symbol of filial ties, similar to our use of a family "tree." The *Codex Tudela* identifies the twelfth day sign as "malinalli, yerba así llamada" (grass thus called), and translates it as *torceduras* (twistedness).[49] This coincides with Molina's definition of *malinalli* as "twisted object as a rope."[50] Scholars consequently usually translate the word *malinalli* as "twisted grass" and recognize the grass's close association with rope or cord.[51]

Susan Kellogg, in discussing how early colonial laws affected genealogical ties and family units, explains the symbolism of rope as follows:

> The use of ropes as an artistic symbol of genealogy is found commonly in early colonial genealogical drawings in legal cases and chronicles as well as elsewhere in Mesoamerica. . . . The concept of "rope of people" expressed, then, a number of linked ideas about birth, consanguineal relationship, *and* descent.[52]

Much early colonial legal documentation pertained to land tenure disputes or inheritance rights, and rope imagery in these documents indicate kinship ties.[53] For example, the *Genealogía de Quauhtliztactzin* features Ocelotzin, a noble from Tlaxcala, linked to his kin with rope (fig. 5.13).[54] Scholars, including Susan Kellogg, Elena Díaz Rubio, Delia A. Cosentino, and Justyna Olko, have demonstrated that the Nahua associated both the image and the Nahuatl word for rope (and cord) with ancestry or consanguineal ties. They point out that *tlacamecayotl* (ancestry or lineage), formed with the words *tlacatl* (person) and *mecatl* (rope), "literally means 'rope of people.'"[55] Most recently, Olko has argued that the use of rope to indicate consanguinity as illustrated by the concept of *tlacamecayotl* (which she translates as "human cordage") in early colonial Central Mexican pictorial genealogies is a pre-Columbian convention indicating "personal history or family links" as well as "historical and social memory grounded in pre-Hispanic ancestry"[56] Consequently, she contends that the use of ropes to indicate kinship

apparently, "surpasses the notion of simple blood bonds to encompass the idea of origin and descent expressed graphically by a tied rope."[57] In sum, Olko's study indicates that rope:

> [N]ot only denotes the memory of personal descent but also bespeaks the perdurable remembrance of pre-Hispanic concepts. As various studies clearly show, it was not exclusively the Nahua idea of kin being "tied," both verbally and graphically, for we see an ancient Mesoamerican tradition that symbolically identified ropes with umbilical cords, and, on a more esoteric level, with links to the supernatural world.[58]

Megged points out that many bereavement songs in the *Cantares Mexicanos*, a collection of Nahua poems and songs compiled in alphabetic text in the early colonial period, express the idea of "entwining" or "binding." Megged interprets these concepts primarily as pertaining to the "destiny of the souls of the departed," although he does not explain the concept of the "soul" as the Nahua may have understood it. He cites songs that express the concept of binding, for example: "Lords, you are Entwined, Nobles, you are Bound in comradeship" and entwined is how "one becomes an ancestor."[59] Megged concluded that these songs express the concept of entwining or binding in a manner that is suggestive of "a joining of people with their ancestors, their gods, and their sacred lands."[60]

In sum, I propose that the key to unlocking the association between wild grass and bones in the twelfth day sign glyph is to understand that to the Nahua, bones symbolized the life-giving aspect of ancestors, and grass was the ancestor of (the "bones of") maize. This also helps to explain why Nahuas, like other Mesoamericans, conceptualized a rope—which the Nahua made out of wild grasses—as connecting the living with prior generations. Therefore, based on the iconographic and linguistic evidence, the Nahua indicated that grass is the progenitor of maize.

Grass in the Guise of Maize in the *Codex Borgia*?

Although in nature maize does not look like grass, in some Aztec artifacts, including the *Codex Borgia*, it does. No study to date has noted the reasons for this. I contend that the similarities reflect the relationship that the Nahua knew existed between the two plants: grass was the progenitor of maize. In a pre-Columbian Aztec basalt stone sculpture at the Museo Nacional de Antropología e Historia, for example, maize appears next to grass and they are depicted to resemble each other; the only differences are that the grass has more leaves and no cobs (fig. 5.14a).[61] The sculpture is in the shape of a cube, and while the top and bottom sides do not include any carvings, all four of its lateral sides do: two feature maize next to grass (fig. 5.14a), and the other two, the *chalchihuitl*, symbolic of preciousness and wombs (see Chapter 3) (fig. 5.14b).[62] Significantly, while the maize plant emerges from a pot, a symbol that food would be available in the coming year (explained in Chapter 3), the grass emerges from the *chalchihuitl*.[63] Book 6, of the *Florentine Codex*, titled *Rhetoric and Moral Philosophy*, explains how mothers described to their daughters their origin: "behold, here is thy mother, thy noble one. From her womb, from her breast thou wert chipped, thou wert flaked. It is as if thou wert an herb, a plant which hath propagated, sprouted, blossomed."[64] Significantly, in the original Nahuatl, the word "herb" is *tixiuhtzintli*, literally: you are grass maize. Moreover, the mother calls her daughter who is old enough to marry "*tichalchihuitl*, *titeuxihuitl*," literally: "you are a *chalchihuitl*, you are godly grass," suggesting that grass was considered as mother or originator of new lineage.

In the *Codex Borgia*, *malinalli* grass is depicted as the twelfth day sign or as the insignia of creator deities. In both cases the *malinalli* grass bear a striking resemblance to the maize plant. For example, page 20 of the *Codex Borgia* features *malinalli* as the twelfth day sign and a maize plant growing in a field, both rendered with the same iconographic elements (see fig. 5.3). In their vegetative aspects—that is, their roots, leaves, and tassels—these two plants are

indistinguishable; each with elements painted in the same color and rendered with the same artistic details. This is particularly notable in the tassel. In each case, the tassel's inflorescence appears at the top of a long peduncle (flower-bearing stalk) and consists of a small, round head crowned with a crest made up of tiny little partitions rendered with thin black lines. These tiny partitions seem to represent the spikelets, the part of the plant that produces pollen.

In the *Codex Borgia*, *malinalli* grass also appears among the insignia of earth goddesses. As Peterson explains, *malinalli* is an iconographic feature in many stone sculptures of earth goddesses, whose hair consists of grass that includes tassels at the end of the blades.[65] On page 34 of the *Codex Borgia*, *malinalli* grass is depicted growing on an earth goddess's lower back (fig. 5.15). Here too, the grass looks like maize. Each is sketched in the same manner and painted with the same palette; the similarities again, are particularly salient in the rendition of the tassels.

Pages 13, 18, 19, 20, and 75 of the *Codex Borgia* all feature the *malinalli* day sign glyph with the same tassels as those seen on the maize plant. The primary difference is that the maize plant appears with large cobs, and the *malinalli* grass (either as a day sign glyph or as a goddess insignia) appears instead with white paper banners. I argue that these white banners, which the Nahua widely used to commemorate their ancestors, further identify *malinalli* as the progenitor of maize. White banners were also used to identify sacrificial victims.[66] This explains why in the *Codex Borbonicus*, Tlazolteotl, who as explained above was sacrificed during Ochpaniztli, thus giving birth to maize, appears with white paper banners resembling those on the *malinalli* grass in the *Codex Borgia* (see figs. 4.9 and 5.3). As Guilhem Olivier has observed about the widespread use of white paper ornaments for sacred bundles: "It is perhaps significant that we often find these same foliated paper ornaments (generally white in color) on mortuary bundles. In this manner Mictlantechtli, the god of death and the underworld, has the same color folded

paper."[67] Folios 55r, 57r, and 60r of the *Codex Tudela*, for example, depict a funeral in which the dead person's bundle is decorated with white paper banners. Folio 57r of the *Codex Tudela* features the funerary rituals of a "high-ranking official or gentleman" whose bundle is decorated with white paper banners (fig. 5.16).[68] Several other aspects of the imagery in folio 57r relate to grass and ancestry. For instance, the bundle is superimposed on a large grass plant with long green blades. The body is featured in the customary Nahua manner, arranged in a sitting position and wrapped in cloths secured with rope.

Evolution from Wild Grass to Maize, as Reported in the Nahua Account of Creation

Knowledge of the origin and subsequent transformation of the maize plant underlies Nahua creation stories. These not only recount how the world was created, but also, and perhaps, more importantly, reflect Nahua philosophy concerning the primordial creative endeavor. Whereas in Western and/or Christian thought creation is the one-time work of a single omnipotent god or force, Nahuas thought of creation as an ongoing process, a systematic sequence of cataclysmic destructions, each succeeded by new creations.

Nahua accounts of creation, compiled in alphabetic text in the early colonial period by indigenous scribes and Spanish chroniclers, include: the *Historia de los mexicanos por sus pinturas*; the *Histoyre du Mechique*; *Memoriales* by Father Toribio de Benavente; the *Legend of the Suns*; the *Annals of Cuauhtitlan*; and the *Codex Vaticanus A*. Only the *Codex Vaticanus A*, an early colonial manuscript (mid-sixteenth century), includes images.

Each of the surviving Nahua creation stories relates an identical central message: the world was created in five discrete stages or eras, each called a *tonatiuh* (sun). In descriptions of each sun, the focus consistently centers on three main themes: the fate and/or development of

human beings, their source of nourishment, and the recording of time based on the sun's movements. Each creation was cataclysmically destroyed, but its three basic elements—sun, humans, and plants (the source of nourishment)—were restored, albeit in altered form in the next sun. Thus, the central message relates how the world first came to exist as well as how it changed over time. A salient characteristic is how terse they are. Perhaps as a consequence, some versions appear to be incomplete because they provide only enough details to express the general sense of how the Nahua conceptualized creation.

In 1960, Selma Anderson pointed out that it was "evident" in Nahua creation stories that "the sustenance of each succeeding epoch had evolved more and more toward the corn of today," correctly asserting:

> We are not told the name of the food of the fourth epoch, but we may assume that it followed this evolution. And in the fifth Sun, the Sun of 4 Movement, appeared corn in its modern form, created by the gods and given to man by Quetzalcóatl.[69]

Anderson, however, mistakenly dismisses the changes in the plant as "legend," adding: "how their 'staff of life' came to be must have been one of the most beloved in the folklore of the nahuas. It has come down to us as a delightfully fantastic and colorful little tale."[70]

In 1967, Roberto Moreno de los Arcos conducted a comparative study of the different versions of Nahua accounts of creation, focusing on juxtaposing their various elements—suns, humans, animals, colors, directions, and plants—and discussing the slight variations regarding their order and/or naming.[71] Because each account relates the same basic story, he explained that his objective was to organize all of the available information into categories and propose a single account—filling in, when necessary, any missing details—that reflected the order and names likely intended by the Nahua in the "original" version. His focus, therefore, was not on the plants, which he called *alimentos* (food), and which he discussed only in passing. Nevertheless,

he correctly noted that "food evolved little by little until it converted into maize in the Fifth Sun."[72] Regrettably, Moreno de los Arcos did not expand upon this insight, commenting only that the "central characteristic is the idea of the progression towards maize, and by extension of each of the previous ages as something incomplete, not finished."[73] He regarded the changes in the food not necessarily as transformations of a plant but as *nuevas adquisiciones* (new acquisitions).[74] Consequently, he characterized the plants' order of appearance in the creation stories as "really not of great importance."[75]

But the name, as well as the order of the plants' appearance in Nahua creation stories, is of *great* significance. In the Nahua creation stories—and this point has not yet been sufficiently emphasized or analyzed in the existing scholarship—a plant explicitly identified as the primary source of nourishment for humans of that era underwent a drastic change. The stories report that during the first suns, humans ate a type of grass or primitive maize that had by the fifth and current sun become the fully domesticated maize plant. For example, in the *Histoyre du Mechique*, in the first age, humans ate "a river grass named *aciantli* [*acicintli*]," which the *Codex Vaticanus A* identifies as wild maize.[76] In the second age "a grass named *centencupi* [*cincocopi*]," in the third age "myrrh and resin of pines," in the fourth age "a fruit from a tree called *mizquitl*," and in the fifth age, the story declares, "the wheat that they ate was called maize."[77] Similarly, in the *Historia de los mexicanos por sus pinturas*, the plant that humans consume during each sun or age progressively changes from a primitive plant or grass to become the maize plant consumed in the current age:

> And at that time [the first sun] the *macehuales* [common folk] ate a type of pine cone or pineapples[78] and not anything else . . . in which time [the third sun] the *macehuales* that there were did not eat but *acicintli*, which is a seed similar to wheat that grows in the water. . . . And the *macehuales* ate at this time [the fourth sun] of a seed similar to maize, that they called *cincocopi*.[79]

The *Codex Vaticanus A* also reports the type of food that humans ate during the first ages: "They said that [in the first sun] they ate no bread, except a certain type of wild maize that they call *atzitziutli* [*acecintle*]. . . . In this age [second sun] they ate no bread, but like in the first age, only wild fruit that they call *acotzintli.* . . . [On the third sun] they ate no bread except a fruit of that tzlucoco [*cincocopi*]," and during the present age, humans cultivated and consumed maize.[80]

In each sun, the plant that sustains humans has maize-like qualities or associations. For example, in the *Codex Vaticanus A*, in the first sun, the plant, "a type of wild maize, *atzitzintli* [*acicintli*]," which in the image appears as growing out of a water glyph, is short with dense green foliage and tassels (fig. 5.17). This rendition and description match those reported in the *Historia de los mexicanos por sus pinturas* and in the *Histoyre du Mechique* accounts, both of which describe *acicintli* as a grass that grows in water.[81] Molina's dictionary also reports *acicintli* to be "the same as *acecentli*," defined as "the said rough grasses."[82] In the second sun, the plant *acotzintli* is a taller specimen resembling a tree with foliage depicted on its branches (fig. 5.17). Although the name *acotzintli* does not coincide with the names of any of the plants in the other creation stories, it does include the suffix *-zintli* or *-centli*, which is the Nahuatl word for maize. Therefore, the Nahua associated the plant that they consumed during this second sun with a version of maize.

In the third sun, the plant *cincoco* [*cencocopi*] even more closely resembles the fully domesticated maize plant because it is portrayed as a single branched plant with wavy leaves that produces what appear to be cobs (fig. 5.17). The *Historia de los mexicanos por sus pinturas* describes *cincocopi* as being similar to maize.[83] Also, the Molina dictionary defines *cencocopi* as a "*zizania* that looks like the plant or the reed of maize, and is not."[84] According to the *Diccionario de la Real Academia Española*, the word *zizania* (spelled *cizaña*) is Latin and refers

to a plant belonging to a family of grasses, *Gramineae* (or *Poaceae*), to which the maize plant also belongs.[85] In the fourth sun, the plant is not depicted, and the imagery on this folio emphasizes instead flower blooms. The goddess Xochiquetzal,[86] who is the mother of maize, descends toward human beings (male and female) holding flowers and white paper banners (fig. 5.17). Folio 7v of the *Codex Vaticanus A* features the modern maize plant in the current age, along with Ehecatl-Quetzalcoatl (fig. 5.17).[87]

Nahua accounts of the creation thus basically recount the evolution of a grass into the maize plant. In the earlier eras, humans received nourishment from wild grasses that were maize-like but not the same as modern maize. In the current era, the process of evolution is complete, and humans eat domesticated maize. The pervasive change characterizing creation is not surprising, given the Nahua dependence on plants, which they routinely manipulated to suit human needs and/or to produce new and different strains with specific traits. As the scientists Arnel R. Hallauer, Marcelo J. Carena, and J. B. Miranda Filho have asserted, "Plant breeding is a science of evolution."[88]

In the fifth sun, the evolution has led to the creation of the modern maize plant and also to the development of agriculture, which gives humans access to reliable sources of sustenance. This is underscored by the fact that the *Leyenda de los Soles* relates how, during the fifth sun, Oxomoco and Cipactonal, the first human couple, upon seeing that Quetzalcoatl alone could not carry *tonacatepetl* (roughly translated as "mountain of sustenance" or "food mountain"), recognized that Nanahuatl, the sun, could help in obtaining maize and other plants for humans.[89] Maize is presented here as the prototype of plants in general. Maize is sometimes called *tonacaiotl* (sometimes spelled *tonacayotl*), which means "human sustenance or fruit of the earth."[90]

The focus during the fifth sun therefore is on the plants that humans ate, culminating with the creation of maize and emphasizing the sun's role. The sun's importance in recording time is not surprising, given that agricultural endeavors inherently involve close observations of the changes of the seasons based on the movements of the sun.[91] Creation stories, analyzed in this way, help to clarify the nature of the interconnectedness that the Nahua perceived among human beings, maize (including grass as well as all other plants), and the sun.

The Ancestor of Maize and Related Grasses in the Ethnohistoric Record

The ethnohistoric record provides further evidence that the Nahua understood that a family of common grasses shared a common ancestry with maize.[92] Francisco Hernández and Bernardino de Sahagún report that the Nahua identified a number of wild grasses as being maize-like. Consequently, the evidence shows that at the time of the conquest, the Nahua recognized a specific family of common grasses, now identified by scientists as the teosintes, to be undomesticated grasses but closely related to maize. The teosintes,[93] as discussed in Chapter 2, is the name for the wild grasses native to Central Mexico that scientists have identified as maize's closest genetic relatives. While the word "teosinte" finds its origins in the Nahuatl language—made up of the words *teo* (connoting ideas of sacred and divine) and *centli* (cob of maize cured and dried)—it is currently recognized as an English term as well, and widely used in the sciences.[94]

Pre-Columbian groups throughout the Americas had a long-standing tradition of manipulating grass, maize, and maize-like plants on the order of a few millennia, and they obviously understood that their botanical practices had led to an astonishing variation of plants that, notwithstanding their different phenotypes (appearances), shared the same genome because

of their capacity to interbreed and produce fertile progeny (see Chapter 2). Knowledge of the genetic variety of grasses and maize explains the large number of entries for maize, maize-like plants, and other maize-related grasses in Hernández and Sahagún's work. This may also explain why the Nahua had so many generic names for maize, for instance *tlaolli* (also spelled *tlaollo* and *tlaulli*), *centli* (also spelled *çintli*), *tonacaiotl* (also spelled *tonacayotl*), *toctli*, *xochi palcentli*, and *yyauh centli*.[95] It also explains why the Nahua had countless words to describe specific varieties of fully domesticated maize plants, including *iztac xiuhtoctli*, *tlapalcintli*, *iavitl anoço iauhçintli*, *xiuhtoctli*, *cinvechtli*, *cincozcatl*, and even *quamochitl* (popcorn).[96]

The Nahuatl language also has several generic terms for grass, such as *zacatl* (also *çacatl*), *quilitl*, *xihuitl*, and of course, *malinalli*.[97] In the *Florentine Codex*, *çacatl* and *xihuitl* are both used interchangeably with *heno*, which, as pointed out earlier in this chapter, is the Spanish word Sahagún used to translate *malinalli*. For example, Book 11 of the *Florentine Codex* identifies the entry for the plant *çacatl* (grass) as *xihuitl* (grass), and *tequixquizacatl* (a type of coarse grass—note the suffix "*zacatl*") as *heno*.[98] *Heno*, and consequently *malinalli*, *çacatl*, and *xihuitl,* are used interchangeably because each of these words refers to the same common grass or family of grasses.[99]

According to the ethnohistoric record, then, the Nahua had a large number of words that they used to describe the common wild grasses that they understood are related to the fully domesticated maize plant. As noted earlier in this chapter, one of those words, *malinalli*, was likely a generic term for wild grasses but may also have been tied to one or more specific species. Other words used by the Nahua for grasses, together with the descriptions provided to chroniclers such as Hernández and Sahagún, establish an even closer association between grasses and maize. For example, the plant that the Nahua called *cocopi*, or *cencocopi*, may be teosinte

(its modern-day appellation). Hernández includes an entry of a wild grass that the Nahua called *cencocopi*, identified as a "plant similar to *tlaolli* [maize]" and described exactly like the modern-day teosinte grass: "its seed is triangular. . . . [It] is maize of inferior quality."[100]

> The *Florentine Codex* provides the variant spelling *cocopi* and describes it as:
>
> Similar to maize: just like the maize stalk. The grains of this are parched very hard; they are well carbonized. It grows everywhere in the fields. No one sows it. Some of it grows first, before the maize plants sprout; some of it grows later, as the maize grows.[101]

In the *Florentine Codex*, the accompanying image of *cocopi* at first glance appears to be of maize, but a closer examination shows that the artist has depicted slight differences, including two branches and two tassels (similar to teosinte) and a smaller cob, although the cob is still similar to those of the maize plant (fig. 5.18). This information in the ethnohistoric record—including the image in the *Florentine Codex*—has led some scientists to conclude that *cencocopi* was the sixteenth-century Nahuatl name for teosinte. Hugh G. Wilkes, one of the leading botanists on teosinte research, for example, asserted, "The standardized Náhuatl name for teosinte in the codices is some form of 'cocopi': 'Cincocopi' (García-Icazbalceta, Historia de los Mexicanos por sus pinturas, 1882); 'Cocopi' (Sahagún, *Florentine Codex*); and 'Cencocopi' (Hernández, Matriti Edition)."[102] George Beadle concurred, wondering if "in his earlier, more extensive writings, which were destroyed by fire in 1651, Hernández had given a more substantial description of teosinte."[103]

Hernandez also reports that the Nahua used the words *tepecentli* or *tepececentli* to describe a plant that was a type of maize: *seu spicis maizij montani* (spikes of maize from the highlands).[104] The use of the *centli* root seems to indicate its botanical association with maize, but Hernandez's description of the plant—that it has large purple leaves that resemble those of the lemon, grows in cold and rocky places, has roots with medicinal qualities, and fruits that

resemble chili peppers and are full of seeds—does not sound like any of the teosinte strains that scientists have identified as maize's progenitor.

