

HOW DRAWING BECOMES WRITING: PROTO-ORTHOGRAPHY

IN THE CODEX BORBONICUS

Taylor Bolinger

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APPROVED:

John 'Haj' Ross, Major Professor

Timothy Montler, Minor Professor

Jongsoo Lee, Committee Member

Brenda Sims, Chair of the Department of

Linguistics and Technical

Communication

Mark Wardell, Dean of the Toulouse Graduate
School

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The scholarship on the extent of the Nahuatl writing system makes something of a sense-reference error. There are a number of occurrences in which the symbols encode a verb, three in the present tense and one in the past tense.

The context of the use of calendar systems and written language in the Aztec empire is roughly described. I suggest that a new typology for is needed in order to fully account for Mesoamerican writing systems and to put to rest the idea that alphabetic orthographies are superior to other full systems. I cite neurolinguistic articles in support of this argument and suggest an evolutionary typology based on Gould's theory of Exaptation paired with the typology outlined by Justeson in his "Origins of Mesoamerican Writing" article.

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CHAPTER 1

INTRODUCTION

*Whence did the wondrous mystic art arise,
Of painting speech, and speaking to the eyes?
That we by tracing magic lines are taught,
How to embody, and to color thought?*

-William Massey

There is something of a contradiction implicit in much of the literature on the subject of the evolution of world literacy. On the one hand, it is typically argued that writing, the concept that inscribed characters could stand in for speech, has only been invented twice in the history of humanity, in Sumer and in Mesoamerica. The truth of this claim is difficult to determine, but to accept it for the sake of argument; it begs the question of why the vast majority of writing on the subject treats only the Indo-European and Semitic-derived system, with some treatment of Chinese and Indic writing; while dedicating only a brief gloss to the rich and fascinating scribal tradition in Mesoamerican societies. Even when it is treated on, the analysis typically only touches on Mayan writing, ignoring the interrelated Zapotec, Epi-Olmec and Aztec traditions, all of which beg some serious questions about the way systems of writing are adapted by the societies that take them up, and about the way that societies that adopt writing systems adapt because of them.

This claim should not be taken too personally by those researchers who have previously written on this subject. The Mayan writing system was only decoded in the last fifty years, and the Zapotec/Epi-Olmec/Aztec system has yet to be fully understood. Both systems work in a manner that is profoundly difficult for a contemporary thinker, particularly one schooled in

alphabetic orthography, to wrap their mind around. The effort, I argue, is worth it for the enlarged conceptual space they allow when the myriad questions implicit in written language are considered. Because considering the variety of forms by which humans have encoded meaning to be reinterpreted at a time and place removed from that of its inscription raises a number of large questions about the way that we have historically considered this meaning to work.

So, to return to the central, deeper question that underlies all this; what then is writing? On its surface, this may seem to be a relatively simple question. But even within a single culture, the variety of possible answers is manifold. Is it merely any sensible mark from which meaning can be derived? It must be more exact than that, for if that were the case, how would we distinguish between footprints left as markers and a fully articulated system of communication (cf. Ong 2002)?

But the question penetrates further still. Is it based upon the use it is put to? If we take use as a definitional basis, a poet might consider writing to be the expression of some inner core of their being. To a businessperson, it could simply be a matter of documentation or a means to facilitate commerce. For many, especially among less privileged groups, it is a struggle; something difficult for them to do that causes much anxiety about the quality of their result. So use must be ruled out, because in all cases, it is assumed to make use of an alphabet and to be to some extent permanent.

Ask a linguist, and they're likely to tell you something like 'Writing is a second-order phenomenon in language dealing with the graphical representation of encoding and decoding information by use of glyphic symbols on a physical medium'. A pretty good answer; and one

with which it may seem difficult to disagree, both because of its technical nature and because of the huge scope of cases to which it is applicable. The accuracy of describing writing as a second-order phenomenon is debatable given recent neurolinguistic evidence however. At a fundamental level, writing is really a technology (cf. Ong 2002; McLuhan 1967). It is an interface invented in several places around the world largely for the purposes of both record keeping and for the transmission of one manner or other of functional information.

When the technology is invented multiple times in widely dispersed geo- graphical locations, it tends to take on a different form in each place. The general consensus is that the cultures of Sumer, China, Mesoamerica, the Indic peoples, and probably Egypt all came to writing without the need for cultural diffusion. All other cultures either borrowed either their script or the idea of a script from their neighbors. The general consensus in linguistics has been that there is only an arbitrary connection between the respective levels at which language functions. For instance, the relationship between syntax or phonology and semantics is arbitrary, the sound of a word or the structure of a sentence has no relationship to the meaning of the word or sentence. The word dog and the animal dog are grouped only by their association in the mind of the speaker. Such claims are beyond the scope of this essay but it is cogent to note that, for instance, a language learner would be unable to pick up the Chinese script from a Chinese-Chinese dictionary. The shape of the glyphs bears only a passing resemblance to what they represent, if any at all.

The relationship between phonetics, syntax, semantics, and orthography –or writing– is supposed to be arbitrary as well. In fact this relationship is described as being doubly arbitrary, as it is one level above even spoken language as a whole. However, there are principally two

distinct ways in which systems of writing come about, via iconography and via numerals (cf. Justeson 1986), and it may be ventured that the origin of a particular system of writing has some impact on the development of the form which it ultimately takes. Because of writings ubiquity in contemporary society, it is easy to forget the outer contours of writing as an invented thing and equate it in a one to one manner with spoken language and language-oriented thought.

When this happens, what was an encoding of the stream of consciousness onto a blank page may become lost in the abstract logical space that the technology both makes possible and structures according to the particularities of its technological form (cf. McLuhan 1967).

This is particularly a problem in the study of historical texts. By virtue of their removal from the contemporary reader in space and time, it is more difficult to visualize their use in practice. When this happens, the text tends to be treated merely a set of symbols in an abstract logical independent of cultural context rather than an instrument of information transfer in the lives of the people who inscribed it. It becomes a sort of instrument of the disembodied Cartesian mind; or to paraphrase, there is a hugely increased likelihood that the map will be mistaken for the territory (cf. Bateson 1999).

This paper takes as its basis the Aztec tonalpohualli calendar that scholars refer to as Codex Borbonicus, and one of the principle objectives of this paper is the full elucidation of the codex, a task which has not been done before. Most analyses of Mesoamerican codices focus on the entirety of the corpus, neglecting to fully exemplify any one codex in particular. There are a few complete exemplifications in the literature, the Codex Borgia, as restored by Diaz and Rodgers, and the Codex Telleriano-Remensis (cf. Keber 1995) being two of the most prominent.

These calendar codices were tremendously important in the life of the Mexica people who were the primary cultural group that made up the Aztec empire and are the repository of conventional symbols that places them at the center of a huge controversy in the field of Mesoamerican studies. This controversy takes as its content whether or not the Aztec system can truly be considered to be writing, or whether it is merely pictograms. This is the second major theme taken up in this paper, and is explored from the perspective of the development of literacy amongst oral cultures worldwide, supplemented by evidence from the latest cognitive and neurolinguistic research, which we then use to analyze particular glyphs from the Codex Telleriano-Remensis in order to show the variety of possible glyphic structures employed by the Mexica scribes, their phonetic correspondences when such correspondences occur, and to show that their writing system was further developed at the time of the Spanish conquest than the level for which they are usually given credit.

Typological Description of Nahuatl

To approach this discussion with adequate linguistic rigor, we must first familiarize ourselves with Nahuatl, the language of the Mexica people. A member of the southern branch of the Uto-Aztecan language family, which encompasses languages as geographically diverse as Shoshone, Comanche, Hopi, and Yaqui; all of which likely descend from a common language known as Proto-Uto-Aztecan. More specifically, Nahuatl is a member of the Core Nahuan group of the Aztecan sub-family. In the modern day, Nahuatl itself refers to a group of somewhat mutually-intelligible languages and dialects spoken by about 1.5 million people in and around the Valley of Mexico.

No modern dialect exactly parallels the classical form that is the major concern of the present paper. However, many of the more centrally located dialects have diverged only slightly. It seems probable that the language was composed of other varieties even at the time its “Classic” form was being recorded as well, but the particularities of the interaction between of early Spanish scholars and the native people led to some elements of distortion in the record. The fact that this distortion did to some extent occur is attested by certain errors in transcription such as the fact that Spanish scholars did not know to distinguish between long and short vowels, and largely disregarded the glottal stop.

This can be taken a step further by considering the sociolinguistic component inherent in the relationship between the Spanish colonialists and the Mexica. There were very few Spaniards in the New World at first, and relative to the vast population of indigenous peoples, their presence for much of the first few centuries of colonization was vanishingly small. As such, much of the interaction was filtered through the upper levels of Mexica society. The scribes they were training to write in the Latin script were already highly-skilled professionals, and the language they were writing their grammars of was the courtly speech of the Mexica aristocracy. The variety of dialects would potentially have eluded detection by grammarians for almost two hundred years, until alphabetic writing had become widespread among the Mexica. This elevation of one particular dialect to the level of a literary prestige dialect is exceedingly common, if not universal, among literate culture (cf. Ong 2002).

Phonologically, Nahuatl vowels break up into two classes, the normal vowels, /a,e,i,o,u/ and their lengthened counterparts /a,e,i,o,u/. The list of consonant phonemes is rather curtailed, containing only fifteen distinct phonemes /p,t,k,ʔ,kʷ,s,š,c,ʎ,č,l,w,y,n,m/. These

typically take the form (C)V(C), and can be strung together at length, so long as there are no complex consonant clusters of more than two adjacent phonemes.

Highly agglutinative and polysynthetic, the morphemes in Nahuatl are almost exclusively bound, aside from a few morphologically free particles that act as speech act particles and clause introducers. An example of noun incorporation, perhaps the single most salient microparameter of polysynthesis, is exemplified in (cf. Suarez 1983):

1. [ni- mits- te- tla- maki- lti -s]

1SG- 2SG- someone-something-give- CAUS-FUT

“I shall make somebody gives something to you”

For the other microparameters of polysynthesis, see (cf. MacSwan 1998). The argument he makes in that paper is that polysynthesis is not a true macroparameter of language as the key microparameters are non-implicational. However, that conclusion is not relevant to the purposes of this paper, and his laying out of the different elements of the alleged macroparameter is helpful, even if he is doing so in order to argue against its existence.

The polysynthetic status of the language makes it quite difficult to evaluate on the same sorts of terms that we evaluate such things in English and other relatively analytic languages. For instance, the closest thing that Nahuatl has to the syntactic category of adjective is relative clause constructions. Verbs and nouns are still recognizable as being what they are, and not every sentence in Nahuatl is a solid string of affixes. But according to J. Richard Andrews in his 1972 grammar of the language, to think of verbal and nominal stems, or nuclear clauses as he calls them, is to impose a faulty view of language centered in the study of Indo-European languages onto Nahuatl, which functions entirely differently. Each constituent, in his view, is a

sentence unto itself (cf. Andrews 1975). This would then entail that synthetically incorporated chunks would function more as complex, multi-clause sentences or perhaps even paragraphs.

Nahuatl marks participants in an indirect nominative-accusative marking system that conforms to Type 2 on the Malinson-Blake typology (cf. Malinson 1981). It marks animacy as well but does so in an affix not associated with the case marking system of the language. As one would expect from a marking system of this type, transitive agents and intransitive subjects are zero-marked, and transitive objects are marked [c], [qu] (pronounced [k]), or [qui].

1. [ni-qu-imita]

1S-ACC-see

“I see them”

2. [tlah-ke-qui]

IND-ACC-took

“he took something”

The inflectional morphology in Nahuatl consists of the categories of person, state, valence, number, and tense, and can encode for animacy and humanness as well by virtue of a combination of particular affixal elements (cf. Andrews 1975). Nahuatl does not mark gender. State has to do with the absence or presence of a possessor in the predicate, a dog being the absolute state (similarly named but not related to the case marking), and my dog being the possessive state. The formal breakdown of Nahuatl stems can be seen here, as described by Andrews:

Verbal Stem

- transitive: #pers1-pers2+va1-va2(STEM)tns+num1-num2#
- intransitive: #pers1-pers2+(STEM)tns+num1-num2#

Nominal Stem

- dyadic state: #pers1-pers2+st1-st2(stem)num1-num2#
- monadic state: #pers1-pers2+st(stem)num1-num2#

Nahuatl is an inconsistent head-initial language, as the adjective-marker-standard and the nominal-relative parameters line up with what would be expected from a Verb initial language, but the genitive-noun and adjective-noun parameters do not, in large part because of syntactic idiosyncrasies in Nahuatl. Two other elements of Nahuatl syntax are also relevant to the following discussion, locatives and the formation of the preterite tense. Nahuatl has several ways of constructing both.