Hernández reports about another grass that the Nahua identified as the "mother" of maize. The *çenanan*, they told him, was also known as *çenantli* and *çentlinan*, and one of maize's progenitors: "*çenanan* of Texcoco or mother of the maize cob."[105] Although the accompanying depiction of the grass in the *Obras Completas* bears only a slight resemblance to teosinte, the accompanying depiction of the fruitcase does bear a more striking similarity to those of teosinte (fig. 5.19). Figure 5.19 shows those similarities particularly in the shape of the fruitcase, the seeds, and the silks.

How the word "teosinte" was first adopted in the sciences as a name for a grass related to maize is a question that has not received enough attention. To my knowledge, the botanist Hugh Wilkes is the only scholar in the United States whose research has shed some light on this issue. Wilkes reported that a letter written in 1869 by the Director of Public Gardens and Promenades of Guatemala is "the first record" of the word *téozinté*. According to the letter, addressed to the Imperial Society of Acclimatization of Paris, "the plant was known locally as 'téozinté' in southwestern Guatemala," but Wilkes added that the "name is not encountered anywhere in Mexico."[106] Consequently, Wilkes concluded, based upon his analysis of the evidence that the name "teosinte," used to denote the progenitor of maize, did not seem to have originated in Central Mexico and could not be attributed to pre-Columbian Nahua thought or systems of botanical nomenclature.

Notwithstanding Wilkes's conclusion, there is some evidence—albeit as of yet inconclusive—in the oeuvre of Hernández that the Nahua may have used the word "teosinte" in the early colonial period. As is well known, most of Francisco Hernández's original work on

Mexican plants, and more generally on natural history, was reportedly lost in a fire at the Monasterio del Escorial on June 17, 1671.[107] But the images, and the substantial body of information that Hernández collected in Mexico in the 1570s from indigenous botanists, doctors, and other sages survives, at least in part, in various copies made from the originals. In 1580, for example, King Phillip II commissioned the Italian royal doctor Nardo Antonio Recchi to copy Hernández's work *Natural History*. That copy, which bears the name *De Materia Medica Novae Hispaniae Manuscrito de Recchi*, is also widely known as the Roman Edition.[108] A subsequent copy of Hernández's work, edited by the Spanish scholar Casimiro Gómez Ortega, dean of the Royal Botanical Garden in Madrid, bears the name *Opera cum edita* and is widely known as the Madrid Edition; it was published in the 1780s.[109]

The Madrid Edition contains an entry referring to a wild maize-like plant called *teocintli*, which is tantalizingly close to the modern word teosinte.[110] But the Roman Edition does not contain that entry, nor does it make any reference to the word *teocintli* (the closest the Roman Edition comes is with the plant called *tepecentli*, described above). José Rojo Navarro, the Mexican scholar who began in 1959 to translate the Madrid Edition from Latin to Spanish, noted, "It is very likely that Hernández's '*teocintli*' does not correspond to the *gramineus* that resembles *maiz*, which is currently known as teosinte (Euchlaena Mexicana Schrad.)," and he attributed his use of teosinte to a copyist's error.[111] More recently, José María López Piñero and José Pardo Tomás, whose work has focused on Francisco Hernández and his legacy, have acknowledged that some versions of Hernández's work refer to *tlaolli seu maizium* (*tlaolli* or maize) and *teocintli seu maizium dei* (*teocintli* or maize god),[112] but they have reiterated Rojo Navarro's point that Hernández's entry on *teocintli* was likely a mistake. Ironically, López Piñero and Pardo Tomás based that conclusion in part on the work of Paul Mangelsdorf, who,

they said, "demonstrated that teosinte is not, as had been traditionally believed, the ancestor of maize, but a hybrid of maize and a species of *Tripsacum*."[113] As explained in Chapter 2, however, cytological tests in the twenty-first century have conclusively rebutted Mangelsdorf's theories to show that teosinte is the progenitor of maize.

Ultimately, we are left without conclusive proof as to how the word "teosinte" was used in the pre-Columbian or early colonial period. Hernández's declaration that *teocintli seu maizium dei*—if proven to be from Hernández himself and not the result of a scrivener's error—would provide incontrovertible evidence that the Nahua not only understood the close botanical relationship between maize and a type of grass that they called *teocintli*, but also that they knew a relative of maize by its modern-day scientific appellation. What the evidence does indicate is that without question the Nahua recognized a family of grasses as being related to maize. The information compiled by Sahagún and Hernández shows that the Nahua described a number of plants as being maize-like, even identifying a few as the ancestors of maize, and actually going as far as describing a plant that they identified as "maize of inferior quality" whose "seed is triangular," which, as Beadle noted, virtually describes teosinte (*Zea mays* ssp. *parviglumis*).[114]

Antiquarianism in Pre-Columbian Central Mexico

That the Nahua understood and recorded ancient history should not be surprising. As Emily Umberger has pointed out, "according to the literary sources the Mexica and other Central Mexicans made ceremonial pilgrimages to ancient sites" and were "familiar with the surface remains, and dug for buried objects."[115] Elizabeth Hill Boone has discussed how the Mexica recorded history in painted books explaining: "although they also recounted long-gone peoples and events in oral stories, songs, and performances, the Mexica relied principally on the painted

books to keep the past firm."[116] Various ethnohistoric sources indicate that the Nahua recorded in manuscripts and other media information on their early ancestors, including details of their history and of their many accomplishments. Diego Durán remarked in the sixteenth century that Nahua *tlacuiloque* (painter scribes) were "very excellent historians who composed extensive histories of their ancestors in paintings."[117] In the introduction to the *Florentine Codex*, Sahagún clearly states of the Nahua,

> And all their ancient customs and books they had about them were painted with figures and representations in such a way that they knew and had records of the things their ancestors had done and had left in their annals more than a thousand years ago, before the Spaniards had come to this land.[118]

The ethnohistoric record indicates that the Nahua had a keen interest in examining their early predecessors' undertakings, some of which could be construed as an archaeological knowledge. For example, in the *Florentine Codex*, the Nahua said of the Teotihuacan architectural ruins: "And there, leaders were elected, wherefore it is called Teotiuacan . . . And they built the pyramids of the sun and the moon very large, just like mountains. It is unbelievable when it is said they are made by hands."[119] Regarding the Toltecs, the Nahua indicated the approximate environs of the site they occupied, which is full of architectural ruins and remnants of artifacts:

> Those named the Tolteca . . . these first came to live here in the land, called land of the Mexica, land of the Chichimeca. And for several four-hundreds of years they dwelt in the vicinity of Tollantzinco. . . . In that area they made what was their temple; its name was 'house of beams.' Today it stands; it exists. . . . Then there they went—they went to live, to dwell on the banks of a river at Xicocotitlan, now called Tula. Because verily they there resided together, they there dwelt, so also many are their traces, which they produced. And they left behind that which today is there, which is to be seen, which they did not finish—the so-called serpent column, the round stone pillar made into a serpent. Its head rests on the ground; its tail, its rattles are above. . . . And Tolteca postherds are there to be seen. And Tolteca bowls, Tolteca ollas are taken from the earth. . . . And these, the traces of the Tolteca, their pyramids, their mounds, etc, not only appear there at the places called Tula [and] Xicocotitlan, but

> practically everywhere they rest covered; for their postherds, their ollas, their pestles, their figurines, their arm bands appear everywhere.[120]

The *Annals of Cuauhtitlan* corroborate the above regarding how Topiltzin Quetzalcoatl, the ruler of the Toltecs, "started and began his temple; he put up the serpent column. But he did not finish it, he did not build it to the top."[121]

The Nahua also recorded information on the ancient history of plants. In Book 10 of the *Florentine Codex*, Sahagún's Nahua informants discuss the botanical and other notable accomplishments of various groups—among them the Toltec, Tamime, Otomi, Chichimec, and Olmec—that flourished in the Central Mexican valley well before the sixteenth century. For example, they say of the Toltec that they were "wise . . . thinkers . . . skilled . . . learned: they knew well, they understood well, that which pertained to herbs [*xihuitl*], to the nature of their essence; which ones were good, which esteemed, and which of them were just plants, which ones bad, evil, harmful, or really deadly. . . . They invented the art of medicine."[122] Of the Chichimec, the Nahua said, "The so-called peyote was their discovery."[123] They also said that the "Otomí possessed gardens; they possessed maize bins good [was] their food, good [was] their drink."[124] The Toltecs, from whom the Nahua descended, are credited in the *Florentine Codex* with producing maize of different varieties: "Their food was that which is now used—maize, grains of maize. It was produced in abundance—green, blue, jade, turquoise [colors] with which to make purchases."[125]

The early colonial Nahua *Quinatzin Map* (1542), painted on *amatl* paper, records—in images and with some Nahuatl glosses—aspects of Acolhua history including their early arrival in the Mexican Basin.[126] The Acolhua were close allies of the Aztecs, and they built their capital city of Texcoco, one of the most important cultural centers in the Aztec empire, to the east of Tenochtitlan, the Aztec capital.[127] The *Quinatzin Map*'s first page features a scene recounting

Texcoco's early history, which includes the Chichimec migration into the Valley of Mexico with scenes evocative of beginning (i.e., emergence from a cave), travel, hunting, plants, and the establishment of rulership. Quinatzin, the founder of Texcoco, appears in the lower left corner of the page speaking to the leaders of the Tlailotlaque and Chimalpaneca, Toltec groups arriving from the Mixteca in Oaxaca. The gloss above Quinatzin reads: "At the time of Quinatzin arrived the Tlailotlaque and the Chimalpanecas approximately 272 years ago."[128] Plants featured on this page include grasses, trees (the species of this recurrent tree on the page has not been identified), cacti, and a maize or maize-like plant with the following inscription: "During Techotlalatzin's time the Colhuaque arrived and brought their chosen maize seed, bean, amaranth, chia, husks with their bundle where they placed their chosen seed. From this they made the maize stalk and the cob, thus they made the *milpa* [field cultivated with maize], they cleaned, purified the maize."[129]

Conclusion

The foregoing comparative analysis of the representations of *malinalli* grass and the maize plant in the *Codex Borgia* reveals the close relationship that the Nahua in the Late Postclassic period knew to exist between these two plants. As scientists have demonstrated, the Nahua and their ancestors routinely manipulated plants. And while maize was only one of these, it, along with its progenitor, a common grass, became ubiquitous and indelible symbols of their remarkable botanical knowledge and accomplishments. This explains the Nahuas' high regard for a common grass that was comparable to that accorded maize. There is ample iconographic, etymological, scientific, mythological, and ethnographic evidence that the Nahua understood that grass and maize share a close filial bond. A specific iconography that included not only grass but also

bones and banners, when compared to the uses of these symbols in Nahua society, provides clues as to why these were essential iconographic elements of grass (*malinalli*) in the twelfth day sign glyph's renditions. Bones, especially jawbones and femurs, represented ancestors, and grass was the ancestor of maize. The banners included in the *malinalli* day sign in the *Codex Borgia* also point to issues of ancestry. The etymology and meaning of the word *malinalli*, which in the sixteenth century was reported to denote "twisted rope," offers other avenues to explore the common grass's significance. Various products, including rope, were manufactured from grass, and rope was a widely recognized symbol of genealogical ties in Nahua society. The relationship between grass and rope revealed in the etymology of the word therefore echoes that between grass and maize.

Creation stories provide crucial additional evidence that the Nahua understood that the maize plant had been created from a wild ancestor that had undergone a series of transformations over time. According to the Nahua, the world was not created once, but through a series of evolutionary changes. The Nahua account of creation focuses on humans and their sources of nourishment. A salient element pertains to a wild plant that undergoes a series of changes, demonstrating the evolution of the maize plant, which is complete by the modern era. Nahuas in the sixteenth century explained that process in the ethnohistoric record. Both Francisco Hernández and Bernardino de Sahagún report that the Nahua explained that the maize plant was related to a number of wild species of maize-like plants. Pre-Columbian screenfolds, the early-colonial chronicles on the Nahuas of the sixteenth century, and the modern-day scientific record all convey the same information: that a common grass was the ancestor of maize.

Endnotes:

[1] Eduard Seler, "The Day Signs of the Aztec and Maya Manuscripts and their Divinities," in *Collected Works in Mesoamerican Linguistics and Archaeology*, ed. J. Eric Thompson and Francis B. Richardson, 5 vols. (Culver City, CA: Labyrinthos, 1990b), 1:127.

[2] According to the *Florentine Codex*, the Nahua equated teeth with bones: "the tooth is a bone" (*in tlantli, ca omitl*), the scribes declared. The *Florentine Codex* also says that teeth are "like ripe maize" and "maize-dough colored." Bernardino de Sahagún, *Florentine Codex: The General History of the Things of New Spain*, trans. and ed. Charles E. Dibble and Arthur J. O. Anderson, 12 books in 13 vols. (Santa Fe: School of American Research and the University of Utah, 1953–82), bk. 10, ch. 27, 109. Karen Bassie-Sweet—who cites numerous other scholars discussing this topic—points out: "The Maya metaphorically refer to kernels of corn as bones or teeth." Karen Bassie-Sweet, *Maya Sacred Geography and the Creator Deities* (Norman: University of Oklahoma Press, 2008), 23–24, 44.

[3] The *Codex Borgia* does contain some alphabetic text on pages 25 and 63, but these inscriptions are not pre-Columbian. See Chapter 1.

[4] Toribio de Benavente Motolinía, *Motolinía's History of the Indians of New Spain*, ed. and trans. Francis Borgia Steck (Washington, DC: Academy of American Franciscan History, 1951), 111.

[5] Also in Karl A. Nowotny and Jacqueline de Durand-Forest, ed., *Codex Borbonicus, Bibliothèque de l'Assamblée Nationale—Paris (Y120)* (Graz, Austria: Akademische Druck- und Verlagsanstalt, 1974), fols. 4, 8, 9, 12, 15, and 18.

[6] Bernardino de Sahagún, *Códice Florentino: El Gobierno de la República edita en facsimil el manuscrito 218–20 de la Colección Palatina de la Biblioteca Medicea Laurenziana Códice Florentino para mayor conocimiento de la historia del pueblo de México*, 3 vols. (Florence: Giunti Barbéra and the Archivo General de la Nación, 1979), vol. 1, bk. 4, ch. 1, fol. 2r.

[7] *Heno* is the Spanish word for grass or hay. According to the *Diccionario de la lengua española*, *heno* derives from the Latin *fenum* (hay) and is defined as: "Planta de la familia de las Gramíneas, con cañas delgadas de unos 20 cm de largo, hojas estrechas, agudas, más cortas que la vaina, y flores en panoja abierta, pocas en número y con arista en el cascabillo" (Plant of the *Gramineae* family with thin reeds of approximate 20 cm in height, thin leaves, sharp, shorter than the vine, and flowers with open panicles, few in number with filaments in the husks). See http://lema.rae.es/drae/?val=heno, accessed September 14, 2014.

[8] "El signo doce que llamaban 'matorral,' que quiere en la lengua decir malinalli." Diego Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, ed. Angel María Garibay Kintana, 2 vols. (Mexico City: Biblioteca Porrúa, 2006), 2:230.

[9] "Campo inculto lleno de matas y malezas." From the *Diccionario de la lengua española*, http://buscon.rae.es/drae/?type=3&val=paleografia&val_aux=&origen=REDRAE, accessed September 14, 2014.

[10] Martín de la Cruz, *Libellus de medicinalibus indorum herbis: Manuscrito Azteca de 1552*, *Según traducción Latina de Juan Badiano*, *Versión Española con estudios y comentarios por diversos autores* (Mexico City: Instituto Mexicano del Seguro Social, 1964), fols. 12v, 20r, and 58v.

[11] Blas P. Reko, *Nombres botánicos del Manuscrito Badiano*, 5 vols. (Mexico City: Sociedad Botánica de México, 1947), 5:23–43.

[12] Jeanette Favrot Peterson, "Sacrificial Earth: The Iconography and Function of Malinalli Grass in Aztec Culture," in *Flora and Fauna Imagery in Precolumbian Culture: Iconography and Function*, ed. Jeanette Favrot Peterson (Oxford, England: British Archaeological Reports Press, 1983), 117.

[13] Peterson, "Sacrificial Earth," 117. Xavier Noguez challenged the established scholarship on *malinalli* grass, which concurs that the Nahua used the word *malinalli* to refer to a number of grasses. Noguez thinks this is a "confusion" that could be attributed to the similar iconography that the Nahua used to depict *malinalli* and a number of what he considers to be other types of grasses, or to mistranslations from the Nahuatl. But Sahagún's work, which has side-by-side text in Nahuatl and Spanish, clearly indicates that the Nahua thought of a number of grasses as in the same family as *malinalli*. See notes 8, 9, and 74, this chapter. Xavier Noguez, "El símbolo del *malinalli*," in *Malinalco*, ed. Rosaura Hernández Rodriguez (Zinacantepec, Mexico: El Colegio Mexiquense, A. C., 2001), 32.

[14] Peterson, "Sacrificial Earth," 115.

[15] Ibid.

[16] Ibid., 123. Following Peterson, James Maffie offers a thorough discussion of the etymology of the Nahuatl word *malinalli*. Maffie also discusses the symbolic and economic significance of this common grass, including the Nahuas' associations of it with various symbols and concepts, among them, fire, change (*ollin*), wind (Ehecatl-Quetzalcoatl), and rope, from which he concludes: "Malinalli motion-change plays a vital and indispensable role in the becoming and processing of the Fifth Sun, Fifth Age, and all inhabitants of the Fifth Age. If olin motion-change constitutes the biorhythm of the Fifth Sun, Fifth Age, and all inhabitants of the Fifth Age, then malinalli motion-change constitutes the shape of the conveyance, circulation, and recycling of vital energies that initiate, nourish, fortify, and complete these olin-defined biorhythms. Olin-defined processes need nourishing and malinalli processes supply them with such nourishment. If we think of olin as the beating heart of the Fifth Age, then we shold think of malinalli as the twisting arteries, veins, and entrails through which circulates the energy that nourishes that beating heart." Maffie does not, however, associate *malinalli* with maize. See James Maffie,

Aztec Philosophy: Understanding a World in Motion (Boulder: University Press of Colorado, 2014), 261–354.

[17] Jill Leslie Furst, "Skeletonization in Mixtec Art: A Re-evaluation," in *The Art and Iconography of Late Post-Classic Central Mexico*, ed. Elizabeth Hill Boone (Washington, DC, Dumbarton Oaks, 1982a), 221.

[18] Ibid., 207.

[19] Ibid.

[20] Ibid., 213.

[21] Ibid., 214.

[22] Ibid., 223.

[23] Translation taken from: Elizabeth Hill Boone, *The Codex Magliabechiano and the Lost Prototype of the Magliabechiano Group* (Berkeley: University of California Press, 1983), 212.

[24] Amos Megged, "Things That Unite and Things That Divide: The Commemorational Significance of Together and Apart in Nahua Thought," in *Mesoamerican Memory: Enduring Systems of Remembrance*, ed. Amos Megged and Stephanie Wood (Norman, OK: University of Oklahoma Press, 2012), 180.

[25] "Torcer cordel encima del muslo" and "cosa torcida, como cordel." Alonso de Molina, *Vocabulario de la lengua méxicana* (Leipzig, Germany: B. G. Teubner, 1880), fol. 51r.

[26] Sahagún, *Florentine Codex*, bk. 10, ch. 27, 125.

[27] Ibid.

[28] Cecelia F. Klein, "Masking Empire: The Material Effects of Masks in Aztec Mexico," *Art History* 9, no. 2 (1986): 144.

[29] Paul Kirchhoff, Lina Odena Güemes, and Luis Reyes García, *Historia Tolteca-Chichimeca* (Mexico City: Instituto Nacional de Antropología e Historia, 1976), 174.

[30] Paul Kirchhoff, *Historia Tolteca-Chichimeca. Anales de Quauhtinchan*, ed. Heinrich Berlin and Silvia Rendón (Mexico City: Antigua Librería Robredo, de José Porrúa e hijos, 1947), 96.

[31] Image available online from: http://isites.harvard.edu/fs/docs/icb.topic200570.files/Tolteca-Chichimeca_fols__20-39/Tolteca-Chichimeca.fol.23r.jpg; also in Dana Leibsohn, "Script and Glyph: Pre-Hispanic History, Colonial Bookmaking and the 'Historia Tolteca-Chichimeca,'" in

Studies in Pre-Columbian Art and Archaeology No. 36, ed. Joanne Pillsbury (Washington DC: Dumbarton Oaks, Trustees for Harvard University, 2009), 133.

[32] Leibsohn, "Script and Glyph: Pre-Hispanic History, Colonial Bookmaking and the 'Historia Tolteca-Chichimeca,'" 132.

[33] Diego Durán, *Book of the Gods and Rites and the Ancient Calendar*, trans. Fernando Horcasitas and Doris Heyden (Norman: University of Oklahoma Press, 1971), 447.

[34] Sahagún, *Florentine Codex*, bk. 2, ch. 30, 120–21. According to Diego Durán, at Ochpaniztli "squadrons simulated combat until they reached the place where stood a scaffold bearing the insignia of the goddess. These consisted of a broom, bones, and the garments which she wore." Durán, *Book of the Gods and Rites and the Ancient Calendar*, 447.

[35] Sahagún, *Florentine Codex*, bk. 2, ch. 30, 121.

[36] Ibid.

[37] Klein, "Masking Empire: The Material Effects of Masks in Aztec Mexico," 142.

[38] This may explain the treatment given to the thighbones of the deceased in various other parts of Mesoamerica (e.g., among the Mixtecs and the Maya). Jeffrey P. Blomster reports of "a focus on body parts starting in the Late Formative and into the Classic periods in the Valley of Oaxaca and the Mixteca Alta, where representation, manipulation, and modification were focused on the head and, later, the long bones—especially the femur" and that "In royal burials from Uaxactun and Tikal, the deceased's head—and occasionally femur—may be missing, suggesting that certain skeletal elements were viewed as more powerful or useful in postmortuary religious and political contexts." See Jeffrey P. Blomster, "Bodies, Bones, and Burials: Corporeal Constructs and Enduring Relationships in Oaxaca, Mexico," in *Living With the Dead: Mortuary Ritual in Mesoamerica*, ed. James L. Fitzsimmons and Izumi Shimada (Tucson: University of Arizona Press, 2011), 125; Gary M. Feinman, Linda M. Nicholas, and Lindsey C. Baker, "The Missing Femur at the Mitla Fortress and Its Implications," *Antiquity* 84, no. 326 (December 2010): 1089–1101; and Michael Lind and Javier Urcid, *The Lords of Lambityeco: Political Evolution in the Valley of Oaxaca* (Boulder: University Press of Colorado, 2010).

[39] I thank Cecelia F. Klein for pointing this out (13 June 2015).

[40] Sahagún, *Florentine Codex*, bk. 2, ch. 22, 60. The Nahuatl word for captive is *malteutl*, which is composed of the words *malli* (captive) and *teutl* (divine), and therefore could be etymologically related to *malinalli*. See "Malli.captiuo en guerra, o captiuado" (captive in war, or captivated). Molina, *Vocabulario de la lengua méxicana*, fol. 51v.

[41] Sahagún, *Florentine Codex*, bk. 2, ch. 21, 54.

[42] Also spelled "*vevei ticiti*." Sahagún, *Florentine Codex*, bk. 2, ch. 30, 118, 119.

[43] Sahagún, *Florentine Codex*, bk. 6, ch. 30, 167.

[44] "En Ochpaniztli las luchas rituals también parecen haber tenido un significaco mítico, pero éste no ha sido estudiado suficientemente hasta ahora. En terminos generales, esta fiesta estaba caracterizada por el simbolismo guerrero por una parte, y el simbolismo de la fertilidad por otra" (In Ochpaniztli the ritual battles also appear to have had a mythical significance, but this has not been sufficiently studied. In general, this feast was characterized by a military symbolism on the one hand, and by a fertility symbolism on the other). Johanna Broda, "Estratificación social y ritual mexica," *Indiana* 5 (1979): 60.

[45] Catherine R. DiCesare, *Sweeping the Way: Divine Transformation in the Aztec Festival of Ochpaniztli* (Boulder: University of Colorado Press, 2009), 12–13.

[46] Ibid., 13.

[47] "El resultado del rito." Michel Graulich, "Las fiestas del año solar en el Códice Borbónico," *Itinerarios* 8 (2008): 190.

[48] Significantly, on pages 11 and 30 of the *Codex Borbonicus*, Tlazolteotl appears adorned with grass that includes spikelets that look tantalizingly similar to those of teosinte. Morevover, the portrayal of the Ochpaniztli celebration on page 30 of the *Codex Borbonicus*, as Michel Graulich observes, "illustrates very well the fertilization of the earth, but not the result: the birth of maize . . . we must turn to page 11 [discussed in Chapter 4] to see the result of the ritual" ("Ilustra muy bien la fecundación de la tierra, pero no el resultado: el nacimiento de Cintéotl . . . tenemos que acudir a la página 11 para ver el resultado del rito"). Graulich finds it "surprising" that the *Codex Borbonicus* "never represents human sacrifice," and that, for example, that which occurs during Ochpaniztli is only "indicated by the fact that it presents the victim . . . and then a person dressed with her skin and some of her attributes" ("Sorprende que en las fiestas nunca se represente directamente el sacrificio humano. . . . El sacrificio de la deidades está señalado por el hecho de que presentan primero a la victima . . . y luego a una persona vestida con su piel y con sus atributos). He wonders if the omission has anything to do with a desire to not offend the Spaniards, and thinks that this could point to a colonial date for the *Codex Borbonicus*. But then he suggests instead that, "these characteristics are due to the need to be concise for reasons of space" ("Pero creo más bien que estas características resultan de una necesidad de concisión por falta de espacio"). However, as DiCesare has observed, the *Codex Borbonicus* devotes three pages for Ochpaniztli—four, if counting page 11—whereas all the other festivals depicted in the manuscript receive at most a half page. I argue that the reason for the extensive treatment of Ochpaniztli in the *Codex Borbonicus*, as well as for the emphasis on the birth of new life rather than the death of the mother, could be because the celebration is focused on the emergence of a new plant, maize, that has grass-like qualities. This explains why emphasizing grass, maize, fighting, skinning and the thighbone mask are more important than the human sacrifice itself. See DiCesare, *Sweeping the Way: Divine Transformation in the Aztec Festival of Ochpaniztli*, 125; and Graulich, "Las fiestas del año solar en el Códice Borbónico," 191.

[49] Tudela de la Orden, *El Códice Tudela*, fol. 100v; and Juan José Batalla Rosado, *El Libro Escrito Europeo del Códice Tudela o Códice del Museo de América*, vol. 9 (Madrid: Itinerarios, 2009), 112.

[50] "Cosa torcida, como cordel." Molina, *Vocabulario de la lengua méxicana*, fol. 51r.

[51] See for example, Cecelia F. Klein, "Woven Heaven, Tangled Earth: A Weaver's Paradigm of the Mesoamerican Cosmos," *Annals of the New York Academy of Sciences* 385 (1982): 1–35; Maffie, *Aztec Philosophy: Understanding a World in Motion*, 261–354; Xavier Noguez, "El símbolo del *malinalli*," in *Malinalco*, ed Rosaura Hernández Rodriguez (Zinacantepec, Mexico: El Colegio Mexiquense, A. C., 2001), 29–70; Antonio Peñafiel, *Nombres geográficos de México. Catálogo alfabético de Códice Mendoza* (Mexico City: Carlos Pacheco, 1885), 135: "*malinalli*, planta de las gramíneas, conocida por 'zacate del carbonero,' dura, áspera, fibrosa, que fresca sirve para formar las sacas del carbon y para sogas que las aseguran; uno de los veinte signos del Tonalamatl, que designaba el duodécimo día"; Peterson, "Sacrificial Earth," 113–48; Cecilio Robelo, *Nombres Geográficos Indígenas del Estado de México*, 2nd ed. (Mexico City: Biblioteca Enciclopédica del Estado de México, 1974 [1900]), 127–28; Hernando Ruiz de Alarcón, "Tratado de las supersticiones y constumbres gentílicas que oy viven entre los indios naturales desta Nueva España, escrito en México año de 1629," in *Tratado de Idolatrías*, ed. Jacinto de la Serna, 2nd ed. (Mexico City: Ediciones Fuente Cultural, 1953), bk. 2:74, 76–84; Seler, "The Day Signs of the Aztec and Maya Manuscripts and their Divinities," 1:127–28, 154; and Eduard Seler, "The Pulque Vessel of the Bilimec Collection," in *Collected Works in Mesoamerican Linguistics and Archaeology*, ed. J. Eric Thompson and Francis B. Richardson, 5 vols. (Culver City, CA: Labyrinthos, 1992a), 3:199–223.

[52] Susan Kellogg, *Law and the Trasformation of Aztec Culture, 1500–1700* (Norman, OK: University of Oklahoma Press, 1995), 175.

[53] See Matthew Restall, Lisa Sousa, Kevin Terraciano, *Mesoamerican Voices: Native-Language Writings From Colonial Mexico, Oaxaca, Yucatan, and Guatemala* (New York: Cambridge University Press, 2005) 8–10, 94–125.

[54] For discussion of this document see Elizabeth Hill Boone, "Pictorial Documents and Visual Thinking and Postconquest Mexico," in *Native Traditions in the Postconquest World*, ed. Elizabeth Hill Boone and Tom Cummins, 149–99 (Washington, DC: Dumbarton Oaks Research Library and Collection, 1998); and Delia Annunziata Cosentino, "Landscapes of Lineage: Nahua Pictorial Genealogies of Early Colonial Tlaxcala, Mexico" (PhD diss., University of California, Los Angeles, 2004).

[55] Cosentino, "Landscapes of Lineage, 63; See also Kellogg, *Law and the Transformation of Aztec Culture*; Elena Díaz Rubio, "Acerca de la terminología de parentesco en el náhuatl clásico: tlacamecayotl," *Revista española de antropología americana* 16 (1986): 63–80, 65; and Justyna Olko, "Remembering the Ancestors: Native Pictorial Genealogies of Central Mexico and Their Pre-Hispanic Roots," in *Mesoamerican Memory: Enduring Systems of Remembrance*, ed. Amos Megged and Stephanie Wood (Norman, OK: University of Oklahoma Press, 2012), 51–72.

Consult also Molina, *Vocabulario de la lengua méxicana*, fols 115v and 55r. "Tlacamecayotl.abolorio de linage o de generacion" (ancestors of lineage or generation); "Tlacatl.hombre, persona, o señor" (man, person, or lord); and "Mecatl.cordel o soga, o açote de cordeles" (cord or rope, or whip of cords).

[56] Olko, "Remembering the Ancestors," 51.

[57] Ibid., 55.

[58] Ibid.

[59] Megged, "Things That Unite and Things That Divide," 178.

[60] Ibid.

[61] The sculpture is in the shape of a cube, and while the top and bottom sides do not include any carvings, all four of its lateral sides include low reliefs of plants (maize and grass). According to the Museo Nacional de Antropología e Historia's archaeological records (in the Director's Office; binder dated 25 Nov., 2009), this sculpture, measuring 29.50 cms in height, 47 cms in length, and 41 cms in width, is an altar and was excavated in Tlalnepantla, a city in the state of Mexico. The record includes the following description: "Altar que en sus 4 caras laterales lleva como elementos decorativos atados de mazorcas y la representación de la planta del maíz. En otra cara tiene un disco solar."

[62] See Molina, *Vocabulario de la lengua méxicana*, fol. 19r; and Cecelia F. Klein, "Who Was Tlaloc?" *Journal of Latin American Lore* 6, no. 2 (1981): 155–204 (165).

[63] See Molina, *Vocabulario de la lengua méxicana*, fol. 19r; and Cecelia F. Klein, "Who Was Tlaloc?" *Journal of Latin American Lore* 6, no. 2 (1981): 155–204 (165).

[64] Sahagún, *Florentine Codex*, bk. 6, ch. 18, 94.

[65] Peterson, "Sacrificial Earth," 113–148. See also Maffie, *Aztec Philosophy: Understanding a World in Motion*, 261–364.

[66] As noted earlier in the chapter, the Nahua perceived a fictive filial tie between captor and captive, the sacrificial victim.

[67] Guilhem Olivier, "Sacred Bundles, Arrows, and the New Fire: Foundation and Power in the Mapa de Cuauhtichan No. 2," in *Cave, City, and Eagle's Nest: An Interpretive Journey Through the Mapa de Cuauhtinchan No. 2*, ed. David Carrasco and Scott Sessions, 281–313 (Albuquerque: University of New Mexico Press, 2007), 290.

[68] "Sepultura de prinçipal o cavallero." Tudela de la Orden, *El Códice Tudela*, fol. 57r. For transcriptions, see Batalla Rosado, "El Libro Escrito Europeo del Códice Tudela o Códice del Museo de América, Madrid," 103.

[69] Selma E. Anderson, "The Discovery of Corn," *Estudios de cultura náhuatl* 2 (1960): 179. Anderson provides very useful translations of passages in creation stories from the original Nahuatl into English.

[70] Ibid.

[71] Roberto Moreno de los Arcos, "Los cinco soles cosmogónicos," *Estudios de cultura náhuatl* 7 (1967): 206. This is an excellent work that summarizes by section each of the surviving Nahua accounts of creation.

[72] "El sentido general es que el alimento evolucionó poco a poco hasta convertirse en el maíz del quinto Sol" (The general sense is that food evolved little by little until it converted into maize in the Fifth Sun). Ibid., 205.

[73] "Su aspecto central es la idea del progreso hacia el maíz, y por extension la de las edades anteriores como algo incompleto, no acabado" (its central characteristic is the idea of the progression toward maize, and, by extension, of each of the previous ages as something incomplete, not finished). Ibid., 205–6.

[74] Ibid., 205.

[75] "Aunque realmente no es de gran importancia." Ibid.

[76] "Et touts vivoynt de une herbe de rivière nomée *aciantli*." Edouard de Jonghe, ed. "Histoyre du Mechique, manuscript français inédit du XVIe siècle," *Journal de la Société des Américanistes. Noevelle Série* 2 (1905): 23.

[77] "En ce temps mangoynt de une herbe nomée *centencupi*," "mangoynt mire et résine de pins des quells il y a grande abondance en ce païs-là," "se nourrissoint de un fruict que vivent en une arbre nomée *mizquitl*," and "le blai quils mangent se appelle maïs." Ibid., 23–24, 31.

[78] "Piña" is defined as "Mazorca del maíz, especialmente cuando carece de farfolla." See Real Academia Española. *Diccionario de la lengua española*, 23rd ed. Madrid: Espasa, 2014, online at http://buscon.rae.es/drae/?type=3&val=paleografia&val_aux=&origen=REDRAE, accessed October 21, 2012.

[79] "Y en este tiempo comían los macehuales piñones de las piñas y no otra cosa . . . en cuyo tiempo los macehuales que habían no comían sino acicintli, que es una simiente, como de trigo, que nace en el agua, . . . Y los macehuales comían en este tiempo de una simitente, como maíz, que se dice cincocopi, . . . El grano que comen que se llama maíz." Ángel María Garibay Kintana, ed., *Teogonía e historia de los mexicanos: Tres opúsculos del siglo XVI*, 2nd ed.

(Mexico City: Editorial Porrúa, Colección "Sepan cuantos," 1973), 30–31, 110. The "ages" and plants' descriptions are related in two places in the *Teogonía e historia de los mexicanos*; see also pages 103–4: "vivían de una yerba del río nombrada *acicintli* . . . comían mirra y resina de los pinos . . . se nutrian con el fruto de un árbol que se llama *mizquitl*" (they lived off of a river grass and was called *acicintli* . . . they ate myrth and pine resin . . . they nourished themselves with the fruit of a tree called mizquitl).

[80] "Dicono che nò mangiavano pane, salvo certo genere di maiz silvestre, che si dice Atzitziutli . . . in questa età non mangiavano pane, si come in la prima, salvo frutte silvestri, che dicono acotzintle . . . non mangiavano pane salvo una frutta detta Tzlucoco [tzincoco]." Ferdinand Anders and Maarten Jansen, *Manual del adivino: Libro explicativo del llamado Códice Vaticano A* (Graz, Austria: Akademische Druck- und Verlagsanstalt and Madrid: Sociedad Estatal Quinto Cetenario; México City: Fondo de Cultura Económica, 1993), 58, 62, 64.