The most common method of forming the preterite is by dropping the final vowel of the verb stem. This only applies to verbs ending in /-a/ or /-i/ (cf. Launey 2011) . There are several other ways to mark the preterite in Nahuatl, but for our purposes the one described is the important one, so we pass over discussing the remaining forms, referring interested readers to either of the reference grammars cited in this article.

The system of locative marking in Nahuatl is extremely rich. Locatives can be marked as adverbs, in either interrogative or demonstrative form. The interrogative /caːn/ means “where?”, and can mean the place of as an imperative. The demonstratives /nicːan/, /oncːan/, and /ːompa/ mean “here”, “there”, and “over there” respectively. Place names also serve as specific locatives, much as in English when one says “I live in Mexico”.

There are also what are known as “denominative” locatives. The primary denominative is the suffix /-c(o)/. The (o) is added if the suffix is placed after a consonant or if the noun is a monosyllable. Animate nouns cannot take the /-c(o)/ suffix. Additional locative suffixes

amount in essence to English prepositions. For example:

/-pan/ “being adjacent to an object and not within it”

This form combined with /-c(o)/ becomes a possessed locative, as in:

[Y^ːalhua in ːon`aci-c nic^ːan ːipan am^ː-- altep-^ːeu]

Yesterday DET arrived-POS here at/by 2PL-city-

“Yesterday I arrived (here)(at your) city”.

Another form is /-cpac/, which signifies “the area on top of something”. The epenthetic suffix /-ti-/ must be inserted before /-cpac/, but has no meaning of its own. An example of this would be:

[tep^ːe-ti-cpac]

Hill-EPN-LOC

“there’s a house atop the mountain”.

Additionally there are the suffixes /-tlan/, meaning “under” with inanimate nouns and “beside” with animate (particularly hierarchically superior) nouns; and /ch^ːan(-tli)/, meaning “(someone’s) place”. There are many others, far too many to list in our brief description. Suffice it to say that the locative suffix marks for the same function that adpositions do in many languages.

Mexica Culture and History

The early history of the Mexica people, who would come to be known to the world as the Aztecs, is difficult to discern. The word Aztec, or *aztecatl* in Nahuatl, means “person from Aztlan”, which was their mythical homeland to the north. It has been posited that this fabled

land could have been anywhere from Northern Mexico to the Four Corners region of the United States.

However, recent linguistic analysis would perhaps challenge these cultural narratives. This is interesting, in that it provides the insight that “Mesoamerican languages do not borrow much from each other, and any amount of borrowing that permeates the whole language or dialect area is evidence of a serious amount of language contact” (cf. Kaufman 2001) , an important point in the discussion of cultural diffusion of scribal practices.

We can look at several structures that occur across the Uto-Aztecan family of languages. It has been argued (cf. Hill 2001) that the Uto-Aztecan language family in fact originated in Mesoamerica and migrated northward rather than originating in the plains and desert of North America and radiating southward. This argument is based on a number of measures, such as the “rake-like” series of splits based around cultural innovations that defines the geographical structure of the Uto-Aztecan languages, the etymology both of flower imagery. Additionally, a semantic shift inherited from Proto-Nahuan, slowly coopted words for foraging to refer to corn, squash, and bean cultivation as cultivation became widespread. The development and diffusion of water management techniques also seem to have “leapfrogged between rivers” from Mesoamerica northward.

This argument is purely lexical and does not attempt to compute dates for these events. It merely suffices to show that lexical diffusion co-evolves with technological innovation and that by looking at the particulars of this diffusion we can retrace its directionality. This is particularly true, as mentioned above, when paired with archeological evidence such as irrigation and crop management techniques.

According to their legends –inflated and potentially entirely false, as mythic origins predictably are– when they arrived in the area, they found that it was already occupied by a multitude of peoples and language groups such as the various Mayan, Oto-Manguean Olmec, Zapotec and Mixtec–, and Mixe-Zoquean, speakers; all with a history stretching back nearly two thousand years. The Mexica and other Nahuatl groups were supposed to have been looked upon with scorn and have had their settlements relegated to the least productive areas around Lake Texcoco. The only knowledge we have to base our understanding on for this time period are the records of the Aztec empire, and it is generally acknowledged among scholars that the Aztecs reverse engineered their own history for political purposes. One of their kings, *Itzcoatl*, ordered all their books be burned after his consolidation of the Aztecs as a political group, as the books were “full of deceptions”(cf. Léon-Portilla 1990). More likely they disagreed with the narrative around which he wished to base his empire.

Regardless of the accuracy of their self-reported accounts, the Triple Alliance would not become a powerful force in Mesoamerica until the late thirteenth century. And by the time they did, emanating outwards from their center at *Tenochtitlan*, they had engineered the most complex society in post-classic Mesoamerica; they had an immensely broad and reflective scholarly and poetic tradition, and were sophisticated mathematicians with a firm grasp of the solar, lunar, and planetary cycles that the *tlapouhqui* or “counters of the day signs” measured time (cf. Boone 2007). This fascination with order and cycle is evinced at nearly every level of Nahua organization (cf. Lockhart 1992).

“The Nahua manner of creating larger constructs, whether in politics, society, economy, or art, tended to place emphasis on a series of relatively equal, relatively separate and self-

contained constituent parts of the whole, the unity of which consisted in the symmetrical numerical arrangement of the parts, their identical relationship to a common reference point and their orderly cyclical rotation,”.

Their cities, or *altepetl*, clearly exemplified this manner of organization. Built of *calpolli*, or “big houses” that would contribute a “more or less equal amount to the common obligations of the *altepetl*,” and would rotate in precedence and leadership on a fixed schedule, *altepetl* often consisted of what would seem to have been a number of smaller settlement nuclei that would, as they pushed together, create “an agglomeration that might in many respects resemble a city,” (cf. Lockhart 1992).

Within these cycles of political sovereignty however, social mobility became quite ossified, as is frequent in societies of classically or post-classical developmental levels. Each *calpolli* had its own set of nobles and only nobles were allowed to display their status (cf. Léon-Portilla 1990), even rich merchants, of which there were many due to the large and sophisticated Mesoamerican trade network, were not allowed to wear jewelry or otherwise give outward evidence of their wealth. There were two routes up into the nobility from the lower social ranks, by way of war and by way of the gods.

Their religious system was as complex as any polytheism, based around a complex system of emanations of gods from other, higher gods and who would go on to take on aspects of yet other gods as they fulfilled various elements of their divine roles. At a human level, they accorded high respect on their wise men or *tlamatini*, or “he who knows something” whose knowledge of sacred books was inculcated by a lifetime of study at the *calemac*, or school for sages (cf. Léon-Portilla 1990), and who knew the arts of divination and healing.

Briefly, their mythology told that the primordial couple *Ometecuhtli* and *Omecihuatl*, – who were in reality the two aspects of *Ometeotl*, the double-god of duality gave birth to the four *Tezcatlipoca*, Red *Tezcatlipoca*, or *Huitzilpochtli*, Blue *Tezcatlipoca*, or *Tlaloc* the rain god, the eponymous Black *Tezcatlipoca*, and White *Tezcatlipoca*, or *Quetzalcoatl*. These four would go on to create the other gods, the four successive worlds prior to this current one, and the peoples that would inhabit them before they were inexorably destroyed by some cosmic cataclysm. Only the blood sacrifice of captives kept the sun moving through the sky in its fifty-two year cycle the end of which always heralded the possibility of cataclysm once again.

As in their veneration of the *tlamatini*, whose wisdom was held equivalent to their abilities “in tllilli in tlapalli”, or in red and in black, a reference to the inks they used for writing; so too was writing placed highly in their cosmogonic scheme. The first two humans, *Cipactonal* and *Oxomoco* were also the first two sages and were strongly associated with the codex tradition (cf. Boone 2007).

Central to this tradition was the calendar codex, which came in two primary varieties. The *tonalpohualli*, or the sacred two-hundred and sixty day calendar used for prognostication and divination, was broken up into twenty thirteen-day segments known in the scholarly literature as *trecenas*. This was accompanied by the *xiuhpohualli*, or the three-hundred and sixty day annual solar calendar, consisting of eighteen months of twenty days with five so called dangerous days appended to the end of each year. These calendars were drawn from an ancient and deeply rooted Mesoamerican calendric tradition that instilled in its participant cultures an enormous emphasis on cyclicity (cf. Aveni 1999), which may have become evident, given the structures described thus far.

The function of the *xiuhpohualli* is easy to discern; a solar calendar locates people in time relative to the motion of the Earth in its planetary rotation, providing a means by which to objectively order the subjective perception of the forward motion of time.

It is the *tonalpohualli* that is the major concern of this thesis however. Functionally, it is less directly obvious to the understandings of contemporary people. However, understood in its cultural milieu, it provides an intermediary cog in the mechanism integrating man with the cosmic order within which he finds himself. As Aveni notes, the *tonal* encompasses a wide variety of cycles, both human and celestial;

approximat[ing] the gestation cycle of the human female, as well as the agricultural cycle in many regions[...] the average morning and evening-star periods of the planet Venus, the time the Sun spends south of the zenith in southern Mesoamerica, and the eclipse half year of 173.5 days, which resonates in a 3 to 2 ratio with the *tonalpohualli* (thus $3 \times 173.5 = 2 \times 260$). The moon is further implicated by the fact that nine lunar synodic months (265.8 days) are also a close approximation of the *tonalpohualli*.

The structure of the *tonalpohualli* itself was a series of overlapping symbolic and numerological codes. The aforementioned twenty thirteen day periods structured the pages, though in many codices abbreviations were used. We however, are looking at the only extant fully elaborated *tonalpohualli* codex, the Codex Borbonicus, considered to be the pinnacle of what remains of the Aztec artistic tradition. Most of the rest was burned by overzealous friars in the early years of the conquest (to the consternation of later generations of heresy hunters who, because of the zeal of their forebears, lacked the requisite information to understand and thus reform the native traditions that were still being practiced (cf. Léon-Portilla 1990)). Other codices that still exist, such as the Borgia group, vary in cultural practice, deriving from deeper in the multicultural Mesoamerican cultural zone and often use shorthand to represent various aspects of the calendar, skipping large sections of day representations that the *tlatimini* were

expected to have interiorized. The *tlamatini* sung, chanted, or retold the tale encoded in the pages as they flipped back and forth (cf. Boone 2007), reinforcing the idea that these works were largely elements in ritual performance commonly exemplified in cultures in which the process of writing has not come to be completely dominant (cf. Ong 2002).

Within a given trecena there were five calendric patterns and two ritualistic patterns. Each of the thirteen days was given two cells (cf. Boone 2007), which in the Codex Borbonicus, as can be seen later in the descriptive section of this paper, formed a backwards L shape with one cell stacked on top of the other. The bottom cell contained three of the five patterns, all of which cycled continuously throughout the codex. The patterns were a day integer, of which there were thirteen; a day sign, of which there were twenty; and a Lord of the Night, one of nine gods tasked with protecting the hours between sundown and sunrise. The second box held the Lord of the Day and a divinatory bird (or in one case, butterfly), known in the literature as a Volatile. As an interesting side note, thirteen and nine were the number of levels that the Aztecs conceived of there being in their heaven and in their hell, respectively (cf. Léon-Portilla 1990). The ritual patterns were the patron god or goddess that oversaw the trecenas and the ritual goods that were involved in the ceremony to propitiate the various divinities and took up the remaining square of the page not devoted to calendric elements.

These codices were not books as we traditionally picture them. Folded accordion style, they could open up into scroll-like strips up to fifty or more feet long and were not read necessarily in a linear progression, *tlamatini* would skip back and forth as they needed to make their prognostications. Aside from the calendar codices, there were also histories and dream almanacs, though none of the latter are attested as surviving. The historical codices are

particularly interesting for the recombinant way in which they utilized the symbols found in the calendar codices, as detailed in the discussion section.

The first large-scale civilization in Northern Mesoamerica since the fall of the Toltecs and their capital of Tula, the Aztecs were also the first to have the capital to centralize and organize a series of scribal colleges, the *calemacs*. This has been an essential feature of any society whose leaders intend to create a system of writing, even if it is rarely remarked on in the scholarly literature. Because as we have already discussed, there is nothing conceptually intuitive about writing. It is easy to catch onto if one is born into a literate society or has contact with one, but the historical rarity of the wholesale invention of writing suggests that it requires a distinct set of circumstances in order for the cognitive leap between sight and hearing to be made.

In order to become a competent writer, a learner must have “massive exposure to the written word” (cf. Ramus, 2004). It does eventually diffuse outward to the common people in a society, but this can be a slow process and is by no means inevitable, depending on the social structure of the society (cf. Kroeber 1940).