[81] Garibay Kintana, ed., *Teogonía e historia de los mexicanos*, 31; and De Jonghe, ed., "Histoyre du Mechique, manuscript français inédit du XVIe siècle," 23.

[82] "Acicintli.lo mesmo es que acecentli" and "Acecetli.las dichas yervas asperas." Molina, *Vocabulario de la lengua méxicana*, fol. 2r.

[83] See note 70, this chapter.

[84] "Cencocopi.zizania, que parece mata o caña de mayz, y no lo es." Molina, *Vocabulario de la lengua méxicana*, fol. 17r.

[85] According to the *Diccionario de la lengua española*, *cizaña* is a type of wild rice: "Planta anual de la familia de las Gramíneas, cuyas cañas crecen hasta más de 1m, con hojas estrechas de 20 cm de largo, y flores en espigas terminales comprimidas, con aristas agudas. Se cría espontáneamente en los sembrados y la harina de su semilla es venenosa." See Real Academia Española. *Diccionario de la lengua española*, 23rd ed. Madrid: Espasa, 2014, online at http://buscon.rae.es/drae/?type=3&val=paleografia&val_aux=&origen=REDRAE, accessed September 14, 2014.

[86] Discussed in Chapter 3.

[87] See Chapters 3 and 4 for discussion of Ehecatl-Quetzalcoatl's significance to the creation and procreation of maize.

[89] John Bierhorst, ed. and trans., *History and Mythology of the Aztecs: The Codex Chimalpopoca* (Tucson: University of Arizona Press, 1992a), 144.

[90] "Tonacayotl.mantenimiento humano, o los fructos dela tierra." Molina, *Vocabulario de la lengua méxicana*, fol. 149r. See also Sahagún, *Florentine Codex*, bk. 11, ch. 13, 279.

[91] Ibid., 24. Although scholars stress that the nature of Oxomoco and Cipactonal's associations with the Mesoamerican calendar pertains to divination based on the 260-day cycle, *Anales de Cuauhtitlan* emphasizes the solar basis of the calendar entrusted to the first human couple.

[92] Although more research is needed, references to Piltzintecuhtli directly link him to *malinalli*. As discussed in Chapter 4, the *Historia de los mexicanos por sus pinturas* and the *Histoyre du Mechique* both declare that Piltzintecuhtli is the father of maize. In the *Codex Tudela*, fols. 78r, 91r, 91v, 94r, 98v, 99r, and 118r include glosses that link Piltzintecuhtli to *malinalli*. Folio 94r, for example, reports: "El dozeno dia llamavan matlact omome malinali q(ue) quiere dezir doze yervas ansi llamadas el demonio propiçio llamavan piltzinteutl, que quiere dezir demonio niño de poca edad" (The twelfth day sign they called *matlactleomome malinalli*, which means twelve grass thus called, and the demon of this day they called Piltzintecuhtli). Tudela de la Orden, *El Códice Tudela*, fol. 101v; and Batalla Rosado, *El Libro Escrito Europeo del Códice Tudela o Códice del Museo de América*, 109.

[93] "Teosinte, n." Oxford English Dictionary Online, http://www.oed.com/view/Entry/199294?redirectedFrom=teosinte#eid, accessed June 30, 2014.

[94] Molina, *Vocabulario de la lengua méxicana*, fols. 18v, 100r–101r. The prefix "*teo*" appears with any word that is qualified as divine or sacred; for example, see *teoamuxpan*, which is translated as "enlos libros diuinos" (in the divine books), fols. 100r–101r. The word *centli* is translated as "maçorca de mayz curada y seca" (cob of maize cured and dry), fol. 18v.

[95] Sahagún, *Florentine Codex*, bk. 11, ch. 13, 279–28; and *Nova plantarvm, animalivm et mineralivm Mexicanorvm historia a Francisco Hernández . . . primum compilata, dein a Nardo Antonio Rechho in volvmen digesta, a lo. Terentio, lo. Fabre, et Fabio Colvmna Lynceis notis,, & additionibus longe doctissimis illustrata. Cui demum accessere, aliqvot ex principis Federici Caessii frontispiciis Theatri naturalis phytosophicae tabulae vna cum quamplurimis iconobus ad octingentas, quibus singula contemplanda graphice exhibentur* (Rome: sumptibus Blasii Deuersini & zanobii Masotti, . . . Typis Vitalis Mascardi, 1651), 185, 193, 223, 242–43, 439, and 448.

[96] Sahagún, *Florentine Codex*, bk. 10, ch. 29, 282–83.

[97] "Çacatl.paja" (dry grass): "quilitl.verdura; o yeruas comestibles" (greenness; or comestible grass). Molina, *Vocabulario de la lengua méxicana*, fols. 13v and 89r. See notes 9, 15, 85 and 86, this chapter. Incidentally, *xihuitl* is a Nahuatl word often used in denoting the concept of preciousness. "Xihuitl.yerua" (grass). Molina, *Vocabulario de la lengua méxicana*, fol. 159v; Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 239; and Sahagún, *Florentine Codex*, bk. 11, ch. 1, 1, and bk. 11, ch. 7, 129–220.

[98] "Icentoca çacatl in xivitl in ovac, in amo tlacotl" (It is the common name of grass [*çacatl*], of the herbs [*xihuitl*], when dried, not the stalk [*tlacotl*]). Sahagún, *Florentine Codex*, bk. 11, ch. 7, 196. For list of grasses translated as *heno* (same as *malinalli*) see Sahagún, *Códice Florentino*, fol. 182 r.

[99] It is possible that within the Nahuatl system of botanical nomenclature—in whatever form it may have existed, but almost certainly very different from our own modern scientific system—each of these terms used to denote grass served to classify the species in some meaningful way. But that information is difficult to detect from the ethnohistoric record for a number of reasons, including that the best resource to address this issue, Hernández's wealth of information exists—or is currently available to scholars—only in fragmentary form.

[100] "Se parece a la planta del maíz, pero su semilla es triangular. . . . Es un maíz de calidad inferior." Francisco Hernández, *Obras Completas: Historia Natural de Nueva España*, trans. José Rojo Navarro (Mexico City: Universidad Nacional de México, 1959b), 288.

[101] Sahagún, *Florentine Codex*, bk. 11, ch. 7, 187–88.

[102] Hugh Garrison Wilkes, *Teosinte: The Closest Relative of Maize* (Cambridge, MA: Bussey Institution of Harvard University, 1967), 5.

[103] George Beadle, "Teosinte and the Origin of Maize," in *Maize Breeding and Genetics*, ed. David B. Walden (New York: John Wiley & Sons, 1978), 113–14.

[104] Hernández, *De Materia Medica Novae Hispaniae Libri Quatuor*, 563.

[105] "Del Cenanan tetzcoquense o madre de la mazorca del maíz. El cenanan tetzcoquense, que algunos llaman cenanatli y otros centlinan." and "De Çenanam Tezcoquensi seu matre spicae maizij. Çenanam Tezcoquensi, quam alij çenantli, alij uero centlinan uocant, herba est folia proferens." Hernández, *Obras Completas: Historia Natural de Nueva España*, 241–42; and Hernández, *De Materia Medica Novae Hispaniae Libri Quatuor*, 489–91.

[106] Wilkes, *Teosinte: The Closest Relative of Maize*, 5.

[107] Hernández's original work on the flora and fauna of Mexico consisted of written descriptions, most accompanied by images. See Francisco Hernández, *Historia natural de Nueva España. Obras completas*, ed. Germán Somolios d'Ardois, 2 vols. (Mexico City: Universidad Nacional de México, 1959a), 2:309–14; and Germán Somolinos d'Ardois, "Sobre la Iconografía Botánica Original de las Obras de Hernández y su Sustitución en las Ediciones Europeas," *Revista de la Sociedad Mexicana de Historia Natural* 15 (1954): 73–86. For a chronology of the publications based on Hernández's original and copies of his work, as well as on the various translations available, see Simon Varey, ed., *The Mexican Treasure: The Writings of Dr. Francisco Hernández*, trans. Rafael Chabrán, Cynthia L. Chamberlin, and Simon Varey (Stanford: Stanford University Press, 2000), xvii–xix.

[108] Francisco Hernández, *De Materia Medica Novae Hispaniae Libri Quatuor. Cuatro libros sobre la materia médica de Nueva España: El Manuscrito de Recchi*, ed. Raquel Álvarez Peláez and Florentino Fernández González (Madrid: Ediciones Doce Calles, S.L., 1998).

[109] Francisco Hernández, *Opera cum edita, tum inedita, ad autographi fidem et integritatem expressa, impresa et jusu regio*, ed. Casimiro Gómez Ortega (Matriti, Italy: Ibarrae heredum, 1790). In December 1784 Gómez Ortega began contractual negotiations with Joaquín Ibarra, the royal publisher in charge of the king's printing press, to begin working on this edition

[110] Hernández, *Obras Completas: Historia Natural de Nueva España*, 287; and Hernández, *De Materia Medica Novae Hispaniae Libri Quatuor. Cuatro libros sobre la materia médica de Nueva España: El Manuscrito de Recchi*, 562–63.

[111] "Parece muy probable que este 'teocintli' de Hernández no corresponda a la graminea parecida al maíz a la cual se da actualmente el nombre de 'teosinte' (Euchlaena Mexicana Schrad.), hecho que fué señalado por Mangelsdorf y Reeves" and "seguramente se trata de un error de los muchos que se encuentran en la edición romana" (this probably has to do with an error, one of many found in the Roman edition). Hernández, *Historia natural de Nueva España*, 866, 868–69.

[112] José María López Piñero and José Pardo Tomás, *La influencia de Francisco Hernández (1515–1587) en la constitución de la botánica y la materia médica modernas* (Valencia, Spain: Instituto de Estudios Documentales e Históricos Sobre la Ciencia Universitat de València—C.S.I.C., 1996), 61.

[113] "Conviene recordar que las investigaciones de Mangelsdorf han demostrado que el teosinte no es, como tradicionalmente se creía, el antecesor del maíz, sino un híbrido del maíz y una especie de *Tripsacum*." López Piñero and Pardo Tomás, *La influencia de Francisco Hernández (1515–1587)*, 61.

[114] See note 90, this chapter.

[115] Emily Umberger "Antiques, Revivals, and References to the Past in Aztec Art," *RES: Anthropology and Aesthetics* 13 (Spring, 1987): 66. Umberger adds "no one has directly addressed the phenomenon of antiquarianism in the cultures of Mesoamerica" and that she is "aware of only one article" by Tatiana Proskouriakoff that discusses this topic. See Tatiana Proskouriakoff, "Olmec and Maya Art: Problems of their Stylistic Relation," in *Dumbarton Oaks Conference on the Olmec*, ed. Elizabeth P. Benson (Washington, DC: Dumbarton Oaks, 1968), 119–34; and Michael D. Coe, *An Early Stone Pectoral From Southeastern Mexico, Studies in Pre-Columbian Art and Archaeology, No. 1* (Washington, DC: Dumbarton Oaks, 1966).

[116] Elizabeth Hill Boone, *Stories in Red and Black: Pictorial Histories of the Aztecs and Mixtecs* (Austin: University of Texas Press, 2000), 20, see also 13–27.

[117] "Excelentísimos historiadores que, con estas pinturas, componían historias amplísimas de sus antepasados." Durán, *Historia de las Indias de Nueva España e Islas de la Tierra Firme*, 226.

[118] Sahagún, *Florentine Codex*, bk. 10, ch. 12, 82.

[119] Ibid., bk. 10, ch. 29, 192.

[120] Ibid., bk. 10, ch. 29, 165, 167.

[121] John Bierhorst, ed. and trans., *History and Mythology of the Aztecs: The Codex Chimalpopoca* (Tucson: University of Arizona Press, 1992a), 30.

[122] Sahagún, *Florentine Codex*, bk. 10, ch. 29, 167–69.

[123] Ibid., bk. 10, ch. 29, 173.

[124] Ibid., bk. 10, ch. 29, 177.

[125] Ibid., bk. 10, ch. 29, 169.

[126] For discussion of the Quinatzin Map see: Eduardo de J. Douglas, "Figures of Speech: Pictorial History in the Qinatzin Map of about 1542," *Art Bulletin* 85, no. 2 (2003): 281–309; Luz María Mohar Betancourt, *Códice Mapa Quinatzin. Justicia y derechos humanos en el México antiguo* (Mexico City: Grupo Editorial Miguel Ángel Porrúa, 2004); and Eloise Quiñones Keber, "The Tlailotlaque in Acolhua Pictorial Histories: Imitators or Inventors?" *Journal de la Société des Américanistes* 84, no. 2 (1998): 83–96. Luz María Mohar Betancourt began to produce literature on the *Quinatzin Map* with her 1999 doctoral dissertation, now a book.

[127] On the so-called "Triple Alliance" between Tenochtitlan, Texcoco, and Tlacopan, see: Susan D. Gillespie, "The Aztec Triple Alliance: A Postconquest Tradition," in *Native Traditions in the Postconquest World*, ed. Elizabeth Hill Boone and Tom Cummins, 233–63 (Washington, DC: Dumbarton Oaks Research Library and Collection, 1998).

[128] In Quinatzin in ipan acico tlailotaque chimalpaneca ye matlaepohual xihuitl ypan epohual xihuitl ypan on xihuitl axcan ("En tiempos de Quinatzin llegaron los Tlailotaques y los Chimalpanecas hace doscientos sesenta y dos años"). Transcription and Spanish translation taken from: Mohar Betancourt, *Códice Mapa Quinatzin. Justicia y derechos humanos en el México antiguo*, 302.

[129] "Techotlalatzin ypan yn huallaque colhuaque, quihualcuique in xinaly tlaolli etl huautli chiyan tozan ipotzal ypan in quitlallique yn inach ic mochiuh yn ohuatl yn xillotl quin yehuantin momiltique quichipauhque yn tlalli quin hualhuicaque yn teohuan in omicque moclatiaya" ("En tiempos de Techotlalatzin llegaron los Colhuaque trajeron sus semillas escogidas de maíz, fríjol, huautli, chía, tuzas su "envoltorio" en él colocaron su semilla escogida. De esto se hizo la caña de maíz el jilote, así ellos se hicieron de milpa limpiaron "purificaron" el maíz los trajeron sus dioses se quemaban los muertos"). Transcription and Spanish translation taken from: Mohar Betancourt, *Códice Mapa Quinatzin. Justicia y derechos humanos en el México antiguo*, 302–3.

CONCLUSION

According to the archaeological record, by the time of the conquest in 1521, the indigenous people of Mesoamerica had been domesticating plants for thousands of years. Their manipulation of a common grass led to the creation of maize, which is one of their many botanical achievements and the most celebrated and studied among scientists. Biologists have demonstrated that maize did not evolve in the wild on its own but was created by human agency. That is, Central Mexicans manipulated a wild grass known in the scientific literature as teosinte (*Zea mays* ssp. *parviglumis*) and created maize (*Zea mays* L.) through selective breeding.

That the Nahua possessed advanced knowledge in the scientific field of botany cannot seriously be questioned. Numerous chronicles and natural histories proliferated in the early years after the European so-called "discovery" of a "New World" in 1492. These documents report extensively that Europeans learned from Nahua doctors, horticulturists, and other indigenous sages how to use and cultivate a vast number of plants that at the time were only known to indigenous people. Motivating the Spaniards' voyages of exploration in the late fifteenth century was a desire to join the Spice trade route, and this naturally predisposed them to be interested in plants. While the Spaniards did not attain their initial goal, they discovered another truly remarkable avenue that supplied them with plants previously unknown in Europe.

Indigenous peoples' botanical knowledge was so extensive that the Spaniards, who ruled over the most powerful empire in Europe at the time, sought out to obtain information from them about the properties and uses of plants, including for food and medicine. What occurred, therefore, was essentially a transfer of domesticated plants and finished botanical products—*not* raw materials—from indigenous people to Europeans. As the scientific and ethnohistoric record

demonstrates, this botanical information was new only to the Europeans, as Nahua horticulturists and other indigenous sages had acquired this knowledge from their ancestors and from their own work with plants.

This dissertation has sought to establish that maize and related images in the *Codex Borgia* reflect scientific information about plants. It has demonstrated this by relating the science behind maize's origin, biology, and mode of reproduction to the analysis of imagery in the manuscript. The notion that the *Codex Borgia* contains scientific and historical information on plants is an entirely new approach to Central Mexican manuscript study. Essential to this study has been a now well-established fact in the scientific literature: that approximately 8,000 years ago, the indigenous people of Central Mexico manipulated a wild grass that produced tiny cobs with triangular seeds enclosed in stony fruitcases and, after years of selective breeding, evolved into maize. The result was a revolution in the development of agriculture and Mesoamerican societies. Maize supported substantial population growth and created an agricultural surplus that allowed the people of Central Mexico to build huge cities and develop advanced civilizations enabling them to produce monumental architecture, sculpture, polychrome pottery, manuscripts, and many other artifacts requiring highly skilled professionals.

Three sources of information—iconography, science, and ethnohistory—refer to the same events pertaining to indigenous people's sophisticated knowledge regarding the history, biology, and manipulation of the maize plant. To date, however, scholars' conclusions about the messages reflected in Central Mexican manuscripts portray the Nahua as being overly preoccupied with superstition, fortune telling, stargazing, and divination. Just as superstition and anxiety about the future have been and continue to be part of the cultural experience of people in societies throughout the world, this may well have been also part of the Nahuas' experience in the late

Postclassic period. I have argued, however, that based on visual, scientific, and ethnohistoric evidence, this is, at most, only a small part of the message inscribed in the *Codex Borgia* and other Central Mexican manuscripts.

I have tried to show that it should come as no surprise that the Nahua thought to record their achievements with plants in order to hand them down to posterity. Indeed, the maize plant is unique in many respects, particularly in its complete dependence on humans for reproduction. It follows that knowledge regarding its cultivation—knowledge that was indispensable for the continuation of the plant and consequently of the Nahuas and their society—was of necessity passed along from generation to generation. Simply put, this plant would not exist otherwise. This alone would suggest that the Nahua would have recorded in their manuscripts and other artifacts information on maize that did not center exclusively on the prediction of rain.

Nahua manuscripts can and, I contended in this dissertation do record scientific information on plants. An image from the early colonial *Florentine Codex* of a Nahua horticulturist studying a book provides compelling evidence that plant imagery in the extant Central Mexican manuscripts reflect botanical information. That Nahua horticulturists consulted books should lead us to reevaluate how scientific information was recorded, communicated, and handed down from one generation to another in an advanced civilization that did not have alphabetic writing but relied on images and day sign glyphs.

Page 28 of the *Codex Borgia* was the impetus for this dissertation. To date, the literature on this page has argued that it records information on divination, astronomy, and farming. As I analyzed the maize imagery on this page, however, I thought of the photograph in Michael Coe's book *Mexico*, which features the archaeologist Richard MacNeish's hand holding a tiny cob of early-domesticated maize (see fig. 2.5). Could there be, I asked, a relationship between the maize

imagery in the *Codex Borgia* and the tiny cobs that MacNeish and other archaeologists recovered from caves in the Tehuacán Valley and in other parts of Central Mexico? This dissertation has shown that, as it turns out, there *is* a close relationship between maize imagery in Nahua artifacts and the cobs that archaeologists have recovered from caves in Central Mexico.

Knowledge of the origin and biology of the maize plant explains why the Nahua held a common grass in great esteem, venerated a god of wind, and explained the reproduction of the maize plant as sexual. This shows that scientific information about the origin and reproduction of plants can help answers questions about the iconography in Nahua artifacts that until now have been overlooked or deemed inexplicable. Science is an effective resource that provides an avenue for probing the information encoded in the *Codex Borgia*'s imagery, and can help to expand our understanding of Nahua thought and religion. I argue that this approach has the potential to further our knowledge of maize and other agricultural imagery depicted in Mesoamerican manuscripts and in other artifacts as well. Scientific literature on plants can assist us in exploring a fuller range of Nahua thought.

For example, this dissertation argued that biology—namely recognizing that maize has male and female parts and therefore reproduces sexually—makes the representations of maize plants amid male and female couples on page 28 of the *Codex Borgia* intelligible. I contended that biology is key to decoding the relationship between maize and the rest of the iconography that features males floating above females, just as pollen flies through the air before landing on the plants' silks. I concluded that thorough examination of the imagery on page 28 indicates that the Nahua understood plant sexuality. The message conveyed in the iconography on page 28 should not be surprising when considering that in the early colonial period the Nahua explained

in *Historia de los mexicanos por sus pinturas* and the *Histoyre du Mechique* that the sexual union between a male and a female produced maize.

Indeed, in their early sixteenth century writings, the Nahua describe the reproductive biology of the maize plant as if they were discussing human beings engaging in lustful intercourse. Creator gods, they said, seeing that a male had no female to couple with, fashioned for him a wife out of the hair of a harlot, a goddess of flowers. The gods descended to observe the two copulate and their union created maize. This indicates that the Nahuas understood that humans and the maize plant reproduce in a similar manner: through the sexual union between a male and a female. That the Nahuas understood the fundamentals of plant sexuality provides numerous avenues to for the study of Mesoamerican material culture and philosophy.

I explained in Chapter 2 that the maize plant is monoecious (it has both male and female parts in the same plant, and is therefore bisexual) as well as diclinous (its male and female flowers are completely separate). That the maize plant is bisexual has tremendous implications for the evaluation of gender in Nahua ideology and how it is represented in art and ritual. Because this topic requires careful and extensive examination, I chose not to address it in this dissertation, and will do so elsewhere. What I did with the information is demonstrate that the Nahua understood plant sexuality, and answer the related question as to why the Nahua thought that wind was significant for plant reproduction. Nevertheless, monoecy in maize explains the themes of gender ambiguity in Nahua art imagery, as well as the unisexuality manifested in various personages that feature prominently in Nahua art and/or participated in official celebrations. For example, it explains the tradition of men donning female garbs during the month of Tititl, an Aztec festival when the mother creator goddess was celebrated. Therefore,

information that I presented in this dissertation raises numerous questions about gender that I will continue to probe and also hope further research will examine.

With this dissertation, I have only begun the task of using science to analyze imagery in Central Mexican artifacts. Much more can be accomplished. The rest of the imagery in the *Codex Borgia* and other Nahua artifacts should be reevaluated in the context of the scientific literature on plant domestication in Central Mexico. Comparative studies between plant imagery in Nahua manuscripts and those painted in the Mixtec and Maya areas may also reveal how painter scribes in those societies recorded botanical information. Birds, bees,bats, and other pollinators are featured prominently in Mixtec and Maya art. How are these pollinators depicted in relation to plants? Can knowledge of the sexual reproduction of plants assisted by wind or other pollinators help to decode messages in these images? Building on the arguments set forth in this dissertation, does the imagery in mural painting (e.g., Cacaxtla, Teotihuacán, San Bartolo, and the Santa Rita Murals) reflect scientific principles pertaining to plants? Does pre-Columbian art contain scientific information relating to fields other than botany and other plant-related sciences?

One potential objection to this new approach to manuscript study is that some may ask whether the Nahua really included scientific information in their manuscripts. The answer to that question, I contend, is emphatically yes. According to numerous early colonial sources, the Nahua used pictorial images to record information on numerous subjects including history, religion, mythology, law, taxes, military campaigns, geography, and even childrearing (see Chapter 1). Given the extraordinary accomplishments of their ancestors in domesticating the maize plant, of the Nahua horticulturists in manipulating the plant to produce cobs with different characteristics, and the plant's significance to their sustenance as well as to their religion and

culture, it would have been odd if the Nahua had *not* recorded botanical information about the maize plant in their manuscripts.

I do not mean to suggest that the manuscripts are science textbooks in a modern sense. Rather, in a pre-modern society, even one as advanced as the Nahua were, there was no strict separation of religion, mythology, and science. To the contrary, these realms were considered together as part of a group of related questions into the relationship between humans and the natural world. The pre-Columbian and colonial manuscripts of Central Mexico, and many other artifacts, reflect these inquiries. There was no more separation of religion and science in sixteenth century Central Mexico than there was in Europe at the time, where the Catholic Church sanctioned scientific findings. Indeed, as Galileo was to experience a century later, the Catholic Church declared what was permissible thought and what was heresy. The mixing of religion and science, although seemingly odd to the modern-day observer, was no more unusual in Europe at the time of the conquest than it was in the Americas. Accordingly, we should accept the notion that Nahua manuscripts include scientific information just as readily as we accept the uncontroversial and long-accepted proposition that the manuscripts and other artifacts reflect information about Nahua mythology and religion.

In light of what my dissertation has argued about plant sexuality, pollination, and the role of the gods in plant reproduction, should lead us to reconsider Nahua religious thought. Did the Nahua concept of "god" differ significantly from how those in other civilizations conceptualized it? How does the idea of evolution, or systematic changes in an organism, fit into Nahua religious philosophy? Since they understood of the licentious sex life of plants, and they even held in high regard goddesses of promiscuity, how did they perceive the institution of marriage and human coupling outside science, ritual, and religion? A related line of inquiry would be to

probe how religious rituals conveyed scientific information about plants, some of this, I analyzed in this dissertation.

There are to be sure certain limitations and obstacles to pre-Columbian and early colonial study of material culture in general and maize and plant imagery in particular. It may seem intuitive that one of the most formidable obstacles to accepting the notion that Central Mexican artifacts reflect scientific information about plants would be that our own field is not inclined to embrace such a radical new hypothesis. Perhaps another related obstacle would be that there is a dearth of material and/or supportive evidence given the terrible loss of human life and wholesale destruction of Mesoamerican artifacts in the immediate aftermath of the conquest. Nevertheless, the greatest challenges, I think, lie elsewhere. Chief among them is the uphill battle in challenging the strict categories and definitions of the established paradigm that has determined that the West is the recorder and disseminator of scientific knowledge and the rest, particularly indigenous civilizations, are mere passive recipients. Such an approach ignores the botanical accomplishments of the people of Central Mexico, rejects the possibility that Nahua artifacts could reflect scientific knowledge, and negates the likelihood that the artifacts could have any significance outside that paradigm.

Indigenous peoples are autonomous contributors to the history of science, but we discuss little of this in the humanities. My dissertation should cue us to reevaluate how the discovery of the "New World" contributed to the Scientific Revolution that developed throughout seventeenth and eighteenth century Europe. Closer examination of the information in the encyclopedic oeuvre of the Spanish doctor Francisco Hernández and the friar Bernardino de Sahagún, which they compiled in collaboration with some of the most learned Nahua of the day, can provide further information to probe this question. Prior to contact with the Americas, in Europe botany

seems to have lagged far behind other fields of scientific inquiry. European herbals before the Age of Exploration appear to be suffused in myth, superstition, and misunderstanding about the nature of plants. To what extent was this due to religious constraints? Did the absence of such constraints allow Nahua botanists to develop knowledge in this area that was far beyond that of their European counterparts? In what ways did plant representations in European art change as a result of the exploration of the natural world in the Americas? In what ways, or to what extent, did plant imagery in European art reflect the vigorous exchange of botanical information that occurred in the sixteenth century?

The Western gaze—that is, the notion that Nahua artifacts can be evaluated and therefore their depth and meaning exists *only* in relation to European artifacts and accomplishments—has been detrimental to the advancement of knowledge and critical thinking. Nevertheless, overcoming this bias so that the material culture that the Nahua produced can reveal to us information about the extraordinary accomplishments with plants achieved by the indigenous people of Central Mexico rests within our hands and power.

Figure 1.1. Horticulturist studying a manuscript, *Florentine Codex*, Book 10, Chapter 12, titled "De otra manera de officiales como son labradores y mercaderes" (Of other types of officers such as laborers and merchants), detail of folio 29v (Sahagún 1979: vol. 2).



Figure 1.2. Farmers in maize field, *Florentine Codex*, Book 10, Chapter 12, titled “De otra manera de officiales como son labradores y mercaderes” (Of other types of officers such as laborers and merchants), detail of folio 29r (Sahagún 1979: vol. 2).



Figure 1.3. Soothsayer with manuscript, *Florentine Codex*, Book 6, Chapter 36, titled "De cómo los padres de la criatura hacian llamar a los adivinos" (Of how the parents of the newborn summoned the soothsayers), detail of folio 168v (Sahagún 1979: vol. 2).



Figure 1.4. Soothsayer, *Florentine Codex*, Book 4, Chapter 14, titled “De las postreras cuatro casas deste signo” (Of the last four houses of this day sign), detail of folio 34v (Sahagún 1979: vol. 1).



Figure 1.5. Singer with manuscript, *Florentine Codex*, Book 10, Chapter 8, titled "De otros oficiales, como son carpinteros y canteros" (Of other officers, such as carpenters and stone cutters), detail of folio 19v (Sahagún 1979: vol. 2).



Figure 1.6. Ruler discussing war strategy using manuscript, *Florentine Codex*, Book 8, Chapter 17, titled “De las cosas en que se exercitavan, los señores para regir bien su Reyno” (Of the things that the Lords exercised in order to perform well in their rulership), detail of folio 33v (Sahagún 1979: vol. 2).



Figure 1.7. Judge with manuscript, *Florentine Codex*, Book 8, Chapter 17, titled “De las cosas en que se exercitavan, los señores para regir bien su Reyno” (Of the things that the Lords exercised in order to perform well in their rulership), detail of folio 37v (Sahagún 1979: vol. 2).



Figure 1.8. Painter-scribe (*tlacuilo*) using a reed pen, *Florentine Codex*, Book 11, Chapter 11, titled “De los colores, de todas maneras de colores” (Of colors, of all manners of colors), detail of folio 219r (Sahagún 1979: vol. 3).



Figure 1.9. Painter-scribe using a brush, *Florentine Codex*, Book 11, Chapter 11, titled “De los colores, de todas maneras de colores” (Of colors, of all manners of colors), detail of folio 219r (Sahagún 1979: vol. 3).



Figure 1.10. “Pintor” (male artist), *Codex Mendoza*, detail of folio 70r (Berdan and Anawalt 1992: vol. 3, 109).



Figure 1.11. “La pintora” (the female artist) *Codex Telleriano-Remensis*, detail of folio 30v (Quiñones Keber 1995).



Figure 1.12. Drawing images with precise contour lines (*tlilanianitla*), *Codex Borgia*, detail of page 23 (Anders, Jansen, and Reyes García 1993).



Figure 1.13. Painting techniques, *Codex Borgia*, detail of page 56 (Anders, Jansen, and Reyes García 1993).



Figure 2.1. Maize cobs painted in different colors, *Codex Borgia*, detail of page 24 (Anders, Jansen, and Reyes García 1993).



Figure 2.2. Maize cobs on male figure, *Codex Borgia*, detail of page 52 (Anders, Jansen, and Reyes García 1993).

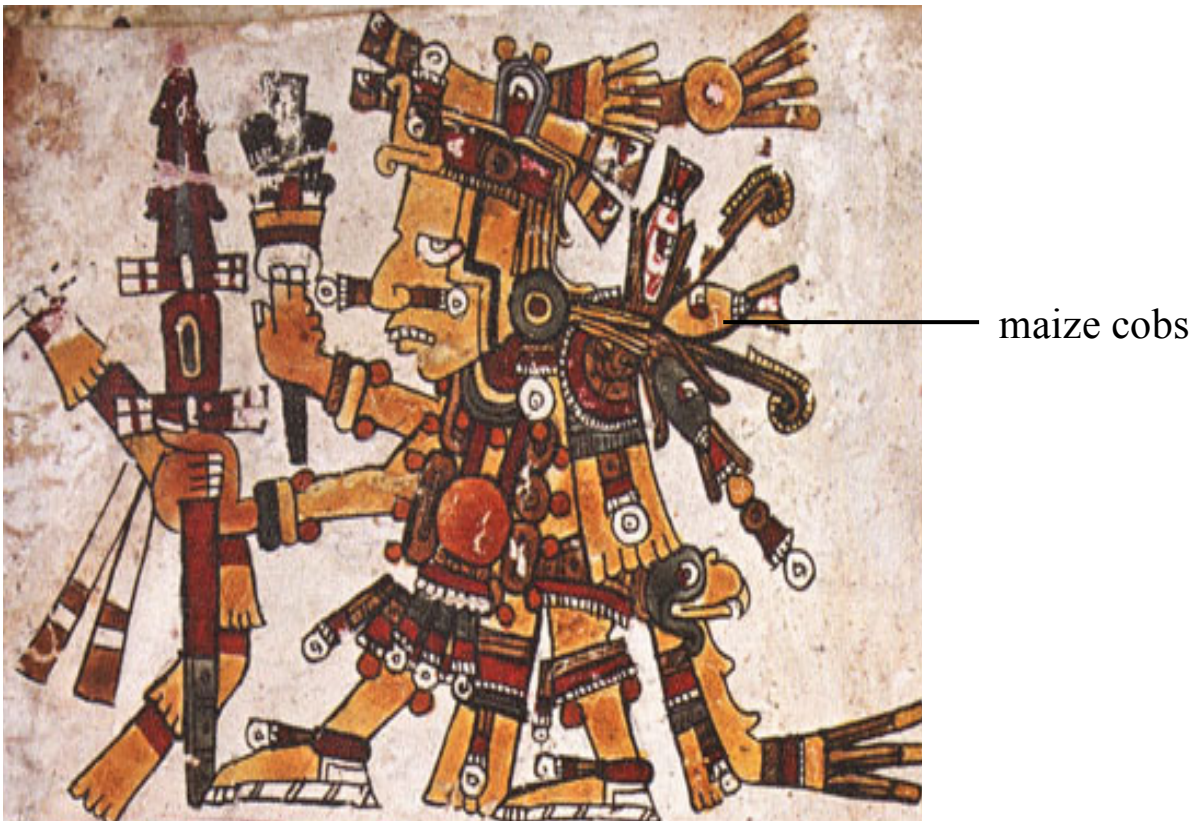


Figure 2.3. Choosing the best seed to plant ("mopepena in xinachtli; vel mocenquixtia"), *Florentine Codex*, Book 11, Chapter 13, titled "De todos los mantenimientos" (Of all type of sustenance), detail of folio 249r (Sahagún 1979: vol. 3).



Figure 2.4. Maize (right) compared to teosinte ears (left) (photographs by Hugh Iltis, 2010a, used with permission).



Teosinte



Maize

Figure 2.5. Archaeologist Richard MacNeish holding cob of early domesticated maize (Coe 1994: fig. 15).



Figure 2.6. Cobs recovered from archaeological excavations in the Tehuacán Valley (Mangelsdorf, MacNeish, and Galinat 1967a: fig. 122).

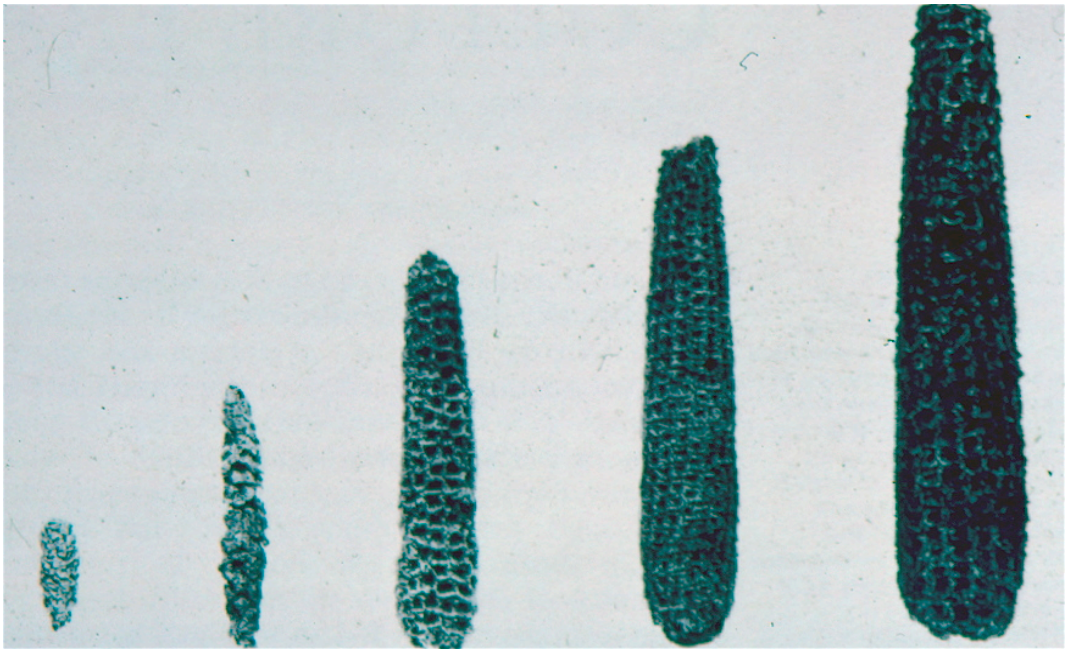


Figure 2.7. Wind carrying pollen from tassels to silks (adapted from Hayes 1963: fig. 1).



Figure 2.8. Comparision of maize and teosinte plants and their respective cobs (image by Nicolle Rager Fuller, National Science Foundation, 2009).

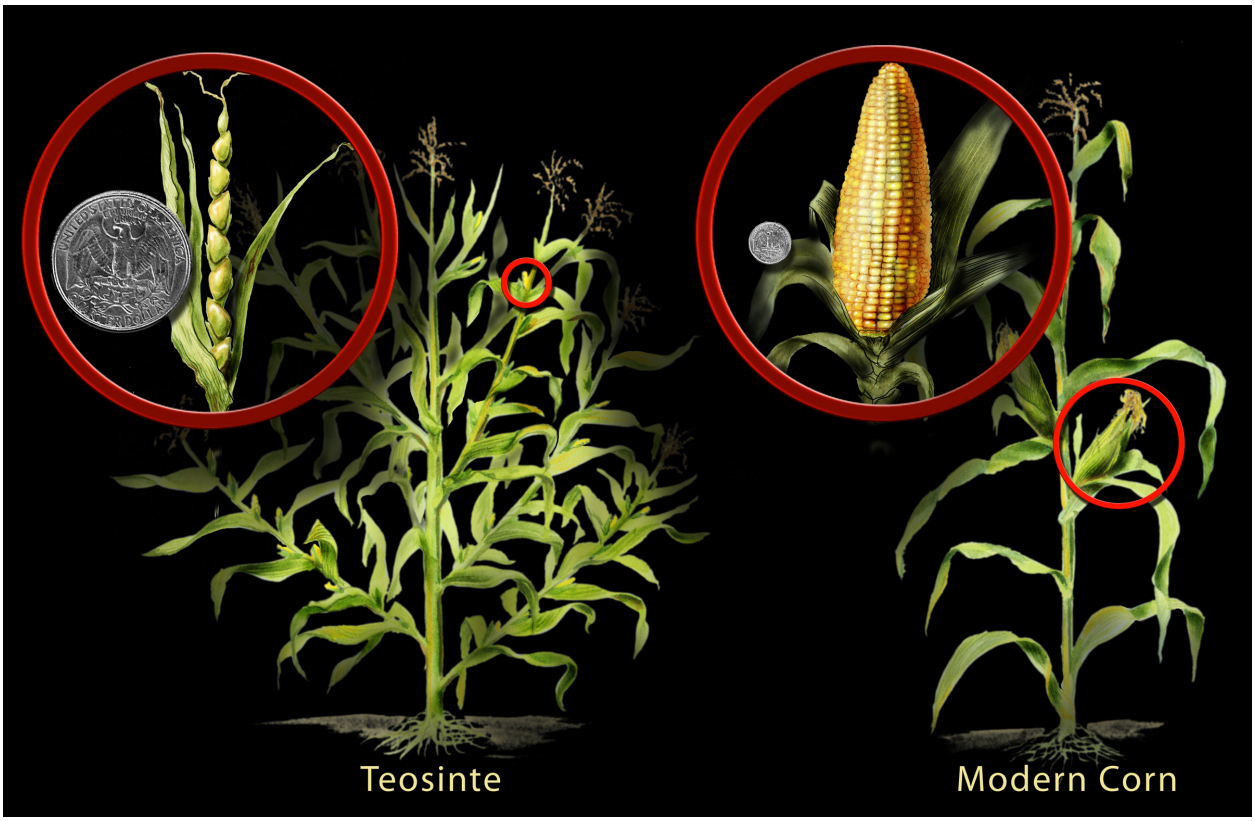


Figure 2.9. Maize and teosine, their crosses, and backcrosses (cross of hybrid with one parent) (photographs by John Doebley 2010a, used with permission).