And indeed we do see extensive use of tonalpohualli codices throughout the rural parts of Mexica society (cf. Léon-Portilla 1990; Boone 2007). However, this calendar was in widespread usage throughout Mesoamerica and antedates the empire based at Tenochtitlan by at least two thousand years. Even the finest examples we have of the tonal are medieval by the aesthetic standards of European society, lacking a perspectival vanishing point or much organization of their constituents; and their rural counterparts are positively cartoonish by comparison. Compare the Codex Xolotl to the intricacy of the Codex Borbonicus for instance.



Figure 1 Codex Baranda vs. Codex Borbonicus

Actual instances of what is controversially called orthography do not appear, except perhaps in isolated instances, in the calendric codices. However, this is not the case for the full set of Aztec documents. Dynastic histories often contain instances of what ought to be considered glyphs, used for names of royal figures and of important locations. This usage would lead one to intuit that they were simply proper nouns and that the Aztecs had not yet worked out a way in which to represent verbs or the other, more subtle parts of speech. This idea is countered however, if we bear in mind two things: the linguistic characteristics of Nahuatl as a polysynthetic language that we discussed earlier and the makeup of the Epi-Olmec and Mayan (and probably the Mixtec/Zapotec) orthographies to which the Mexica were the conceptual and practical heirs.

In essence, the society overseen by the Triple Alliance was a society in tradition from a primarily oral society to what Ong calls a chirographic society, one dominated by text and by the visual modality. This is preserved in the transcriptions of their oral poetry, full of parallelism, mnemonic devices, larger than life culture heroes, and ornate figures of speech; all of which typify the discourse of oral societies (cf. Bright 1990).

The Codex Borbonicus

Out of this milieu has come to us what was, as far as our knowledge extends, one of the finest examples of Nahua literary craftsmanship, the Codex Borbonicus (cf. Anonymous 1985). There is debate as to whether it was crafted prior to the Spanish conquest or after it, but either way, it remains essentially untainted by European cultural and aesthetic practices. This is the argument for the pre-conquest dating, while the post-conquest argument circles around the seemingly unusual fact that a *tonalpohualli* calendar contains a fully elaborated post-scripted section describing the festivals of the *vientenas*, which are proper to the *xiuhpohualli* solar calendar, and which the codex has not previously concerned itself with. This paper does not take a position on the issue, as the content stands for itself and the festival section does not bear directly on the argument under examination here. The final section of the codex contains no linguistic material whatsoever, and while there is no doubt a manner in which it could be tied into the larger question at hand, it is beyond our current scope of investigation. A few particularly elaborately illustrated pages from it have been retained nonetheless for the examination of the interested reader.

Its structure has already been laid out in the general discussion of the *tonalpohualli* as being the exemplar of the fully elaborated *trecena*. As such, let us turn to the document itself in an attempt to decipher its contents, and see what it has to say.

CHAPTER 2

DISCUSSION

The Contents of the Codex Borbonicus

This section refers extensively to the charts in Appendix A, which represent a fully elaborated spelling out of all the elements of the *tonalpohualli* in the Codex Borbonicus, both calendric and mantic, or ritual. I neglect to break down the specifics of each divinity for reasons of space.

The calendar elements of the chart are five. The day numbers rotate count days one through thirteen of each trecena, much as Gregorian date numbers count the days of the month. The day signs assign one of twenty possible name values to each day; similar to, though more extensive than, the Gregorian days of the week (Sunday-Saturday). This is the point at which the two systems diverge however, unless one were to go into the details of western astrology for correspondences. I am neither knowledgeable enough to do so, nor is it relevant to the aims of this essay. Regardless, there are nine Lords of the Night and thirteen Lords of the Day. Why any given deity was selected to be a Lord of the Day or Lord of the Night is a question which is lost to history. We can however observe some overlaps in the lists; *Xiuhtecuhtli* “Turquoise Lord,” *Cenoteotl* “Corn God,” *Tlaloc* “One Who Lies on the Land,” *Chalchiuhtlique* “Jade Skirt Woman,” and *Tlatzoteotl* “God(dess) of Filth”. These are particularly important gods, as they occur frequently in both the myth and ritual of the Mexica; *Cenoteotl* and *Tlaloc* at the very least are derived from the larger Mesoamerican tradition as well.

Very little remains to us of the prognostic significance that tlamatini would have read out of particular combinations of days and lords thereof. Spanish monks interpreted the system

through the bias of European astrology (cf. Boone 2007), and did not go into any sort of detail. They often do not even agree with one another, Sahagun might list a day as being of good portent and Diego Duran might list it as being neutral or bad. There is a question of whether the system was conventionalized throughout the empire or whether it varied from place to place. It seems most likely that the disagreements were errors on the part of the ignorant Spanish interpreters. Interestingly, later generations of friars bemoaned the destruction of so much of the native mythos by their zealous earlier brethren, because the traditions were still being practiced up through the late sixteenth century, and the priests and heresy hunters had no way of interpreting exactly what it was that the natives were doing when they consulted their divinatory manuscripts (cf. Lockhart 1992).

To turn our attention to the more specific elements of the codex, I provide a brief description of each trecena, allowing the calendar charts to stand for themselves but speculating about the mantic content, based on the literature on the subject and my own experiences in preparing a decipherment of the document.

The first page of Codex Borbonicus, below, is actually the third trecena, the first two having been lost. It depicts *Tepeyollotl*, the jaguar aspect of *Tezcatlipoca*, as evidenced by the protuberant bone/smoking mirror that replaces his front foot. *Tepeyollotl* means “hill heart,” and he is associated with caves. He is speaking to *Quetzalcoatl*, the “feathered serpent” who is perhaps the most studied of Mesoamerican deities. The identification is evident both in Quetzalcoatl’s yellow and black face paint and the conch shell located near him. They are framed below a shield and spears, no doubt indicating their eternal war as equal and opposite deities. It is interesting to note that *Quetzalcoatl* is also carrying an *atl atl*, or “spear thrower”,

in his back hand. Below them are sacrifices, including the first appearance of the *cuauhxicalli*, or “eagle vessel” for holding human hearts.



Figure 2 Trecena 3

The fourth trecena, again pictured below, is of a dancing *Huehuecoyotl* “old coyote” being sung to in the “flower song” or poetry of a drummer with distinctive face paint. In the top left corner there is what seems to be a star, as stars are usually represented as eyes in Mexica documents, pierced by twin maguey thorns and topped with flowers. My suspicion, and I have documented it as such in the charts, is that this star is Venus, the principal celestial body with which the *tonalpohualli* is concerned. The only evidence I have for this hypothesis is text internal, as no literature I have been able to locate says anything about it. If I were capable of reading German, a Mesoamericanist from early in the twentieth century, Eduard Seler, has thoroughly documented many of the Mexica codices. No English translations of his work exist however, and his hypotheses have mostly been disproven.



Figure 3 Trecena 4

The fifth trecena is dedicated to *Chalchiuhtlicue*, “Her of the Jade Skirt”, goddess of underground water. Two human figures flow out on the water that emerges from the bottom of her throne and there are two stones whose forms are considerably different than any of the others that appear throughout the codex. The furthestmost to the left in particular is of interest, with an eye and mouth.



Figure 4 Trecena 5

The patron of the sixth trecena is *Tecciztecatl* “Old Moon God”; he wears stars on his headdress. The image is reproduced below. He is accompanied by *Tonatiuh*, the sun god. This mantic space is interesting in that it is the first that does not seem to be located in some abstract ritual space. The bottom of the mantic space depicts what I believed was a deer, but upon further reflection, I think it may be a dog bleeding from the head since neither its shape

nor its color correspond to the conventional shape and color of antlers as they occur elsewhere in the codex. It is then (we must assume a timeline here) eaten by a crocodile/earth monster. There is also what may be a flower, but which is quite different from any other depiction of a flower in the codex.



Figure 5 Trecena 6

In the next trecena, *Tlaloc*, the chief rain god, is faced by what may be a priest in his same garb, wielding a staff in the shape of a snake. He is one of the most visually distinctive of the Mesoamerican divinities, his “goggle eyes” and fangs marking him out. Another god swims up the river emerging from the hill upon which he sits. Both are adorned with the paper rosette on their headdresses that connotes a connection to the underworld due to its association with *Mictlantecuhtli*, the chief death god.



Figure 6 Trecena 7

The patroness of the eighth trecena is *Mayahuel*, the goddess of the maguey plant that northern Mesoamerican peoples put to extensive use as a fiber for cloth, brewed into wine, and pierced themselves with its thorns for penance, among other uses. This ceremony is notable because it takes place at night, as signified by the dark mound studded with white stars near the top of the page. Another interesting feature is the man under the snake under the shield at the bottom left. It is rare in this codex for symbols to be in contact with one another, and suggests perhaps a semantic polyvalence that is not transparent to readers at our remove.



Figure 7 Trecena 8

The ninth trecena is presided over by *Xiuhtecuhtli* “Turquoise Year Lord”, the god of fire, time, and the calendar; and *Tlahuizcalpantecuhtli* “Lord Above the House of Dawn”, who is an aspect of *Quetzalcoatl* as the planet Venus, and has malevolent overtones. This is a particularly interesting mantic space in that the offerings stacked on the throne of *Tlahuizcalpantecuhtli* are connected to him by a band of scorched earth. They are located below a river with spears flowing down it.



Figure 8 Trecena 9

The patron of the tenth trecena is *Mictlantecuhctli* “Lord Under Death” chief god of the Mexica underworld *Mictlan*. He is accompanied by *Tonatiuh*, a manifestation of the sun. The trecena takes place at night and there is a pole topped by the presumed Venus star that being climbed by a human figure. An additional point worth of note is the human figure disappearing into an unidentified oblate form. This symbol has never been deciphered to my knowledge, but it is reminiscent of a particular rebus suffix “-tzin”, which means lower half of the body and also serves as a diminutive.



Figure 9 Trecena 10

Patecatl, god of healing and fertility is the patron of the eleventh trecena. The sun disk/night disk is representative of dawn, and the eagle and jaguar figures are members of the

elite Jaguar and Eagle warrior societies as can be observed from the battle flags that they wear tied to their bodies. Also interesting is the composite glyph of a pot with a loincloth and a monkey's head wearing a shell earring. What this represents is open to question, but it is unique within the codex, both in its specifics and in its form. Another piece worth noting here is the two-headed snake, for which I have been unable to identify a Nahuatl name, but which is reminiscent, in a sort of reverse *a fortiori* sense, of the Mayan bi-cephalic earth serpent.



Figure 10 Trecena 11

In the particularly striking twelfth trecena, the god *Itztlacoliuhqui* “All is Bent by Means of Frost”, is depicted. The embodiment of the Evening Star after the morning star assaulted the sun, *Tonatiuh*, with a spear, missed, and was speared in return, becoming a judgmental god of stone. You can see the spear in his headdress, and almost all the associated mantic items have a spurt of blood flowing from them. Additionally, there are two humans who have been stoned lying dead in the lower right hand-corner. A note here is the interesting semantic-phonological play that goes on with *Itztlacoliuhqui*. The mora [-col-] is the Nahuatl morpheme for “curve”, and it is represented in his curved headdress, which has led many scholars to translate his name

as “Curved Obsidian Blade”. We return to *Itztlacolihqui* in when we discuss the character of Mexica writing.



Figure 11 Trecena 12

The thirteenth and fourteenth trecena seem to be thematically closely linked. The thirteenth patron, *Tlatzoteotl*, “The Filth-Eater, Forgiver of Sins” is a goddess of childbirth and a patron of weavers. She is giving birth to *Cenoteotl*, the corn god while wearing a flayed skin. Death is always closely tied to new life in Mesoamerican myth. She is accompanied by an eagle god or priest for whom little information is available. *Xipe Totec* “Our Lord the Flayed One” is a solar war god, and who was known as Red Tezcatlipoca before he was replaced by *Huitzilpochtli*. He wears a flayed skin, thematically indicating him to be the patron of the trecena. He is surrounded by several day signs, only one of which, the day 1 Dog, occurs during the trecena over which he presides. Of the other two, the day 4 Movement does not occur at all in the tonalpohualli, and the other of which the day 3 Eagle occurs in the fifth trecena. The numbers relate to the position of the day within the trecena in which it is located, and the day sign indicates its position in the larger cyclic order. What is to be made of this remains obscure at this juncture but is a definite question that could be taken up by later scholars.