F_1 generation
teosinte and maize crosses



F_2 generation
teosinte and maize backcrosses

Figure 2.10. Mature stony fruitcases (far left) covering the tesointe grains, which scientists discovered was caused by the gene mutant *Teosinte glume architecture 1*, widely known as *Tga 1* (photograph by Hugh Iltis, 2010b, used with permission).



Figure 2.11. “El preguntador” (One who asks questions), *El Libro de Chilam Balam de Chumayel* (Hernández 1959a: vol. 1, 224).



Figure 3.1. Males and females with maize, *Codex Borgia*, page 28 (Anders, Jansen, and Reyes García 1993).

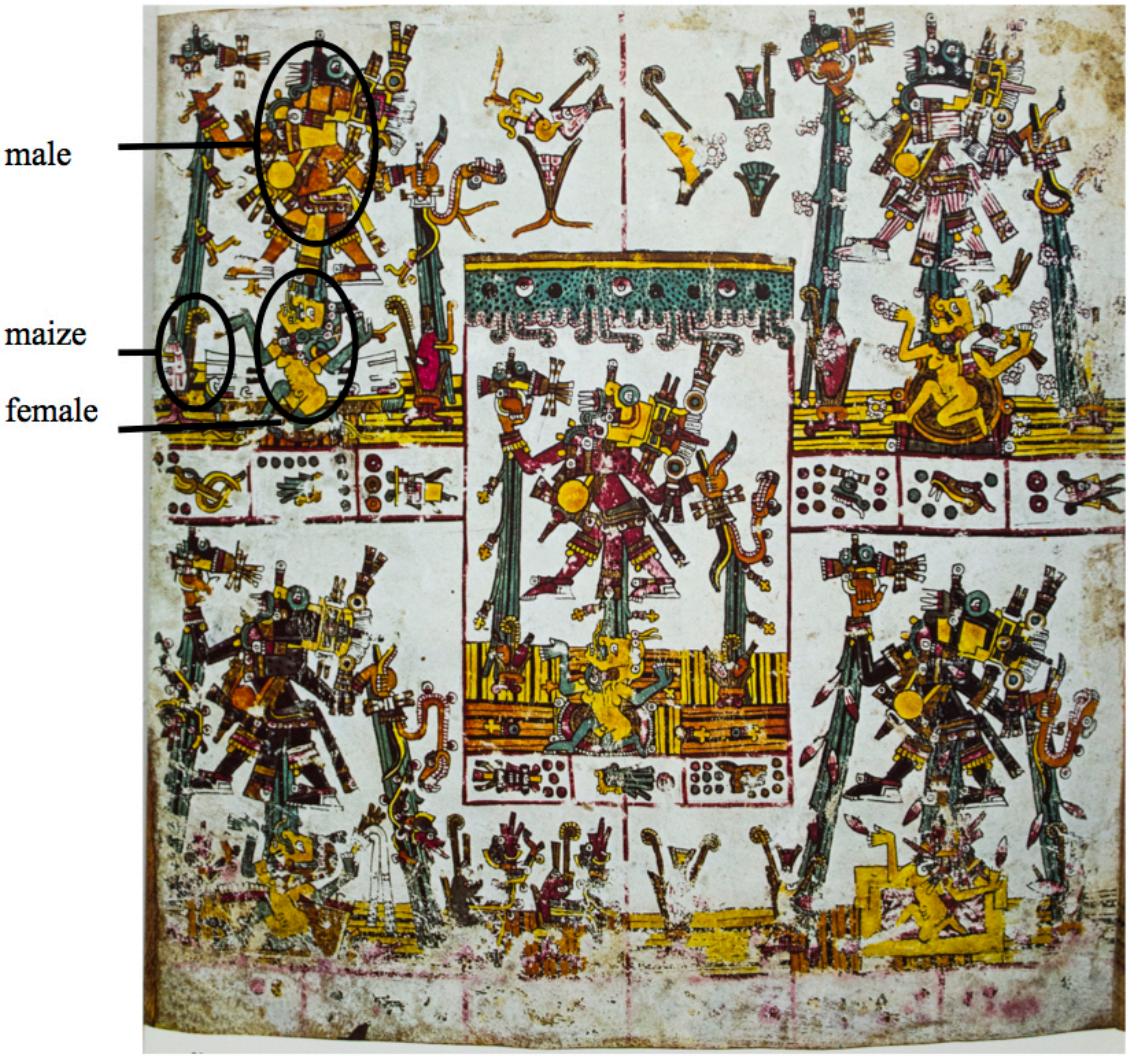


Figure 3.2. Maize plants, *Codex Borgia*, detail of page 28 (Anders, Jansen, and Reyes García 1993).

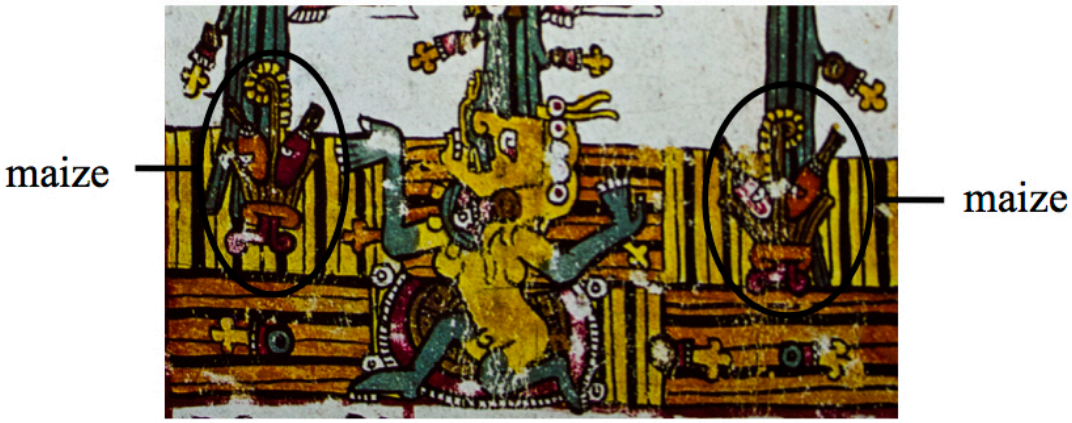


Figure 3.3. Headdress of Ehecatl-Quetzalcoatl (the god of wind), *Codex Borgia*, detail of page 28 (Anders, Jansen, and Reyes García 1993).



Figure 3.4. Calendrical symbols, *Codex Borgia*, detail of page 28 (Anders, Jansen, and Reyes García 1993).

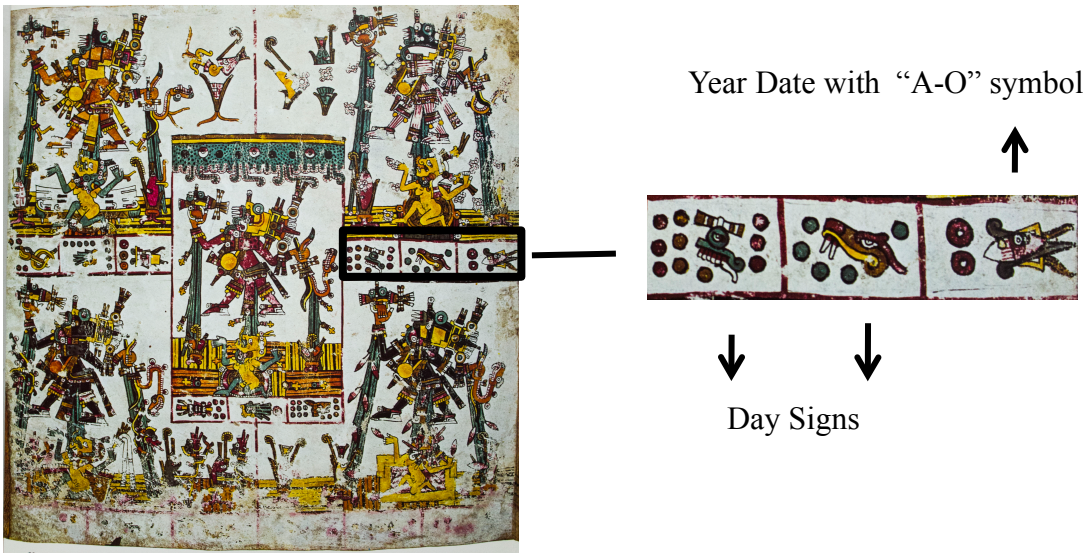


Figure 3.5. Tlaloc and maize, *Codex Borgia*, page 27 (Anders, Jansen, and Reyes García 1993).



Figure 3.6. Chac, the Maya god of rain, *Codex Dresden*, detail of page 37 (FAMSI n.d.-a).



Figure 3.7. Ehecatl-Quetzalcoatl's headdress on otherwise naked goddess and Tlaloc, as Tezcatlipoca, disseminating flint knives, *Codex Borgia*, detail (lower-right compartment) of page 28 (Anders, Jansen, and Reyes García 1993).

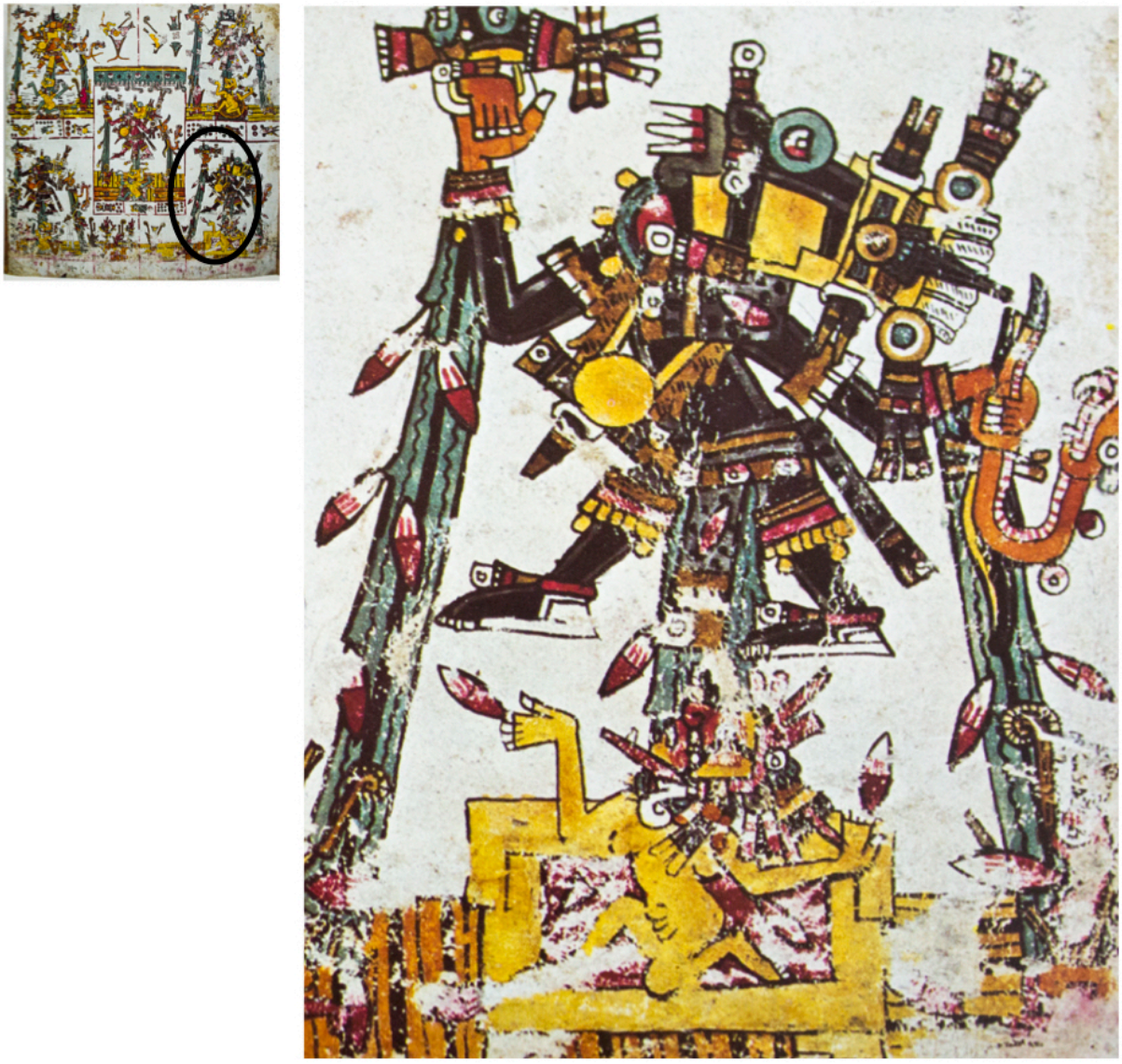


Figure 3.8. Tonacatecuhtli's vessel, *Codex Borgia*, detail of page 61 (Anders, Jansen, and Reyes García 1993).

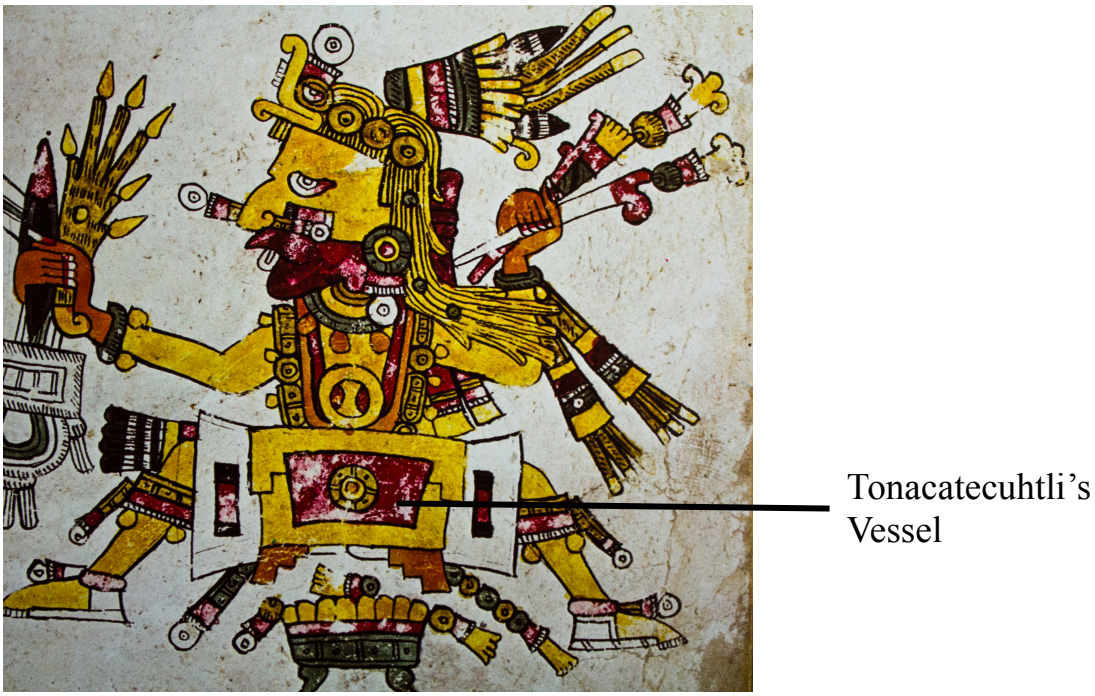


Figure 3.9. A male-female couple, their bodies intertwined in sexual intercourse (right), *Codex Vaticanus A*, detail of folio 13v (Anders and Jansen 1996).



Figure 3.10. Naked goddess as Xochiquetzal and Tlaloc as Tlahuizcalpantecuhtli, disseminating "red-spotted stones," *Codex Borgia*, detail (upper-right compartment) of page 28 (Anders, Jansen, and Reyes García 1993).





Figure 3.11. Naked goddess as Chalchiuhtlicue and Tlaloc as Xiutecuhtli, *Codex Borgia*, detail (upper-left corner) of page 28 (Anders, Jansen, and Reyes García 1993).

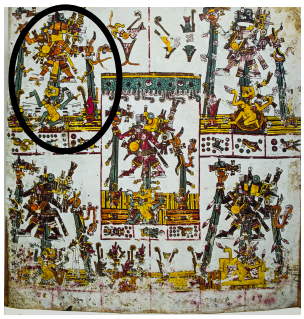




Figure. 3.12. Naked Goddess as Chalchiuhtlicue and Tlaloc as Quetzalcoatl, disseminating wind serpents, *Codex Borgia*, detail (lower-left corner) of page 28 (Anders, Jansen, and Reyes García 1993).

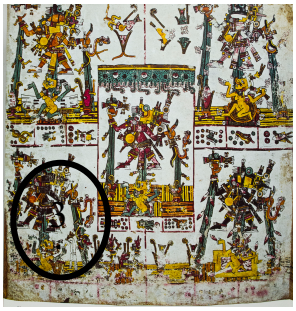
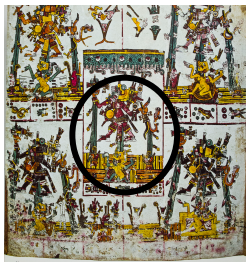




Figure 3.13. Naked Goddess as Chalchiuhtlicue and Tlaloc as Xochipilli, *Codex Borgia*, detail (center) of page 28 (Anders, Jansen, and Reyes García 1993).



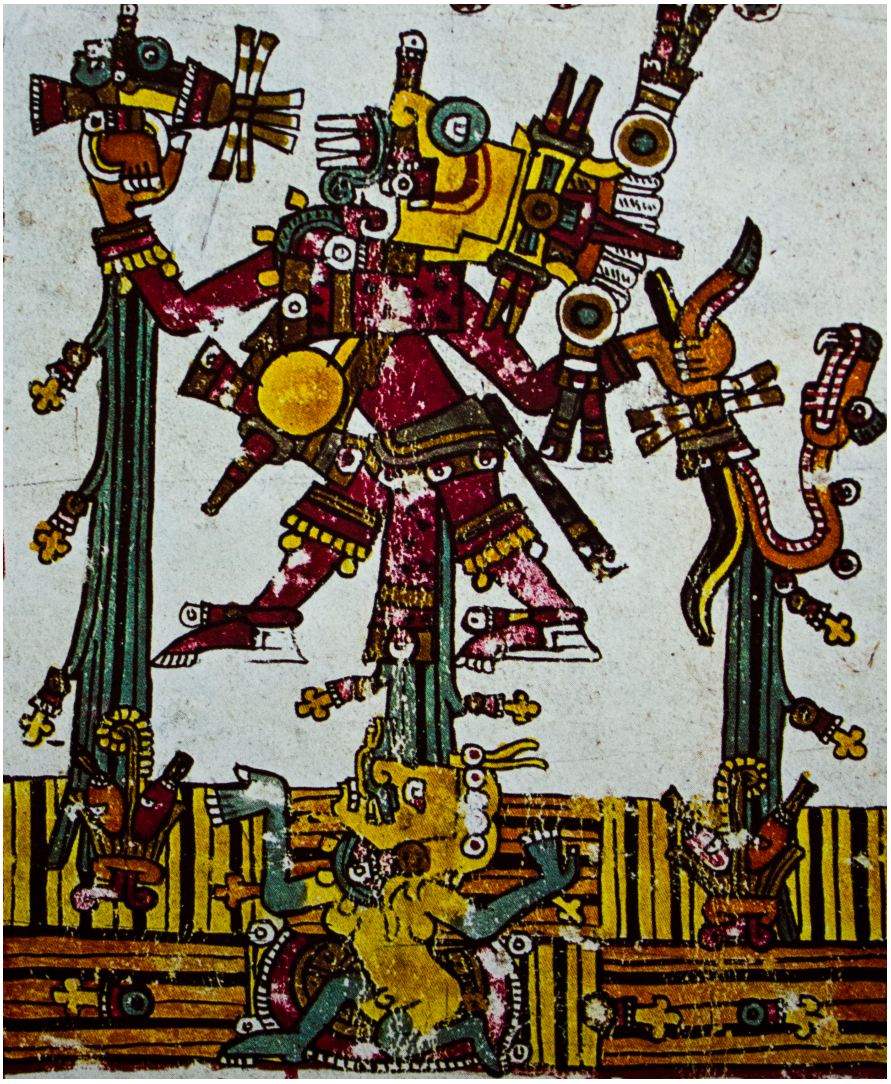


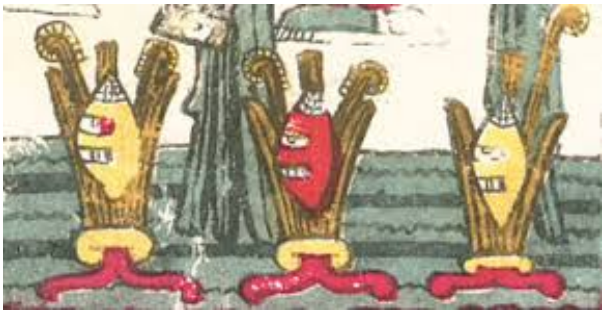
Figure 3.14. Stone relief of Tlaltecuhtli, the Earth Monster, whose womb is a *chalchihuitl* from where emerges 2 Acatl (2 Reed), Tezcatlipoca, Aztec, Late Postclassic period (1250–1521 CE), 86 cm (height), Museo Nacional de Antropología e Historia, Mexico City (Klein 1976: fig. 5; photographed by author).





Detail

Figure 4.1. Maize with anthropomorphic features, details of *Codex Borgia*, page 27 (left), and *Codex Fejérváry-Mayer*, page 34 (right) (FAMSI n.d.-a).



Codex Borgia, page 27

Detail



Codex Fejérváry-Mayer, page 34

Figure 4.2. Bone, feathers, flower, and pollinating bird in Ehecatl-Quetzalcoatl's headdress, *Codex Tudela*, detail of folio 42r (Tudela de la Órden 1980).



Figure 4.3. Bone, flower, and pollinating bird in Ehecatl-Quetzalcoatl's headdress, detail of *Selden Roll* (Burland 1955).



Figure 4.4. Bone, feathers, flowers, and pollinating bird in Ehecatl-Quetzalcoatl's headdress, *Codex Magliabechiano*, detail of folio 60v (FAMSI n.d.-a).



Figure 4.5. Bird impregnating or “pollinating” a human, detail of *Codex Laud*, page 30 (left) (FAMSI n.d.-a).



Figure 4.6. Coatlicue (Mother of Huitzilopochtli, the tutelary god of the Aztecs) with feathers on her head, *Florentine Codex*, Book 3, Chapter 1, titled “Del principio que tuvieron los dioses” (Of how the gods had their beginning), detail of folio 3v (Sahagún 1979: vol. 1).



Figure 4.7. Turkeys copulating, *Florentine Codex*, Book 11, Chapter 2, titled “De las aves” (Of birds), detail of folio 57r (Sahagún 1979: vol. 3).

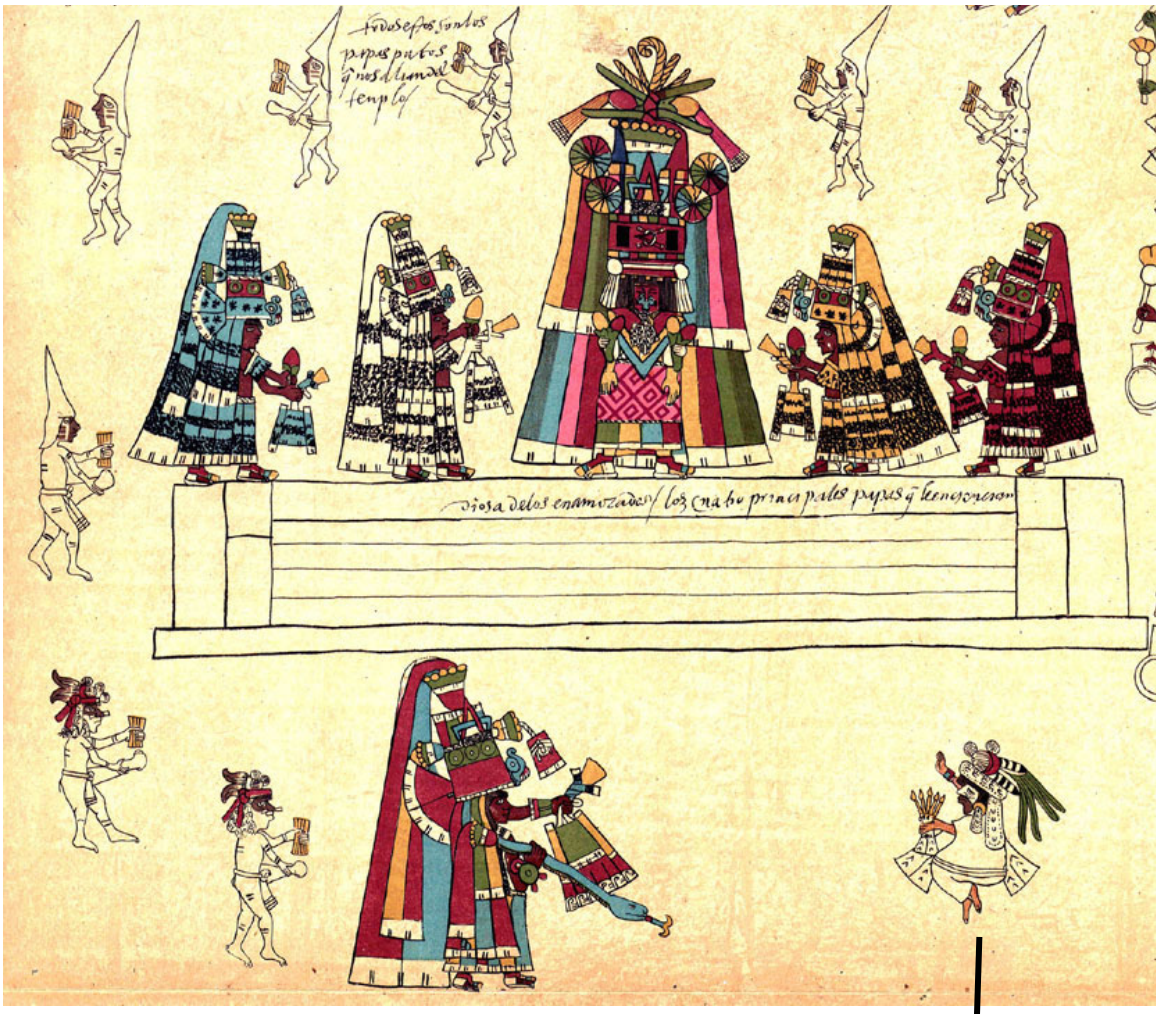


Figure 4.8. Tlazolteotl, Goddess of Sex and Debauchery, simultaneously conceiving (through her hair) and childbearing, *Codex Borbonicus*, detail of page 11 (FAMSI n.d.-a).



Figure 4.9. Tlazolteotl or Toci "Great Mother" with "putos" (male whores) marching towards her during the autumnal Aztec feast Ochpaniztli, *Codex Borbonicus*, detail of page 30 (FAMSI n.d.-a).

Males with overextended erections



Tlazolteotl, or Toci (Great Mother)

Figure 4.10. Ehecatl-Quetzalcoatl and Tlazolteotl, the goddess related to sexual lust and childbearing, *Codex Laud*, detail of page 39 (FAMSI n.d.-a)

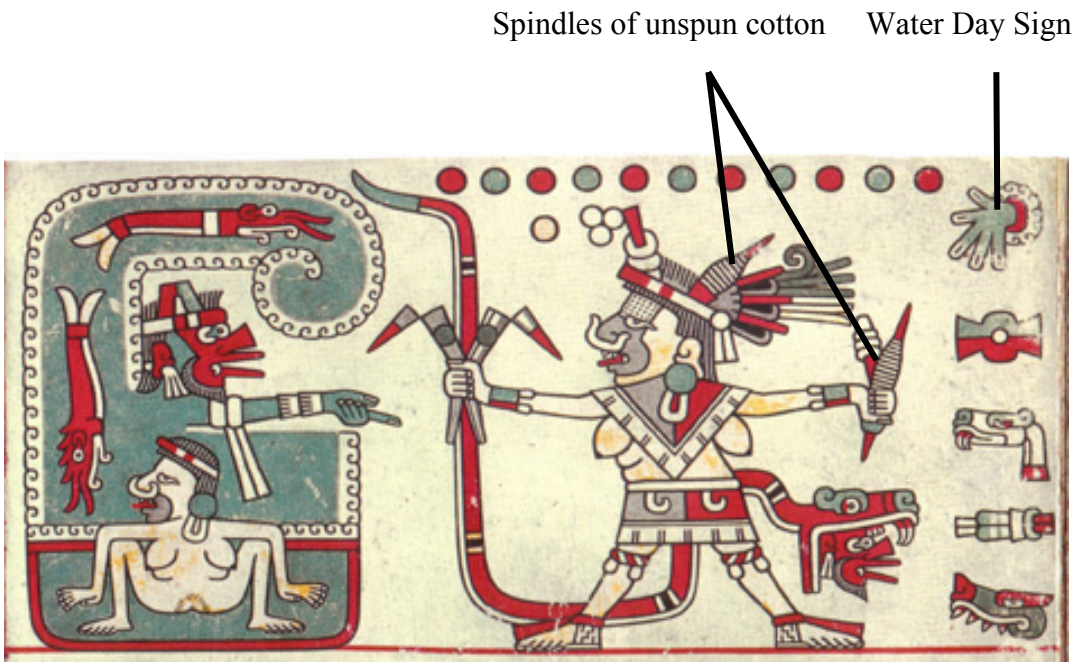


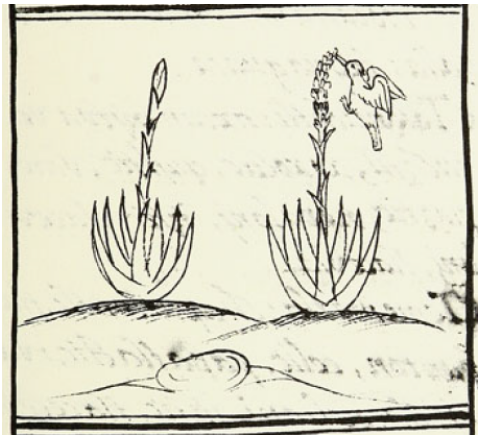
Figure 4.11. Serpent Quetzalcoatl, *Florentine Codex*, Book 11, Chapter 5, titled “De las serpientes y otros animales de tierra de diversas maneras” (Of serpents and other types of animals that live on the ground), detail of folio 89v (Sahagún 1979: vol. 3).



Figure 4.12. Eggshells scattered on ground during Xochilhuitl (Feast of Flowers), celebrated in honor of the goddess Chicomexochitl (Seven Flowers), *Codex Magliabecchino*, detail of folio 46v (FAMSI n.d.-a).



Figure 4.13. Birds pollinating flowers (right) and small maguey (*tziuactli*) (left), *Florentine Codex*, Book 11, Chapter 2, titled "De las aves" (Of birds), detail of folio 24r; and Book 11, Chapter 7, titled "En que se trata de todas las yerbas" (About all the herbs), detail of folio 201r. (Sahagún 1979: vol. 3).



a) bird pollinating maguey (*tziuactli*), folio 201r



b) pollinating hummingbirds, folio 24r

Figure 4.14. Birds and butterflies pollinating flowers, details from the *Florentine Codex*, Book 11, Chapter 7, titled "En que se trata de todas las yerbas" (About all the herbs): a) *cacauaxochitl*, folio 188v; b) *uitztecolxochitl*, folio 190r (Sahagún 1979: vol. 3).



a) *cacauaxochitl*, detail of folio 188v



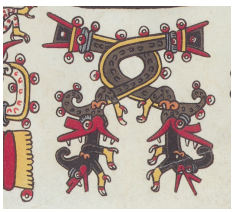
b) *uitztecolxochitl*, detail of folio 190r

Figure 4.15. Birds pollinating the maguey's blossoms (*quiiosuchitl*), *Florentine Codex*, Book 11, Chapter 7, titled "En que se trata de todas las yerbas" (About all the herbs), detail of folio 197v (Sahagún 1979: vol. 3).

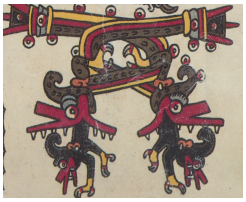


Figure 4.16. Flying, *Codex Borgia*, details of pages 29 through 46 (Díaz and Rodgers 1993).

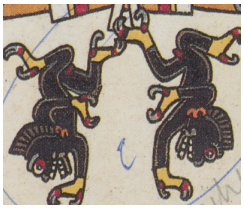
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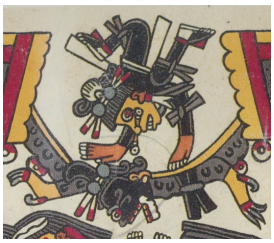
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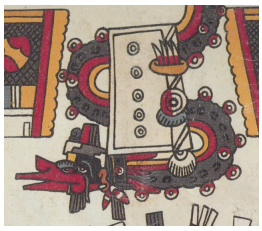
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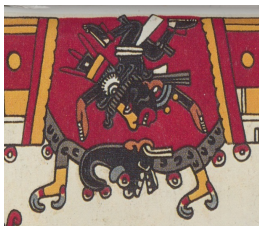
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44



46



46



Figure 4.17. Male flying out of page carrying maize bundle on his back, *Codex Borgia*, detail of page 43 (Díaz and Rodgers 1993).



Figure 4.18. Ehecatl-Quetzalcoatl figures flying out of a large vessel, *Codex Borgia*, detail of page 29 (Seler 1963).

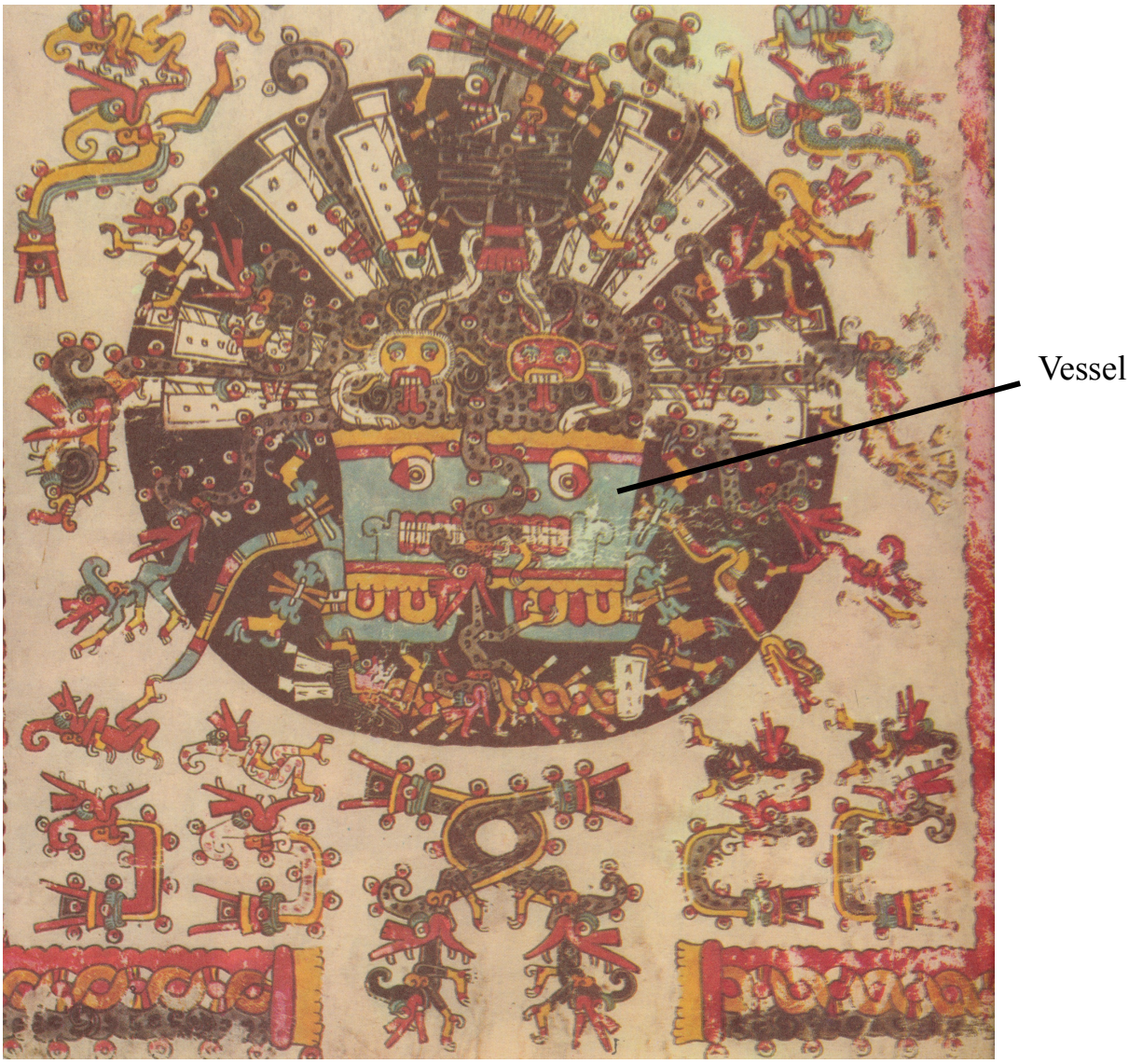


Figure 4.19. “Caña de maíz en la mano, denotando fertilidad, and . . . Olleta, que era decir que bien podían comer sin temor . . . que no había que tener hambre” (Maize plant in hand denoting fertility, and . . . [The] pot meant that one could they could very well eat without fear . . . that there would be no famine), *Historia de las Indias de Nueva España e Islas de la tierra firme*, detail of folio 331v (Durán 2005 [1579]).