Figure 12 Trecenas 13 and 14

The patroness of the fifteenth trecena, *Itzpapalotl*, or “Obsidian Butterfly”, is a warrior goddess whose wings are tipped with obsidian knives. The sacrificed parrot with its sacrificial banner is reminiscent of a frequent rebus principle that we see later in our discussion, the [-pan] standing in for the locative suffix “on” (cf. Keber 1995).



Figure 13 Trecena 15

The sixteenth trecena is again quite interesting. The patrons, *Xolotl*, or “Monster” is the god of sunset and the twin of *Quetzalcoatl*. He aided the dead in their journey to *Mictlan* and guarded the sun at night as it passes through the underworld. It is bundled in the traditional Aztec funerary garb and sits on the head of the Earth Monster, *Cipactli*.



Figure 14 Trecena 16

Chalchihuatotolin is the patron of the seventeenth trecena. Known as “Jade Turkey”, he is perhaps an attribute of Tezcatlipoca and does not seem to occur outside calendric codices. He is interacting with a pot, either drinking from it (presumably *octli* or “maguey wine”) or vomiting into it. The is confronted by a priest and a number of sacrificial baskets and censers.



Figure 15 Trecena 17

Chanitco “In the House”, notable for her prominent nose plug, was the goddess of the hearth and the patron of the eighteenth *trecena*. She is attended to by a priest carrying a bouquet of flowers and the traditional Mexica obsidian club/sword. The fact of his priesthood is made clear by the incense pouch he carries. He seems to be in some sort of enclosure, perhaps a cave. Also notable in this trecena is the woven grass mound used to store maguey thorns

when they were not being used in bloodletting.



Figure 16 Trecena 18

The nineteenth trecena is presided over by *Xochiquetzal*, a youthful fertility goddess, resplendent in feathers and sitting on a jaguar skin mat. She is attended by an animal of some sort. It could be some sort of *nagual*, or it could be an *ahuitzotl*, a monster that lives in the water, waiting to drown people and eat their soft tissues. This second hypothesis seems doubtful, given the colorful spots on its body, its large nose plug, and the heavily plumed headdress it wears. They are located below a ball court marked with a skull/water glyph. It is possible that this could be an example of a logogram, seeing as its glyphic structure is consonant with that which we see occurring over and over when we get to the discussion of the way in which Mexica scribes used the re-analyzed symbols from calendar codices such as Borbonicus for the purposes of naming. What exactly it would signify is currently unknown. Next to the ball court is a married couple beneath a blanket, the implications of which are surely obvious.



Figure 17 Trecena 19

In the final trecena, we see *Xiuhtecutli* again, this time with *Itztapaltotec* a deified obsidian knife. He wears a flayed skin, carries a knife in one hand, and what may be a staff of office in the other. Also present is a stick with the head of a deer, an image that occurs again in the next section.



Figure 18 Trecena 20

The next section, the year count, is fifty-two years in four sets of thirteen, spread out over two pages. On the first page we see *Cipactonal* and *Oxomoco*, the first two humans represented as priests. One is wearing a tobacco gourd and throwing lots, possibly with corn. The other can be identified as *Cipactonal* by the day sign *cipactli*, or “Crocodile” behind him. He has an incense pan and a bone awl for bloodletting. They are in some kind of primal enclosure,

with the sea spilling out on one side and a channel demarcated by deer sticks on the other. A deer stick, as can be seen in the picture, is a sort of stick with the head of what seems to be a deer carved on top. Their significance is obscure. On the second page we see *Quetzalcoatl* and *Tezcatlipoca* again, though this time *Quetzalcoatl* is in the form of *Ehecatl*, the wind god and *Tezcatlipoca* is himself rather than in the *Tepeyollotl* aspect that we saw in the third *trecena*.



Figure 19 Year Bearer Pages

The year bearer count ought to be mentioned. For numerical reference, see the chart on page asdkfja that accompanies these pages in the figures section. These numbers can be cross-referenced against the Lords of the Night lists in the charts accompanying the tonalpohualli pages. The significance of this chart is the fact that the cycle of Lords of the Night was, as Bowditch 1900 states, discontinuous. The list would begin anew at the beginning of each tonalpohualli cycle. It also signifies however, that while the pattern of nine lords did not form a continuous cycle between cycles of the tonal, the calendar itself fell into a larger pattern. Each solar year would contain between one- and-a-half and slightly less than two tonal cycles, depending when the Venus cycle began and ended relative to the solar cycle. This relationship between the two calendars is what, in a very real sense, makes the Codex Borbonicus a contiguous and coherent document rather than a *tonalmatl*, or “book of years” with a ritual

section tacked *ex post facto* to the end.

This brings us to the final section, the veintena rituals, which I largely do not venture into here. They rely on an entirely different calendar that operates very differently from the rolling *tonalpohualli* calendar. They are mainly included so that the reader may get a sense of how the final section of the codex is structured, and if the reader wants to look at them, they are located at the end of Appendix One on page akdjf. More work remains to be done on this section, as the scholarly literature focuses much more heavily on the *tonal* calendar than on the *xiuhpohualli*, as far as I have found in my research into the literature anyway.

It is worth noting the correlation between this section and the year count, as I mentioned in connection with the year count section of the calendar. The year count has fifty-two year-bearing deities, each a Lord of the Night in possession of the day sign that begins the year to which the deity corresponds. This fifty-two year cycle was of the utmost important to the Mexica religious life and it corresponded to the interval at which the *tonalpohualli* and the *xiuhpohualli* would overlap, beginning the period of five Dangerous Days in which all fires in the empire would be put out and the people would wait nervously to see if the world would end. The ceremony to prevent this occurring is included in the diagrams section on the page in which eleven priests dressed as various major deities bring bundles of logs to light the New Fire that would, along with the ritually prescribed regimen of sacrifices, sustain the movement of the sun for the next fifty-two year cycle.

Having given a description of the codex itself, we now turn to the implications that we may derive from our study. These fall into three categories, anthropological, linguistic, and psychological, but all serve to illuminate our discussion of symbol use and writing in late Post-

Classic Mesoamerica. I hope by doing so to correct a few misconceptions, not only about the writing system of the Aztecs, but of the functioning of writing systems cross-linguistically as well.

I mentioned in my discussion a few cases in the Codex Borbonicus in which a symbol may have another reading beyond its purely artistic significance. It requires a more focused study to work out the meanings of those particular symbols, if indeed they do work in the manner that I believe them to, but equally important as their meaning is the functional way in which the symbols themselves are designed to create that meaning. After all, “What the reader is seeing on this page are not real words but coded symbols whereby a properly informed human being can evoke in his or her consciousness real words, in actual or imagined sound” (cf. Ong 2002).

Orthographies Cross-Linguistically

But before we can continue to move forward with our analysis, we must take a step back to look at the problem of writing systems from a cross-linguistic perspective. We are dealing here with a relatively new kingdom in an area where such kingdoms have risen and fallen continuously for thousands of years. An enormous trade network was in place, evidenced by the fact that I have witnessed a Mayan sculpture at the Dallas Museum of Art that had been identified in archeological sites as far north as Tennessee. The idea of writing was well established in the area.

Yet it remains an open scholarly question as to whether or not what the Aztecs were doing was in fact writing as it's typically considered. To provide an answer to this question, we

are going to have to look at the scribal tradition of the Aztecs in terms of what we know about the peoples that had developed writing in different parts of the world. For much of the last hundred years or so, there was a fairly standard model for the development of writing, clearly articulated in 1922 by William Anton Smith in his book *The Reading Process* (cf. Smith 1922).

Conceived of as an evolutionary process, it went like this:

1. The Mnemonic Stage: the sign is primarily a reminder
2. The Pictographic Stage: the sign represents directly an object or objective situation
3. The Ideographic Stage: the sign represents an idea or ideal situation
4. A Transition Stage: the sign represents not only the object or idea but its name as well
5. The Phonetic Stage: the sign refers to sounds or spoken symbols regardless of meaning
 - (a) The Verbal: the sign represents a whole word
 - (b) The Syllabic: the sign represents a syllable
 - (c) The Alphabetic: the sign represents an elementary sound.

There is a definite logic behind this model and it is still well enough thought of in intellectual circles to show up in the “History of Writing” page on Wikipedia. Not that a citation there reflects the scientific consensus in any way, but it does show the extent to which such presuppositions remain largely unexamined.

However, it suffers from a number of flaws when held up against both modern evolutionary theory and empirical data.

The first is that it assumes a sort of *telos*, or the idea that there is an endpoint to evolution. This would imply that things become more highly evolved as time passes, rather than differentiating into ecological niches created by the particularities of their environment as the

currently accepted consensus on evolution holds. It assumes that the alphabet is the highest pinnacle of human textual development. The problem is that there is no evidence for this claim whatsoever aside from the current socio-political supremacy of alphabet using peoples. What is it, beyond Eurocentrism that is, that makes an alphabet particularly superior to a syllabary, an abjad that encodes consonants like that used in Semitic scripts such as Arabic, or an abudiga that takes the abjad system and adds vowel diacritics in the manner of the Devanagari and related scripts? Or for that matter a logographic system like Chinese kanji? The argument that an alphabet is in some sense more highly developed than other writing systems simply does not hold up.

Even if it were to be possible to make a convincing argument for a linear worldwide development, would that not mean that systems of writing created consciously, such as Hangul or the International Phonetic Alphabet would be more evolved still? Or even computer languages for that matter, which again are consciously devised, but which do things rather than are things. The point here is not to actually argue that the IPA or Python or PERL or HTML is in fact more sophisticated than a natural written language. The argument is untenable anyway. It is more to point out that the classification of one system of orthography as being more or less developed than any other is a trickier process than it might appear on the surface.

From a more typological standpoint the developmental argument falls apart as well. It simply does not elegantly represent all of the possibilities for constructing a writing system. A more elegant system is cited and explained by Whittaker in his “Fundamentals of Aztec Writing” (cf. Whittaker 2009). To paraphrase, writing systems are built of either (i) morphogram- semantic sign representing a morpheme or compound of such or (ii)

phonograms- a phonetic sign representing a linguistic sound (phone) or sequence of sounds.

Signs can be “polyvalent” and “function in different contexts as a morphogram or phonogram[...] or homophonous” as they do in Kanji. Compound morphograms “are known as logograms”. Phonograms can also be broken down into two smaller classes

- Letters- phonetic signs representing a unit of sound, a group of phonetically related sounds[...], a diphthong[...], or even a consonant cluster[...].
- Syllabograms- represent a mora (C)V, or syllable in general

These all emerge from a fundamental category related to the inscription of the glyph itself, breaking it down into three categories:

- Simplex, consisting of a single autonomous graphic element
- Compound, consisting of two or more such elements sharing the space of a single sign
- Complex, consisting of two or more overlapping or fused elements, or of one element surrounding another

Three other elements bear mentioning as well. These are not independent glyphs, but are glyphic elements that can be added in order to supplement or modify another glyph in some manner.

- Semantic indicator- a graphic element often referred to as a classifier or determinative is a semantic sign that may come before, after, or be embedded in a glyph to indicate the semantic category
- Phonetic indicator- placed before, after, or beside a sign or sign group to indicate which of the latter’s sonic values is intended
- Phonetic complement- adds precision to the reading of a logogram, for example by recording the affixation of a noun or verb

These basic types of signs, sign groups, and sign supplements are significant in the discussion of the Aztec system. Also important in the Aztec system are what is known as the

Rebus Principle, which relies on visual-phonetic puns to rhyme a word for an abstract concept with another similar sounding word that can be depicted by means of the conventional set of Aztec symbols, allowing Mexica scribes to record things that would otherwise be unavailable to them. This may as well falsify once again the principle of writing as a process of development from most basic to most complex, representationally, because a major argument against logographic systems is that they cannot represent things that do not have an immediate reality.

Having established all this, we can move on to a vastly summarized version of the scribal traditions from which these typological concepts have been derived, making a few digressions into territory not often considered by scholars of this history of writing in order to show how these categories succeed and fail, as well as the enormous fecundity of the human ability to create symbolic glyphs and the diversity of ways in which we do so.

But in order to do so, we must establish how this transition took place. We know absolutely for certain that writing emerged in two different places, Mesopotamia and Mesoamerica. This is more than saying that independent writing systems were worked up by the intellectuals in those areas; this is common enough throughout history. What separates these two from the others, is that the scribes or thinkers or whoever it may have been that originally thought the idea up –some lone genius, some innovative collective, or some class of people driven by necessity, or some combination of the three-- actually conceptualized a way in which inscribed marks on a surface clay, stone, or papyrus could stand in for and take the place of spoken sounds. This idea is not an intuitive one once you get past its simple and overwhelming familiarity to literate peoples. It represents something quite disruptive in the history of humanity's self-organization.