Figure 4.20. Plant emerging from Ehecatl-Quetzalcoatl serpent, *Codex Borgia*, detail of page 29 (Díaz and Rodgers 1993).



Figure 4.21. Ehecatl-Quetzalcoatl, plants, and the twenty day signs of Central Mexican calendar, *Codex Borgia*, detail of page 30 (Seler 1963).



Figure 4.22. Pollen on maize plant, *Codex Telleriano-Remensis*, detail of folio 43r (left) (Quiñones Keber 1995); and on Ehecatl-Quetzalcoatl, holding a digging stick, *Primeros Memoriales*, detail of folio 282 (right) (Sahagún 1993).



Maize



Ehecatl-Quetzalcoal

Figure 4.23. Dots surrounding hummingbirds' beaks in Late Postclassic Maya manuscripts, *Codex Madrid*, detail of page 34 (from FAMSI n.d.-a); *Codex Madrid*, detail of page 23 (Seler 1996a: fig. 394); and *Codex Dresden*, detail of page 6 (Seler 1996a: fig. 389).



Codex Madrid, page 34



Codex Madrid, page 23



Codex Dresden, page 6

Figure 4.24. Hummingbird with dots on beak polychrome on Maya vase dating from the Classic period (ca. 250–1000 CE) (Taube 1987: fig. 2b).



Figure 4.25. Ehecatl-Quetzalcoatl serpent transporting flowers, birds, butterflies, pots, and Quetzalcoatl figures on his body, *Codex Borgia,* page 36, and details of pages 37, and 38 (Díaz and Rodgers 1993).



Figure 4.26. Maize and *metl* (maguey) emerging from Ehecatl-Quetzalcoatl's beak, *Codex Borgia*, detail of page 36 (Díaz and Rodgers 1993).



Figure 4.27. Colossal stone sculpture of a rattlesnake with maize cobs emerging from the scales on its body, Aztec, Late Postclassic period (1250–1521 CE), 99.8 x 138 x 56 cm, Museo Nacional de Antropología e Historia, Mexico City (photographed by author).



Figure 4.28. Bundle on Ehecatl-Quetzalcoatl, *Codex Borgia*, detail of page 36 (Díaz and Rodgers 1993).

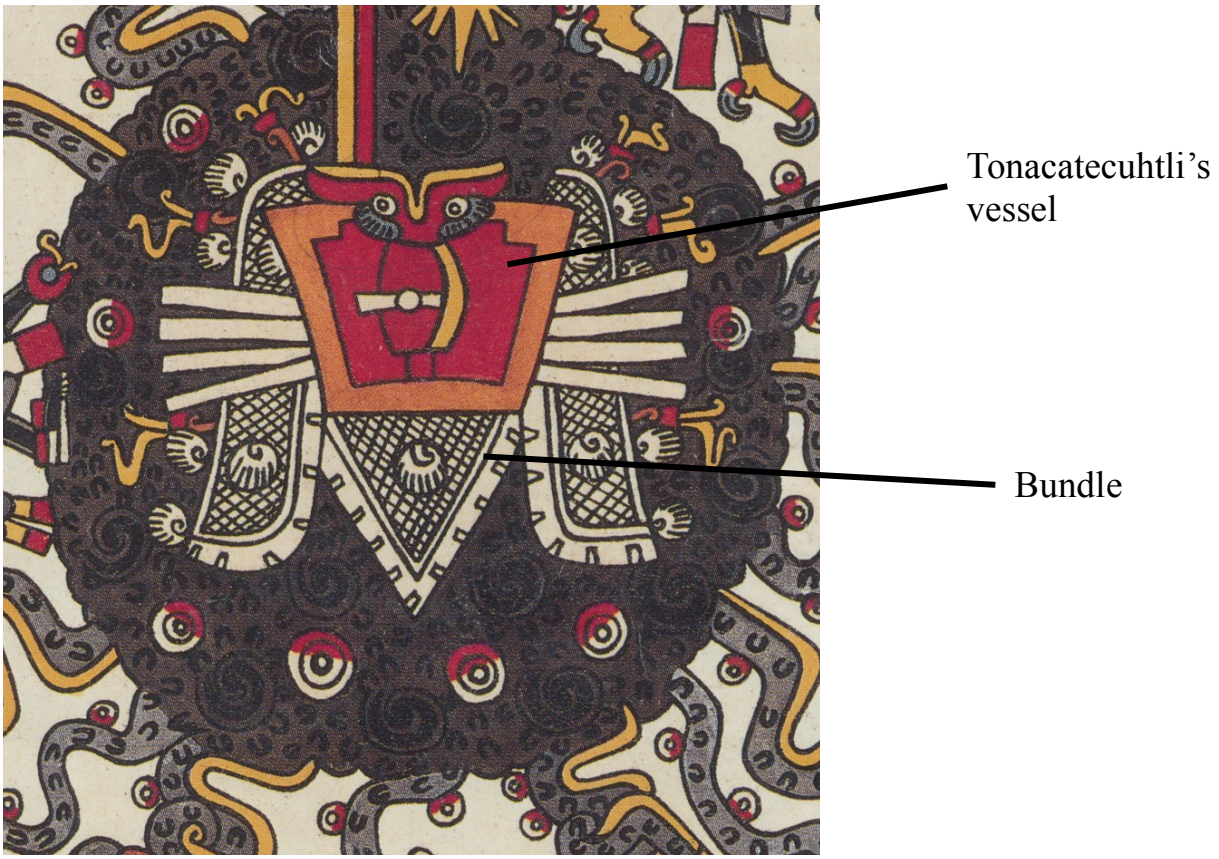


Figure 4.29. Bones and yellow bloom on Ehecatl-Quetzalcoatl's headdress, *Codex Borgia*, detail of page 23 (Anders, Jansen, and Reyes García 1993).



Figure 4.30. Ehecatl-Quetzalcoatl (god of wind) wearing conch-shell pectoral and Mictlantecuhtli (Lord of Underworld) back to back, *Codex Borgia*, detail page 73 (Anders, Jansen, and Reyes García 1993).



Figure 4.31. Mictlantecutli holding a staff and Ehecatl-Quetzalcoatl holding a *coa*, digging stick, symbolic of planting in Nahua society, *Codex Borgia*, detail of page 56 (left) (Anders, Jansen, and Reyes García 1993); and conch shell painted white with red dots, the same motif used in painting Mictlantecuhtli's staff, *Codex Borgia*, detail of page 45 (right) (Anders, Jansen, and Reyes García 1993) 45 (right) (Díaz and Rodgers 1993).



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Figure 4.32. Bone piercing bird in sky during two different Aztec agrarian feasts, *Historia de las Indias de Nueva España e Islas de la tierra firme*, details of folios 328r (left) and 329r (right) (Durán 2005 [1579]).



Tozontontli (piercing), folio 328r



Huey Tozontontli (great piercing), folio 329r

Figure 5.1. Grass (*malinalli*) day sign glyphs, each depicted as a plant growing out of a skeletal jaw, *Codex Cospi*, detail of page 1; and *Codex Borgia*, detail of page 15 (from FAMSI n.d.-a).



Codex Cospi, detail of page 1



Codex Borgia, detail of page 15

Figure 5.2. Grass (*malinalli*) day sign glyphs, each depicted as a skeletal jaw with teeth (no plant elements), *Codex Fejérváry Mayer*, detail of page 33; and *Codex Laud*, detail of page 24 (from FAMSI n.d.-a).



Codex Fejérváry-Mayer, detail, page 33



Codex Laud, detail, page 24

Figure 5.3. Striking resemblance between the *malinalli* grass (here as day sign glyph) and the maize plant depictions, *Codex Borgia*, details of page 20 (Anders, Jansen, and Reyes García 1993).



malinalli



maize

Figure 5.4. Comparison of maize plants and teosinte (*Zea mays* ssp. *parviglumis*) grass, their fruit (cobs), and kernels (photographed, upper right by author, 2012; upper left by Hugh Iltis, 2010c; and below by Beadle 1978: fig. 1).



Maize (*Zea mays* L.) plant



Teosinte (*Zea mays* ssp. *parviglumis*)

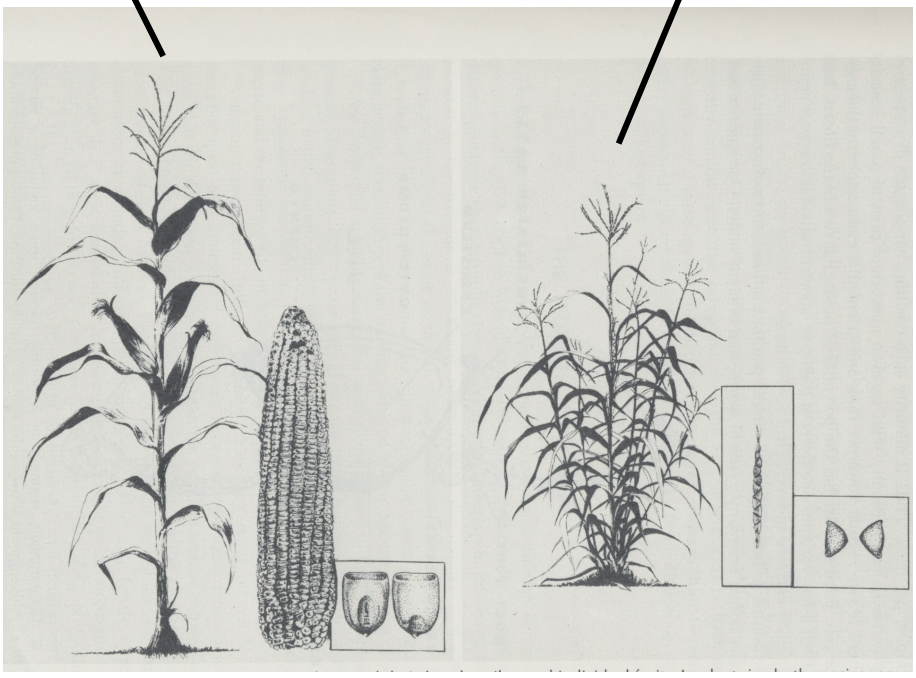
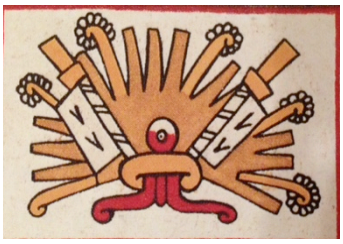


Figure 5.5. Grass (*malinalli*) day sign glyphs depicted as plants (no skeletal features), *Codex Borgia*, detail of page 18 (Díaz and Rodgers 1993); the *Florentine Codex*, Book 4, Chapter 28, titled "De las malas condiciones de las mujeres que nacían en este signo" (Of the bad conditions of women born on this day sign), detail of folio 27r (Sahagún 1979: vol. 1); and *Historia de las Indias de Nueva España e Islas de la tierra firme,* folio 340v (Durán 2005 [1579]).



Codex Borgia, page 18



Florentine Codex, Bk. 4, Ch. 28, folio 27r



Historia de las Indias, folio 340v

Figure 5.6. Grass (*malinalli*) day sign glyphs, each depicted as blades growing out of a skeletal mandible with teeth, *Codex Borgia*, detail of page 23 (Anders, Jansen, and Reyes García 1993), and page 52 (Díaz and Rodgers 1993).



Codex Borgia, detail of page 23



Codex Borgia, detail of page 52

Figure 5.7. Grass (*malinalli*) day sign glyphs, each depicted as a plant growing out of a skeletal jaw with grass blades resembling hair, *Codex Borbonicus*, detail of page 1 (Anders, Jansen, and Reyes García 1991); and *Codex Vaticanus A* (also known as the *Codex Rios*), detail of folios 14r (Anders and Jansen 1993).



Codex Borbonicus, page 1



Codex Vaticanus A, folio 14r

Figure 5.8. Grass (*malinalli*) day sign glyphs with tassels, *Codex Laud*, detail of page 40; and *Codex Vaticanus B*, detail of page 8 (both from FAMSI n.d.-a).



Codex Laud, page 40



Codex Vaticanus B, page 8

Figure 5.9. Malinalli grass, *Codex Badianus*, detail of folio 12v (De la Cruz 1964 [1552]).



Figure 5.10. Skeletal jaws on a male and female figure (a couple), each identified by the calendrical name 1 Deer, *Codex Vindobonensis,* detail of page 51 (Anders, Jansen, Pérez Jiménez 1992).



Figure 5.11. Shooting *malinalli* and *nopal* (cactus), *Historia Tolteca Chichimeca*, folio 12v (Gallica, 2013 [ca. 1549]).



Malinalli Cactus

Figure 5.12. Rope, details from the *Codex Borbonicus*: a) Tlazolteotl's offspring holding intertwined rope, detail of page 11; and b) maize plant with tassel resembling rope, detail of page 30 (FAMSI n.d.-a).



Tlazolteotl's offspring holding intertwined rope



Maize plant with tassel resembling rope

Figure 5.13. Rope representing filial or consanguineal ties; here a Tlaxcallan Lord, Ocelotzin with his descendants, *Genealogía de Quauhtliztactzin*, detail (Boone 2011: fig. 9.16).

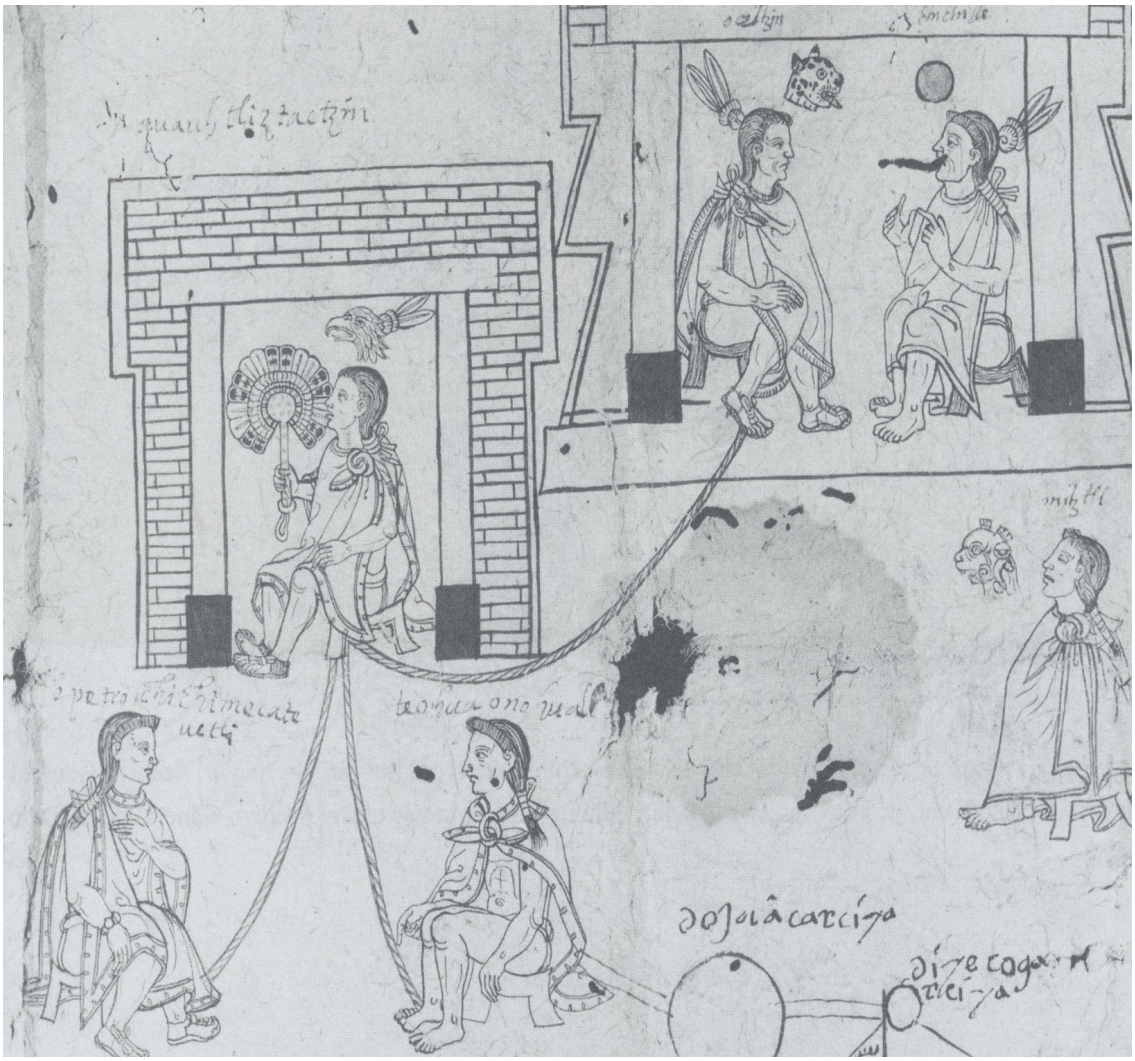


Figure 5.14. Sculpture in basalt stone with maize (left) and grass (right) reliefs, Aztec, Late Postclassic period (1250–1521 CE), 29.5 x 47 x 41 cm, Museo Nacional de Antropología e Historia, Mexico City (photographed by author).



Figure 5.15. The *malinalli* grass on a goddess, *Codex Borgia*, detail of page 34 (Díaz and Rodgers 1993).



Figure 5.16. Death Bundle of a high-ranking official or gentleman, *Codex Tudela*, detail of folio 57r (Tudela de la Orden 1980).



Figure 5.17. Plant as nourishment during each "Sun" or "Age" in Nahua creation stories, *Codex Vaticanus A*, details of folios 4v, 5v, 6r, 7r, and 7v (Anders and Jansen 1996).



Folio 4v – First Age



Folio 7r – Forth Age



Folio 5v – Second Age



Folio 7v – Fifth Age



Folio 6r – Third Age

Figure 5.18. A grass called *cocopi*, very similar to maize ("Una yerba que se llama *cocopi*, muy semejante al mayz"), *Florentine Codex*, Book 11, Chapter 7, titled "Itechpa tlatoa, in ixquich in nepapan xihuitl" (Which telleth of all the different grasses), detail of folio 177r (Sahagún 1979: vol. 3).



Figure 5.19. Of the *Texcocan çenanam*, or the mother of maize. The çenanam of Texcoco that others call *cenantli* and *centlinan* is a grass with abundant, oblong leaves . . . ("De Çenanam Tezcoquensi seu matre spicae maizij. Çenanam Tezcoquensi, quam alij çenantli, alij uero centlinan uocant, herba est folia proferens ampla . . ."), in Francisco Hernández, *Nova plantarvm, animalivm et mineralivm Mexicanorvm* (Hernández 1651: 185); and teosinte cob (left) and maize cob (right) (Vollbrecht and Sigman 2005: fig. 2).



Texcocan çenanam



teosinte maize cob

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