It is not quite as without precedent as it may seem however. There were, in a sense, cognitive pre-adaptations that, when reanalyzed, could come together to create the phonosemanticographic matrix of early writing. This preadaptation was twofold. In the first place we have the tradition of artistic representation, stretching back to the beginning of the human *noös*. The other element vital in the emergence of language was numeric recording, essentially tally marks (cf. Justeson 1986). This can be clearly seen in both Mesoamerican calendars and Mesopotamian temple accounting.

The Mesoamericanist John S. Justeson proposes what seems to be an explanatorily adequate basis for looking at how this process of reanalysis takes place. His argument begins with what might almost seem to be a tautology, stating “the coding conventions of any one representation system are intrinsically adequate in the contexts of its traditional application”. This would entail that the cultural devices that humans developed to express themselves in a manner extending beyond solely speaking to one another, that is drawing and counting, are well adapted for the applications for which they were devised. Drawing or painting adequately represents the general function of symbolic representation of spiritual, magical, social, or emotional truths for which it is made; and counting systems do the same for the numerals they encode, typically record keeping or commerce, as mentioned above. Furthermore, “applying it to a novel context presupposes [this] applicability” (cf. Justeson 1986).

However, Justeson argues, the two forms are not sufficient to fully encode the breadth of human experience, as neither is representationally adequate to depict what had been typically expressed in terms of the other. In, “the interpretive principles of art, [...] number [is] depicted by replication, while identification of enumerated items is foreign to a tally system”.

So by taking conceptual elements from both strategies and recombining them by virtue of what Justeson calls “external or higher-order integrative conventions” a system can be developed in which “structure does correspond to such juxtaposition, in that numerals and the enumerated are represented by distinct roots or words.”

Thus are derived symbolic linguistic glyphs from pre-existing patterns of expressive or denotative cultural icons, according to one theory anyway. Theories of this nature are, however, quite hard to come by. Most thinkers seem to simply move from orality to literacy without pausing to consider how precisely the transition occurred, despite the implications the nature of this transition has for the form that written language takes and the questions it raises about the nature of oral and written symbolism. Or, more frequently, they simply begin after writing has already come into being, as addressed in the book by Walter Ong cited earlier in the introduction to this paper.

One item of particular interest in this conception of the origin of written signs is the way in which this origin mirrors by analogy the way in which modern linguistic science considers language to have emerged as a cognitive phenomenon. It is made all the more interesting by the way in which it modifies the structure of evolutionary development dismantled earlier in this section. Taking a nod from modern evolutionary biology, in particular a paper by the pre-eminent biologist Stephen J. Gould and taken up by some of the most prominent names in linguistics like Noam Chomsky, language evolution is looked at in terms of what is known as an exaptation, or as referenced in passing before, a pre-adaptation, which is a biological, or in this case social, functionality that first evolved for another purpose and was then co-opted to serve some novel purpose that arises in response to the environment.

I offer this explanation more as a model or metaphor for the way in which writing developed than as an empirical explanation. I believe framing the development of writing as an exaptation is useful for thinking about the way in which it re-combined forms that already existed in human culture and applied them to language functions. However, as Gould admits, (cf. Gould 1991) it is exceptionally difficult to determine the historical origination of socio-cultural phenomena outside their current usage, particularly one such as writing, for which the evidence is so fragmentary and difficult to interpret as we see immediately below. So any such theory must by necessity be more of a model or heuristic than a real claim to empirical knowledge, and we as social scientists must simply make do with the explanation that fits best with the relevant data, which in this case would be examples of historical writing, modern anthropological accounts of oral and primarily oral societies and psycholinguistic data about literacy and the development thereof.

As such, I briefly run down the contentious history of the development of literacy, excluding the present because while interesting, it does not bear on the ideas presented in this paper. I begin with cuneiform, as it is traditionally held to have been the first manifestation of true writing in the world. It emerged out of early Mesopotamian society, located a fertile region with a newly emergent cluster of cities bounded by tribal hill peoples. Cities were structured around the temple ziggurat, and a temple could employ hundreds of people of every class and occupation (cf. Graeber 2011).

Cuneiform writing is considered to have taken form between 3500 and 3200 BCE in Sumeria with an initial repertoire of about 700 signs. These mostly functioned as multivalent logograms that could be strung together into complex signs that would depict various items

going out of and coming into temple accounts, eventually spreading by diffusion along trade networks to Akkadian, Elamite, Hittite, and Hurian societies (cf. Everson 2008). From what we know of the Sumerian language, it was quite different from its surrounding languages, which as has been mentioned before, is a major factor for innovation in the cultural exaptation of the technology of writing. As an agglutinative, split-ergative (except in first and second person indicative) language isolate, it varied considerably from its early Semitic neighbors (cf. Edzard 2003; Buccellati 1997).

Eventually, the cuneiform accounting system was extended to its logical end point, symbols being invented or derived for various things not necessarily relevant to accounting, but which would have been of pressing concern to the literate members of temple complexes. These were things such as morality, law, cosmology, and instructive hero narratives such as the adventures of Gilgamesh and Enkidu (cf. Graeber 2011). It never developed a phonetic component among the societies that initially adopted it, but it would go on to have a long history in the region, providing the basis for Aramaic, Hebrew, Phoenician and eventually Arabic scripts.

Aside from cuneiform, the other script that is traditionally held up as an exemplar of ancient writing is the hieroglyphic system of the Ancient Egyptian Pharaohs. This culture is much more familiar to modern western readers, as it is frequently depicted in the media, at least in stereotype. Existing in the Nile River Valley much as the Sumerians existed along the Tigris and Euphrates, the Egyptian society was an agrarian society ruled over by a frequently interrupted series of imperial dynasties that, in periods of stability, became the Old, Middle, and New Kingdoms.

Their spoken language began as a synthetic language and became more analytic over time. What we know of the historical spoken language is by necessity derived via a combination of evidence from the modern Egyptian language and an analysis of the written hieroglyphic tradition. An Afroasiatic language, it shares a fusional quality with other languages in its family, but nonetheless varies considerably from the other languages to which it is considered to be genetically related. It has many mono-lateral and bi-lateral roots, whereas Semitic languages are more regularized with tri-lateral root systems (cf. Loprieno 1995).

Like the Mesopotamians, Egyptian society was one that was caught up in the fabric of temple life in a very pronounced way. Their script emerged from a pre-existing artistic tradition, with the earliest full-fledged hieroglyphs being attested around 3300 BCE (cf. Mattessich 2002). It may have “come into existence a little after the Sumerian script, and, probably [was], invented under the influence of the latter,” although this has been challenged by scholars who believe that there is no evidence for this idea and that the Egyptians developed their writing system independently of Mesopotamian influences (cf. Najovits 2004). Their script could function in two different ways, and the way in which a particular sign was used was determined by its context. They could either be written phonetically, in which case each symbol stood for a letter of the root, giving the resulting series of glyphs the form of an abjad supplemented by phonetic indicators; or semantically as morphemic logograms, supplemented by semantic indicators (cf. Loprieno 1995).

The next script that any cross-cultural study of writing must consider is the Phoenician alphabet; considered to be the prototypical alphabet from which all others derive. However, this is not quite accurate. It would be better called the Phoenician abjad, because while it

represents all the consonants of the Phoenician language, it neglects to represent the vowels. This may be laid at the feet of the nonconcatenative or triliteral morphological construction of the Semitic family of languages, of which Phoenician was a member (cf. Fischer 2004). In these languages, the consonant phonograms are the primary bearers of semantic content. If a reader fluent in Phoenician could decipher the text without the need for inventing additional symbols, it simply would never have occurred to the Phoenicians to invent them.

Vowels would develop when their script was transmitted to the early Greeks. The Phoenicians were the masters of a huge trade empire that spanned the Mediterranean and beyond, all the way to the United Kingdom and perhaps Scandinavia. Their interaction with other cultures on a commercial level necessitated the spread of the already sophisticated means by which they kept records. This was true at least of cultures they came into contact with who did not already have some form of written script.

The Indus script is the alleged writing pictographic system of the Indus Valley Civilization that was located in what is modern Pakistan. We know almost nothing about the society, except that it had a very sophisticated system of measurement, a highly realistic artistic style, and a large trade network, and that this society did not seem to build monumental structures. They may have been proto-Dravidian speakers, but there is no real way of being certain as their script, if it is indeed a script, remains to be deciphered.

Given their seemingly highly sophisticated culture, it seems unlikely that they did not possess some form of writing, but existing texts are extremely brief, leading some to propose “that the Indus script is not a script at all but instead is a collection of religious or political symbols”. Adherents of the “non-script thesis have likened the Indus script to nonlinguistic

systems such as traffic signs, [or] medieval heraldry” (cf. Rao 2010).

Recent computational analyses have shown however that it has significant patterning which, combined with its high degree of linearity and the existence of complement markers, suggests a syntactic structure and potentially even rebus- based phonetic elements (cf. Rao 2010). A considerable amount of further study is required before any further conclusions –such as whether it originated independently or whether it derived in concept or structure from another language– is possible. It merits mention here mostly for its attestation to the fact that the history of writing is still quite murky, and that new archeological discoveries and new methods may change our understandings of its procession in a quite striking manner.

Moving further east, we reach what may be the pinnacle of world literacy, China. With an ancient written tradition made up of approximately 10,000 modern logosyllabic and compound morphogramic characters which form the semantic root of the glyph and which rely on what would seem, according to our typology, to be bivalent semantic/phonetic indicators. Which valence the indicator takes is predicated both on syntactic and orthographic contexts as well as varying by particular character (cf. Woon 1987). This complexity and the extent to which a vast margin of society has internalized it, taken together with the world’s longest unbroken record of centralized government, makes China perhaps the epitome of a literate society.

The spoken language of China forms one branch of the Sino-Tibetan family, with a number of different languages that have some degree of mutual intelligibility. The primary language used for official purposes is Mandarin. The Chinese languages are tonal and analytic and correspond well to the written script.

Though their script in its modern form is not the world’s oldest system, there is a strong,

though contentious, case to be made that China developed the beginnings of a writing system significantly earlier than any other people. Classical Chinese was developed during the Zhou Dynasty around 1000 BCE (cf. Gernet 1996). However, its roots stretch back considerably farther.

The “idea of sign use” dates back to Neolithic sites such as Jiahu, near the Yellow River. Dated between 6600 and 6200 BCE, inscriptions in tortoise shell and bone excavated from graves show intentionality, meaning that they were put there for a specific reason; orientation, meaning that they all line up in the same direction relative to the medium they are inscribed on; co-occurrence, meaning that more than one sign can be found per element of medium, ruling out clan signs and the like; and prominence, meaning that they are placed conspicuously. This is to be expected of a script or proto-script. More sophisticated signs have been found on potsherds ranging in date from 5000 to 3000 BCE, while a fully articulate system of 5000 signs is in evidence as early as the Shang Dynasty around 1700 BCE. This would mean that the system would have had to have been taking form considerably earlier (cf. Li 2003).

A discussion of the Chinese writing system would be incomplete without mentioning three other systems that fall within its purview, though in strikingly different manners. Japanese, with its agglutinative, syllable timed linguistic structure, co-opted Chinese characters and reanalyzed them to create their own related but distinct writing system, eventually deriving two of their own syllabaries, hiragana and katakana, from it, making it an excellent example of a mixed system.

Kanji (meaning “Han characters”) forms the main system of Japanese orthography, supplying the written form of most nouns. It is made up of logographs imported from China

during the period in which literacy in Japan meant the ability to write in Mandarin. It also contains some recombinant characters native to Japan, known as Kokuji, or national characters. This main system cannot function independently given the differences inherent in encoding Japanese and Chinese syntax; and is supplemented by hiragana, used to mark adjective and verb word final inflections, grammatical particles, and as phonetic indicators. The other supplemental form is katakana, phonograms used to transliterate foreign words and onomatopoeia (cf. Habein 1984).

The second script relevant to Chinese that bears discussion is the Dongba ritual script of the Naxi people. The Naxi are an ethnic minority that live near the Himalayas in China and speak a Tibeto-Burman language. Many practice a derivative of the pre-Buddhist Bon religion, called Dongba, which means “wise man” in Naxi (cf. Milnor 2005), and whose practitioners are known as *dto-mba*.

If one takes the Bon sect as an ongoing institution and then progressively strips it of its lamaseries, its temples, its books, and bans its monks from their traditional begging as a means of revenue, proscribes them from gathering together in the main towns and villages, and leaves them for a few years: what results? The answer is plainly evident: a peasant farmer with a fund of esoteric means of coping with demons, a *dto-mba*.

They possess two scripts, one of which is a phonetic script used for every-day communication, though it is ambiguous because it lacks tonal diacritics (cf. Milnor 2005). The other script is known as Dongba was not invented until the seventeenth or eighteenth century, and is, typologically, the more interesting of the two. Dongba utilizes a purely logographic system. Milnor states that it “lie[s] right on the cusp between writing and proto-writing”. It is

used only by dǒ-mba as memory aids for the recitation of spells and complex ritual components. Thus the glyphs “do not systematically represent speech and thus do not constitute a writing system”. However, “every glyph has an associated pronunciation,” therefore “individual Dongba characters are writing”. This differs from English, for example, in that its orthography maps at a one to one ratio of written words to spoken words, even including novel lexical items. IF you can speak it, you can write it. This is not true of Dongba logograms.

So, Milnor argues, “each pictograph represents a spoken word, yet in the aggregate they fail to cover the entire spoken lexicon”. This is interesting from the perspective of its precarious position between writing and artistic representation, and it has implications larger than itself that is discussed later in this essay.

The third and final script that we must look at in connection with Mandarin is Hangul, the writing system of Korea. Korea is a small pair of states Northeast of China that has attempted throughout its history to maintain its cultural and ethnic distinctness from the Chinese umbrella. They have, to a greater or lesser extent, been successful, though the early adoption of the Chinese script was a blow to this distinctiveness, as were periods of domination by the Mongols and by Japan. It is an agglutinative, head-final, SOV language.

What makes it particularly interesting from an orthographic perspective is that its alphabet, called Hangul, rather than having been adopted from another culture or having arisen organically among a scribal class because of usage pressures, was in fact devised by a group of scholars under the patronage of King Sejong in 1443. Even more interesting is that the symbols visually encode the articulatory structure of the phoneme for which they stand. It is, as stated

before, a true alphabet, in that each phoneme has a unique glyph, but the letters are grouped in such a way as to compose syllabograms. This structure is attested in no other system and is an artifact of its conscious creation. However, arrangement is an important element in written discourse, and it varies from script to script. Hangul simply calls our attention to this fact in a more than normal way, and one that is similar, superficially at least, to the Mayan and Epi-Olmec scripts discussed below.

We now move on to a completely different and often neglected part of the globe, but one which is vital to the current study as the language under primary investigation. It is located in the context of the other cultures so far discussed. This area is Mesoamerica. So, let us start from what is generally agreed to be the beginning of both writing and organized culture in the area. The Epi-Olmec were the descendants of the Olmec culture, about whose ways of life we have only artifacts and speculation to go on. Many of the innovations endemic to Mesoamerica are at least tentatively attributed the Olmec, including nagual-ism, the use of jade, the Long Count calendar, bloodletting, and perhaps writing.

We know for certain however that the Epi-Olmec did develop a writing system, and a quite sophisticated system at that. We have only a few steles remaining, but the evidence these few monuments affords us depicts a system of writing composed of multiple strands and fully capable of encoding spoken language. The stele of La Mojarra is particularly beautiful (cf. Kaufman 2001).

Their script was a mixed system composed of logograms and phonograms. The logograms seemed to represent lexical stems. The phonograms took the form of a well fleshed-out syllabary of sixty-six CV units, made up of eleven consonants and six vowels, though

not all sixty-six have yet been identified (cf. Kaufman and Justeson 2001). So, in its form, the Epi-Olmec system is similar to the Mayan script. For example, both systems use depictions of faces for a number of different glyphic elements. But in practice the glyphs very rarely resemble one another. At times, the Epi-Olmecs used a combination of logograms and syllabograms, in others they fully spelled out the word. There are also symbols for grammatical suffixes such as locatives and relativizers, as well as semantic determiners. There is also speculation that the Zapotec, a people whose Mixe-Zoquean language is genetically similar to that of the Olmec peoples, had a script as well, perhaps even antedating the Epi-Olmec script. The literature on this topic remains spotty however.

Inheritors of the Olmecs' Formative Era cultural dominance, the Classic Era Mayan civilization is prototypical of Mesoamerican civilizations. Made up of perennially warring city-states ruled over by semi-divine priest kings, Mesoamerican art and culture flourished under the Maya. As discussed earlier in this article, they had an expansive trade network, and they additionally had, from what we understand of the few books and numerous monumental inscriptions left to us by the ravages of time, a sophisticated religious and political cosmology. For all intents and purposes, they perfected the elements that make up the commonalities between Mesoamerican societies.

Speaking a variety of different but interrelated languages, the Mayan family of languages vary in allowable word order but share ergativity, classify animacy of numerals depending upon the semantic class of the thing being counted, contrast alienable and inalienable possession, and have an enormous and unique class of grammatical markers known as positionals that specify the shape or position of a person or object (cf. Suarez 1983).

Literacy in Mayan cultures was highly restricted to a noble priestly class. This is attested by graffiti on various surfaces composed of nonsense signs drawn by commoners in an attempt to mimic the writing system. Given the elaborate structure of that their orthography takes, that a specialized class of scribe would come into being is no great surprise. Such class divisions are quite common in the early history of many of the orthographies discussed above; cuneiform, hieroglyphics, and Dongba being prime examples (cf. Lacadena 2008a). It seems as though the Mayan system began as a logographic system that then developed to encode morphograms primarily as phonetic complements to the logograms, possibly by virtue of inter-linguistic transfer and reanalysis. Glyphs were written in blocks, read in a snaking zigzag pattern and were often compounded. The orthography was capable of encoding the complicated system of voices in Mayan languages, consisting of five variants that could be applied to a verb stem. These were active, passive, mediopassive, antipassive, and participial. This was done by virtue of systematic overspelling or underspelling of a given root such that the morphogram would line up with the spoken phonotactics of the language (cf. Kettunen 2005).

There are many, many other writing systems that are in use today or have been in use in the past that are beyond the bounds of this essay to discuss. The total number may be upwards of one hundred and fifty. They seem to cluster together into cultural groups and evolve as they move from language to language, changing to fit the requirements of the new languages' syntaxes as their speakers internalize the orthographic technology. Some examples of this are the Linear A & B scripts of the ancient Minoan civilization, the Devanagari family of scripts from India, Runic alphabets used by the Germanic peoples before the invasion of Rome, Mongolian, which is visually similar to Arabic but is written vertically, just to name a tiny minority. This

number is of course hugely dwarfed by the number of spoken languages on Earth, but it testifies none the less to human creative adaptability and ingenuity in creating what are, to put it generally, elegant cyphers by which speech is transformed from a neurological activation pattern transformed into sound into a visual set of signs that can be learned, analyzed, and inscribed to facilitate speaker autonomous discourse (cf. Ong 2002), and greatly increased information transmission and retrieval.

We now return, fully prepared to confront the detail of the Mexica writing system. The outlines of the ideas that shape our discussion of this matter have been drawn in the previous sections, but to recall them to mind, we note that an extremely common view within academia is that “The whole point of this [Mesoamerican] system is that it did not usually record speech and thus was not dependent on one language or another” (cf. Boone-Hill, 32). However, I hope that our discussion of world orthographies has put such ideas in context, if not put them to rest entirely. As with Mandarin glyphs, the fact that a number of language groups have borrowed elements or systems of orthography from one another does not by any means indicate that the system was not intended to encode specific meaning in the language of origin. It simply means that once the people of another language group have worked out the details of how the particular glyphic technology works, they can adapt it fairly easily for their own purposes, as did the Japanese with Mandarin. Mixtec codices appear similar to Mexica codices on a surface level, and were in fact mistaken for Mexica codices until the last half of the twentieth century. However they vary significantly in important aesthetic, structural and functional details, including the layout of particular divinatory almanacs, the naming and symbolism of various divinities, and the way in which years are indicated (cf. Boone 2007). They also tend to be more

symbolically dense than their Mexica equivalents, perhaps because their system, derived from the Zapotec writing tradition is considerably older than the Mexica one (cf. Caso 1965).

One other thing must be kept in mind as we explore the implications of Mexica writing, that being the tension between the individual *altepetl*, “city or community”, and the overarching political hierarchy of the Triple Alliances empire. The empire’s rule was not fully centralized, markets were encouraged by requiring items of tribute not available in the area from which was being demanded (cf. Lockhart 1992), but there was not standardized system of coinage within the empire that would have reflected a totalized system of control and an army that stood as an independent power base made up of members of the free peasantry (cf. Graeber 2011). Rather, except for a few modest reforms made by Montezuma I, the warrior class was restricted to nobility who fought in epic-style battles for prisoners and glory, more reminiscent of decentralized societies.

Much as was the case in ancient Greece, though we understand both religions from a synthesized modern perspective, in reality different *altepetl* venerated particular divinities more than others and had quirks both in their ritual and scribal practices. For example, as Lacadena notes,

The scribes of Tetzaco in many cases favored more phonetically transparent spellings, but they used exactly the same spelling rules and orthographic conventions as the scribes belonging to the other contemporary schools. There is an analogy here with neighboring Maya writing, where the differences between regional scribal schools have never been interpreted as evidence for the existence of different writing systems.

Now we focus on the specific ways in which Mexica scribes actually used their symbols

as glyphs. The following examples are from the Codex Telleriano-Remensis, a composite calendric-historical codex written after the Spanish conquest, presumably following a pre-Columbian template now lost to history. The edition to which I refer was is an annotated edition by Eloise Quinones Keber in 1995.

To begin our analysis, I have sought out multiple glyphs based on one underlying symbol, that of *tepetl*, or hill. They are arranged so as to demonstrate the existence of a minimal pair, showing that two examples vary only in one attribute. This is the single most common method of argumentation in linguistics, though it is usually practiced on morphemes in the International Phonetic Alphabet, so I have adapted it slightly to apply instead to a grapheme. The form of the argument does not really change much, only the variable being analyzed. By means of these minimal pairs I demonstrate the way different possible syntheses of symbols are used to create a variety of phonetic representations.

Keep in mind the three things that I am trying to illustrate with these examples. First, the structures the Mexica scribes used to draw their actual glyphs. Second, the phonetic correspondences between the glyph and the spoken word in the cases in which there is such a correspondence. By means of these two things I mean to show the third thing that is important to keep in mind while looking at the glyphs below, the idea that the Mexica orthography was quite a bit better worked out at the advent of the Spanish conquest than the level of development for which they are generally given credit.



Figure 20 Ayavaluluco

We begin with a generic example by which to establish a baseline. The glyph is of a hill with a circle of water placed on it, the meaning of which is A-yava-lu-lu-co, “The Place of Swirling Water. This glyph is a conventional logogram, and agrees with Boone-Hills non-linguistic formulation wherein only meaning is passed from writer to reader. Meaning bereft of phonology is a compound logogram in the typological sense, like the Japanese Kanji for poem, which is formed of the glyph for word within the glyph for temple (cf. Ross, personal correspondence). The hill glyph is semantically polyvalent, standing for a few possible locative suffixes, in this case the generic locative [-co]. All the images in the following discussion are made from photos taken from (cf. Kebler 1995).



Figure 21 Colhuacan



Figure 22 Itztlacolihqui

With the next glyph, the conception that the entire Aztec orthography works in this pure manner begins to be challenged. The glyph itself is a hill with a curved peak, signifying *Colhuacan*, made up of [col-], “bent”, [-hua-], which is an adjectivizer, and [-can], a locative. The meaning is “The Place of the Curved Hill”, which hearkens back to the deity *Itztlacolihqui*,

meaning again “All is Bent by Means of Frost”, and whose name also includes the morpheme [-col-], and who is also represented by means of a curved headdress. Specifically speaking, his name breaks down into:

[itz- tla- col- i-uh -qui]

Obsidian/cold-impersonal pronoun (everything)-curve-AUX-stative.

“Everything is made bent by means of frost”

So, this is a strong indicator that a borrowing and re-analysis from the calendar codex into phonemic-semantic writing has occurred, and in this instance would entail the reading of this symbol as having a phonetic indicator attached to the main logogram. Thus, we establish the first variation from the pure form. Mexica scribes, in order to distinguish between their different divinities, seized upon a particular element in this god’s name that was easily represented graphically and integrated it into his image in the calendar codices. At this point the curve seems to have become metonymic, representing a representation, an abstraction several levels deep. It is unsurprising then that Mexica scribes could easily enough co-opt the form [col] from there and re-analyze to stand for its purely phonemic element, discarding its divine connotations and applied in a general manner.

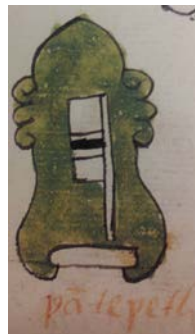


Figure 23 Pantepetl

The third example is even simpler, as it does not require the base glyph to be modified at all. Instead we see a sacrificial flag, [pan] on a hill. A purely logographic reading would be that this place is the place of sacrificial flags. However, this is not the case. Instead it signifies *Pantepetl*, which means “On the Hill”, because [pan] is a locative affix with the meaning of “contact without penetration”, and [tepetl] means “hill”, although it serves as the general logogram for locatives. It is typically transliterated in English (from Nahuatl speech or Latinized text) as by, on, or in (cf. Launey 2011). This example could be considered to be formally ambiguous, as it could be either a phonetic indicator or a compound phonetic glyph, the word, meaning that the glyph would be read in Nahuatl as its default semantic value of “hill”. The distinction comes down to which level takes precedence in the hierarchy of connections between orthography, semantics, and phonology. This is mentioned in detail after we finish our examination of relevant glyphs.



Figure 24 Maxuquetepetl

The next glyph, *Maxuquetepetl*, which Quinones Keber translates as “Hill of the One-Handed Man”, as opposed to the simplicity of *Pantepetl*, is highly complex. I am unsure of this translation however, as the modern spelling would be [macuiltepetl], and [macuil-] means

“five”.

What then do we make of the pot, which is rendered [acomitl] in Nahuatl? The hand probably refers to [maitl], the Nahuatl word for “hand” and the first morphogram of the glyph. It seems probable that the man inside the glyph holding an arm and a leg functions as a sort of visual pun or joke, almost a rebus but not quite, being that if he is holding an arm and a leg there must be another man missing an arm or leg somewhere nearby. The glyphs themselves again can be easily traced back to their origin in the calendar codices. There are pots full of sacrificial *octli*, which again is “maguey wine” throughout Codex Borbonicus. There are no severed human arms or legs in the codex, but there are severed human head and the severed legs of animals, so the conversion is made easily enough.

This would then be supplemented by the phonetic indicator [ma-], a reduced form of [mai-], which is the word for hand without the absolutive case marking. In addition, with the supplement of [aco-] the first syllable of [acomitl], one would be able to decipher what was meant by the rather ambiguous logogram, the ambiguity of the two phonetic indicators working against one another so that the selection of possible phonetic options becomes so limited that the choice becomes obvious. Inelegant perhaps, but workable.



Figure 25 Tentutepetl

The next sign is another difficult one to parse, though in this instance because of a

particular artifact of Mexica culture rather than simple ambiguity. The glyph is a bird with a man's head perched precariously on top, and Quinones Keber analyzes it as signifying *Tentutepetl*- On the Edge of the Hill of the Bird. The cultural artifact is the Mexica obsession with "face", meaning both the respect owed a person of stature and standing metonymically for the person as a whole. Within this is the concept of indirect and therefore figurative speech, indicative of such erudition and status, spoken "cententli ontentli, lit.(with) one lip, (with) two lips" (cf. Bright 1990). So the important element of the head is the face, a key element of the face is the lips. And the word lip is [tentli], making the phonetic association obvious, even if the glyph by which the indicator is depicted is not as obvious. While this interpretation may seem to stretch credulity, it is to some extent reinforced by what we know of the behavioral norms of Mexica society, which placed a high value on correct speech (cf. Léon-Portilla 1990), as well as the fact that [tentli] was capable of being metaphorically extended in a manner congruent with that discussed by Lakoff in his Contemporary Theory of Metaphor to mean "edge", as the lips were seen as the edge of the face according to Eloise Quinones Keber in her commentary on this glyph in her gloss of the Codex Telleriano-Remensis. So, keeping this in mind, it is possible that we are dealing with a polyvalent indicator, working on both a semantic and a phonetic level.



Figure 26 Tezontepec

The next glyph in our discussion, while the depiction itself looks rather complex, is in fact quite straightforward, especially compared to the rather circuitous ambiguity of the previous three examples. The glyph depicts a rock, which is [tetl] in Nahuatl. The rock has a flower and grass growing from it, and we are assured by both Quinones Keber and the Spanish annotator of the Telleriano-Remensis that the place referred to is Tezontepec, or “Hill of the Volcanic Rock”. Volcanic rock is [tezontli] in Nahuatl, and thus the rebus riddle is easily solved. Without the annotation, it would not have been so clear, however closely mirrored are the depiction and its pronunciation. One can only speculate on the relationship between volcanic rock and grass and flowers and why the one would indicate the other to the Mexica mind.



Figure 27 Tliluhquitepec

Another simple phonetic indicator is the color black in the logogram *Tliluhquitepec*, which literally translates to “Place of the Hill the Color of Black”. Black is [tliltic] and color is [uhqui]. Nahuatl tends to be specific to the point of repetition in this sense, making sure that black is referring to a literal color and not perhaps some abstract or metaphorical quality.



Figure 28 Itzactlalocan

The final example of the variations on this logogram is slightly different than the

previous iterations. The glyph is white, surmounted with a Tlaloc head, and represents *Itzactlalocan*, The White Place of Tlaloc. Tlalocan, the place of Tlaloc, was a name for the abode of Tlaloc, a heavenly place located at the center of the physical plane, or the “Navel of the World” (cf. Léon-Portilla 1990), and [itzac] is the Nahuatl term for white. Presumably [uhquitl], “of the color of” is unnecessary here because it refers to someone’s abode or location rather than simply a location, though “of the color black”, [tlili-uhqui] in the previous example could simply be an instance of the metaphorical doubling found so commonly throughout Nahuatl poetics (cf, Bright 1990).

This ties in with the calendric origin of the glyphs quite explicitly, making no bones about the mythological significance of the location it denotes. The cyclic calendar was both the technology around which the Mesoamerican peoples built their lives and structured their society and the focal point around which their mythology revolved. Tlaloc was less a god than an incarnation of rainclouds, as is indicated by his name, which means “One Who Lays Over the Land”. He is one of only two deities to be accorded their own day symbol, and in this form he was simply thought of as rain. The natural force was inseparable from its divine counterpart, but in some cases one manifestation or the other took precedence. The *tonalpohualli* continued to be consulted to determine the days of planting and harvest even more than a century after the Spanish conquest (cf. Lockhart 1992).

From here we move from place names to the names of royalty. These are the two areas typically acknowledged by scholars as being the places in which the Mexica used or attempted to use phonetic elements in their writing. I have already shown the complexity of ways in which Mexica scribes utilized phonetic and semantic complements in order to lead a reader to

the meaning of a glyph. I now look at a few of the names of the tlatoani of the Mexica in order to show that the Mexica scribes used considerably more cleverness in their encoding of proper names than they are generally given credit for, and in doing so encode a number of linguistic forms beyond the simple proper nouns that are typically assumed to be the extent of their orthography. So, let us take a look at Nahuatl naming conventions and the way they were written down.



Figure 29 Tizoc

First, we look at *Tizoc*. His name is represented as a stone pierced through with a maguēy thorn. But it is the nature of the relationship between the name and what it signifies that particularly interests us here. It translates to “He Pierced You,” which immediately strikes us as interesting in as much as it is not a noun at all but a verb, and furthermore a verb in the preterit tense, which can be seen in the dropped word final suffix. The stone [tetl], becomes simply [te] without its absolutive suffix, serving as an approximate phonetic indicator specifying [ti-], an association strengthened all the more by the homophone [Tizoc], or bleeder. The reason I believe that the appropriate translation of his name is “He Pierced You”, which would make it transitive rather than “He was Pierced” or something of that nature is that the second person prefix in Nahuatl is [ti-], and the third person prefix is [Ø]. Taken together then, they would yield the transitive preterit form.



Figure 30 Cuauhtlatoa

Another royal name worth considering is *Cuauhtlatoa*, meaning “Eagle Speaks”. This is another verb though this time in the present tense. Eagle is [cuauh-], [-tla-] is an indefinite prefix, and [-toa] is the present tense of the verb “to speak”. So it is really translatable into something more along the lines of “An Eagle Speaks”, or “Some Eagle Speaks”. The salient point here is that *Cuauhtlatoa* functions like a verb phrase, not like a proper noun. Between this example and the previous example *Tizoc*, we have the first glyphic pieces of a syntactic paradigm that previous work on the subject has simply passed over. In order to fill the paradigm, we would have to find an example of a verb stem in customary present tense, marked by [-ni-], the future tense marked [-z-], the distant past indicative [-ca-], the non-past optative [Ø], and the past optative, also marked [-ni-]. It seems possible that glyphs that stand for verbs containing these tense markers could be located in a thorough search of the logosyllabic Nahuatl literature.



Figure 31 Chimalpopoca



Figure 32 Citalpopoca

To exemplify the verbalized glyphs further, we have the name of another ruler, *Chimalpopoca*, or “Shield that Smokes”. The principal is [chimal-] being shield, and [-popoca]

being the present tense of the verb “to smoke” is affixed to it. Recall that all complete “lexical” units in Nahuatl contain the equivalent of an English sentence. *Chimalpopoca* can be contrasted, by way of a minimal pair, against a phenomenon that again expands our conception of what Aztec sages could do with writing. It is that of a celestial phenomenon from the same codex, Telleriano-Remensis.

The item itself, as you can see, is literally a round field of stars with smoke escaping from the top. To be so bold as to say that any Mexica logogram can be rendered as a word or labeled with one, I offer the translation *Citalpopoca*, [cital] or “star”, and again [popoca], the present tense of the verb “to smoke”, giving us the resultant “The Star that Smokes”. If a shield can be said to be smoking (Nahuatl does not have a continuous aspect in the present tense, only a customary one) and a star is recorded as having done so as well; and if the smoking shield is considered to be referring as a name or label to something particular in reality, then there seems to be no reason to exclude the possibility that the glyphs recording them could function in the same manner as one another. What this means is that symbols that previously had not been considered to have a meaning apart from their artistic expression must be re-examined in the light that any symbol can be a polyvalent glyph, working at either a semantic and at a phonetic level or at both simultaneously. After all, what is the difference between seeing a symbol and mouthing the word meaning of a supposed morphogram to oneself and that symbol having a formally recognized phonetic meaning. In my estimation there is no difference at all.



Figure 33 Pan-maitl-cxi-tetl

On the other hand however we have purely phonetic glyphs for which no independent semantic meaning suggests itself. We take as our example the glyph [pan-maitl-cxi-tetl], for which the translation is unattested by Quinones Keber. This glyph is undoubtedly a phonetic glyph, there can be no question. And as such it must be read in a particular order in order to mean anything at all. It is a flag [pan-] in a hand [mai-], attached to a leg [-cxi-] on a stone [te-], if we take the root associated with the glyph to be what the writer is meaning to convey.

A question exists about the order in which they are supposed to read. Top to bottom, in columns, or in rows from left to right? There is very little way of deciding, though an approximate top-bottom reading seems to suggest itself. The caveat here is that the Codex Tellariano-Remensis dates to considerably after the conquest, and conventional sign usage had shifted to reflect that. As Lockhart observes:

My own provisional, speculative conclusion is that pictorial phoneticism expanded in the post-conquest period, but that the method already existed for use when needed; we have too little pre-conquest material to be able to tell much from the apparent absence of some trait. In pre-conquest times, since nearly all proper names consisted of readily intelligible roots, there must have been little occasion for a pure phoneticism that would use the sound value of a depicted root regardless of its meaning; even non-Nahuatl Mesoamerican names were translatable into familiar concepts and roots. Not so Spanish names, which seemed to consist

of a series of nonsense syllables crying out for purely phonetic transcription. Thus it would have been primarily the opaqueness of the new subject material that caused one aspect of the indigenous system to be more practiced, not Spanish encouragement or conscious imitation bringing on an entirely new writing principle.

The sign is listed in conjunction with the death of Itzcoatl, represented as a serpent with spines of black obsidian jutting from its back. The assumption would be that he is of Aztec descent, though he may have been named according to Spanish convention. A search of the Mexica imperial lineage reveals no clues however. So, lacking a firm phonetic transcription, we must restrain ourselves to the signs themselves and conclude that apart from the fact that it is actually two compound glyphs connected by a black line, as was the convention for associating things in the historical codices, very little concrete can be said about it. One final note would be that it seems to function quite differently from the glyphs we have observed thus far in that the glyphs only adjoin one another even when compounded. There is none of the cleverness of integration that we see in Chimalpopoca or Citalpopoca, and none of the allusive richness that characterizes the more complex place name logograms.

What it comes down to is that in the course of studying Mesoamerican writing, particularly that of northern Mesoamerica, we have made two rather small but fundamental errors that have affected the scholarly consensus on the entire subject. The first has been to look at the problem too narrowly, as though writing in Mesoamerica worked in a fundamentally different way than it did elsewhere in the world.

At one level this is an understandable assumption; after all, Mesoamerica is geographically and culturally at a complete remove from any of the other societies which

practiced writing, all of which came to know about one another at some point in their relatively early history. Secondly, it has not been deciphered until recently, leaving scholars with only guesswork to go on.

And finally, it looks quite unusual, even to a scholar to whom Sanskrit and Mandarin are fairly commonplace. So the temptation to ascribe unusual properties to it is only natural, if a bit ill-considered. And this does not even take into account the biases which have been so commonplace until recently against giving credit to the American natives for having built complex societies.

The second mistaken assumption is more of a sense-reference error, brought on; it seems by a linguistically inadequate understanding of the nature of Nahuatl. Going on the naming conventions of Europe, scholars have assumed that the names of Aztec *tlatoani*, or kings, are by their nature proper nouns. This, as discussed, turns out not to be the case. Just because we are used to only referring to people with by means of a particular syntactic class of words by no means entails that it is the only syntactic class that can be used for such a purpose. The extension of this argument is that Mexica writers did in fact use verbs, though not in the manner usually seen in linear western texts. This enriches our understanding of Aztec glyphic capabilities considerably, allowing us to see the *tlamatini*, who were the wise men if you'll remember, as being much farther along in the conceptual process of working out the logic of the correspondences between their language and their orthography than we have previously given them credit for.

It was a script in the process of creating itself, and no doubt it had a considerable distance to go before it would have been able to express every syntactic and lexical element of

the language, work that other orthographic forms such as the alphabet would have saved it, but work that was nonetheless doable. Compare, for instance the Epi-Olmec syllabary, which is much more fully fleshed out in terms of glyphs that represent possible C(V) combinations (cf. Justeson 2001) than is the Aztec syllabary (cf. Lacadena 2008b). The Epi-Olmec script was also capable of many forming many syntactic constructions by virtue of specific glyphs or arrangement of glyphs, such as locatives (which Mexica scribes could to an extent express as well, as we've seen), relativizers, possessives, and auxiliary verbs. They had also worked out in logophonetic form many of the complexities of spelling that a syllabary entails.

So what we see then are that the calendar codices serve as repositories of symbols that are then taken, co-opted, and repurposed for use in denoting specific phenomenon in the physical world rather than in the figurative space of myth and cosmological structure. This makes sense given our previous discussion of the cognitive origins of linguistic representation as a combination of conceptual aspects of numerals and pictorial expression. Justeson puts it well in his article on the invention of writing in Mesoamerica, saying:

Linguistic processing enters visual symbol systems by associating numerals with independent visual symbols; in Mesoamerica it did so via the names of the 260 days of the ritual calendar. Patterns in the use of written numerals and in the representation of day names support this view, while the representation of day names naturally induces the conjoining of numerals with iconographic units.

This synthetic repurposing can be looked at profitably through the use of two heuristics, the first of which feeds into the second. They are that of exaptation and that of language

acquisition. We look first at language acquisition, which has implications for brain structure as it relates to our discussion of exaptation.

The Neurolinguistics of Reading

There are three studies that I found that are particularly relevant to the more abstract point towards which this article is reaching. The first is a brain scan study looking into the neural correlates of reading development in children with particular recourse to strategies they use to interiorize writing. The second is a study about eye movement during reading, and the way in which it varies to an extent in Chinese and American readers. The third is another study of neural correlates, but it is focused more on the structural breakdown of the hierarchy of orthography, phonetics, and semantics in the brain, and is occupied with the question of whether or not one necessarily mediates the others. I think these studies are important elements in a full understanding of world orthographies, and their results provide some tantalizing analogies for Mesoamerican writing systems, because “Writing is a completely artificial technology, [and] technologies are not mere exterior aids but also interior transformations of consciousness, and never more than when they affect the word” (cf. Ong 2002).

The first study, (cf. Ramus 2004), tells us that “alphabetic/orthographic processing has been reliably associated with the occipito-temporal region of the left hemisphere”. Given that the left hemisphere of the brain is the hemisphere associated with logical, syntactic language functions, that the occipital lobe is the primary area of visual processing, and that the temporal lobe is the location of both Broca's area and Wernicke's area; this is only to be expected.

Moving upwards and forwards “From the fusiform gyrus [located in a part of the cerebellum wrapped underneath the mid-brain], the hierarchy of more and more abstract orthographic representations seems to progress over the posterior portions of the inferior and medial temporal gyri, the latter being a possible locus for the orthographic lexicon”. This means that as we move forward from the visual centers of the brain towards the hearing and speaking centers, we also move away from concrete word forms in an abstract sense, adding layers of meaning and slotting them into the functional roles they play within sentences. It is worth noting the obvious fact here that this study was performed on participants fluent in an alphabetic orthography. The results seem to indicate that the region of the brain responsible for encoding the form of the whole word is the location being activated during reading, rather than the “temporo-parietal junction, including the posterior superior temporal gyrus (STGp), the angular gyrus and the supra-marginal gyrus”, which seems to correlate more with the forms of individual letters that make up the words, with the “STGp and anterior supra-marginal [involved] as well as in computing grapheme-phoneme correspondences” (cf. Ramus 2004).

What this would indicate is, contrary to expectations, the form of an alphabetic word taken as a whole symbol is actually what is being computed in fluent readers. This would seem to indicate is that neurally; perhaps logograms and phonograms are not so different after all, particularly keeping in mind that many, if not most, words in scripts such as Mandarin are encoded by several logograms working in concert.

Indeed, “children seem to activate the left STGp more than adults in tasks requiring word reading (Booth et al., 2001). This is again consistent with the idea that they rely more on alphabetic and less on orthographic strategies” (cf. Ramus 2004). So in much the same manner

that the children of Mexica nobles were taught the various component symbols that aligned with the attributes of the various divinities in their *calemac*, so too are letters the component symbols we build into whole-word units that we recall as unitary symbols on sight.

Proceeding now to the second relevant neurological study, we move from the interior of the brain to its exterior visual organs. Amatya 2011 tells us that “results suggesting that eye movement patterns differ between Chinese and Caucasian subjects when looking at complex scenes. This is relevant to language, despite the fact that the study was done with complex scenes in photographs for two reasons. Firstly, the only difference between Chinese and Caucasian subjects is the language that they speak and read in. To assert any other reasoning would be to shy uncomfortably close to cultural or even biological Darwinism in the ethnocentric sense. No doubt their cultures are different, but it seems difficult to imagine what aspect of culture (other than language) would be responsible for entraining eye-movement. It remains an open question however.

These eye-movements are known as saccades, and are the nearly unnoticeable way in which your eyes wiggle slightly when you stare at something in order to fill in perceptual gaps caused by the optic nerve and blood vessels on the back of the eye, as well as to refresh your vision by updating the scene with any changes that occur.

To define the terms used in the study, “Express saccades (ES) are low latency visually-guided saccades that have a distinct neurophysiological origin [in the occipital lobe].” They are saccades that have approximately half of the duration of a normal saccade. An “[Express Saccade Markers] [in some subjects, even] in the absence of any pathology continue to exhibit high proportions (30%) of ES in overlap conditions.” This means that there are some people,

particularly of Chinese descent, move their eyes in a specific way about thirty percent of the time when looking in a fixed, goal-directed manner at a complex scene.

Amatya continues, saying “These subjects have been reported to be relatively rare [as stated by Biscaldi et al. 1996]. However, we found that 10/34 (29%) of our Chinese subjects were ESMs, compared to 1/38 (3%) of Caucasian subjects,”(cf. Amatya 2011). What we can infer from this is that different orthographic systems are perceived differently by the visual system. So, despite what would seem to be apparent neurological similarities in the decoding of alphabetic and logographic scripts, they are processed differently in the visual cortex. The significance of this for the further stages of the cognitive process of reading are unknown at this time as more experiments would need to be performed. It stands to reason however that these results could entail the fact that though the neurological mechanisms put to use decoding different orthographies are the same, they are not necessarily employed in an identical order or manner, or by means of an identical process.

The third study that is reviewed here, “Form-Meaning Links in the Development of Visual Word Recognition” by Kate Nation, relates to the development of phonetic, orthographic and semantic knowledge, and the way the three scaffold one another. She notes that “in adults, orthography and phonology are tightly linked”. So much so that “orthographic knowledge interferes with phonological processing in literate adults: even when a task is presented entirely within the auditory domain, orthographic information exerts an influence”(cf. Nation 2009). Meaning, essentially, that in the brain of a literate person, as the nobility of Mesoamerica undoubtedly were, phonology does not precede orthography. In this sense, it is not the second-order modeling system that it has long been taken to be but actually integrates itself into the

linguistic processing of the brain in a recursive manner, becoming inseparable from oral language competence.

This process obviously begins in children. “Decoding is the term used to describe the active process by which children map from orthography to phonology, usually in a letter-by-letter (or grapheme-by-grapheme) manner, sounding-out words to decipher their pronunciation,” Nation says, meaning that as they acquire all but the most basic of childhood vocabulary, they are associating the orthographic and the phonological simultaneously. This would be even truer of texts like the Mesoamerican codices, where extensive speeches were taught in parallel with the graphic texts, highlighting what Nation also points out, that “access to meaning from print can be direct, consistent with children using [Orthography-Semantic] connections much earlier in development than traditionally assumed” (cf. Nation 2009). Even in alphabetic cultures, as we looked at in our discussion the brain scan study, the roles that phonology and orthography play are quite different than what has traditionally been assumed, though it is consistent with the current scholarly consensus. Building from that, it is likely that in cultures with logographic or logophonetic orthographies that these relationships are conserved, though perhaps in varying proportions on the basis of the semantic/phonetic ratios of their particular script.

The purpose of the background in neurolinguistics and cross-orthographic typography that I have included in this paper have been for the purposes of “Casting the comparative net more broadly,” in the hopes that it “will most likely reveal larger regularities in evolution, helping to address the role of such constraints [in our case attested orthographic types and neural processing] in the evolution of [written] language” (cf. Chomsky 2002).

To conclude, I would like to put all of the data we have considered into something of a semantic frame, that of exaptation. An exaptation is an evolutionary process in which a previously useless function or an adapted function adapted is taken and used for something or used for something other than the purpose for which it originally adapted. Within this frame, the idea of a spandrel is an evolutionary feature that is exapted out of the biological (or in our case cognitive) scaffolding of some other feature.

I am being careful to frame this discussion as being metaphorical rather than literal, because I am currently incapable of proving in any manner that this is what actually occurred in the development of writing, but it seems to fit with everything that has been discussed up to this point and this very problem, that of current utility as opposed to origination, is the problem which the concept of exaptation was originally created to solve. Perhaps as more information becomes available to us from the different research paradigms within linguistics, anthropology, neuroscience, and cognitive science, we will be able to say with more surety whether or not this frame is a good fit for the topic at hand. But for the time being, it provides a useful “handhold” (or perhaps mindhold) for thinking about the topic, so it bears reflection.

After all, Gould said, in the paper in which he took the concept from the field of paleobiology for which he developed it and used it (exapted it?) as a tool for advancing the paradigm of evolutionary anthropology, “for something so complex and so replete with latent capacity as the human brain, spandrels must vastly outnumber original reasons, spandrels and exaptations of the brain must greatly exceed adaptations by orders of magnitude” (cf. Gould 1991).

The concept applies to written language in many ways. Firstly, there is the point

discussed on several occasions in which one culture borrows the writing system or concept of writing from another culture and uses it to create their own system that may or may not be particularly similar to the original system. Examples include the exchange the Greeks and the Phoenicians, the Phoenicians and the Mesopotamians, the Ganges empires and (likely) the Phoenicians, the Japanese and the Chinese, probably the Mexica and the Mixtec, and others that I am as yet unaware of. Secondly, going a level deeper, there is the cognitive development of writing. Justeson's thesis about the combination of pictorial and numerical elements is a classic example of exaptation. The identification of the common elements of representation in artistic expression and in numerical ordinality was genius enough in its own analytical right, but to reanalyze them and synthesize the two together was a leap beyond leaps, and the fact that it occurred more than once in the history of the world is testament to the ingenuity of our particular brand of upright ape. To go yet deeper still, the way in which the neural mechanisms of writing have homologized themselves with the structures of oral language is something to be marveled at, and speaks to the plasticity of the human brain. That it can refigure itself in a bottom-up developmental manner while at the same time exerting top-down control over precise eye movements calculated to optimize information processing rates that vary based on entrainment by external phenomenon and that it can use mechanisms of its own development to study and decipher the way in which it does these things is, to put it mildly, rather incredible.

CHAPTER 3

PROBLEMS AND FURTHER RESEARCH

The problems that still confront the field of Mesoamerican studies are enough to occupy generations of scholars. The concrete problems that my research in particular opens up however are several. First, there is the identity of the mystery figure from Codex Tellariano-Remensis. Extending from that, the extant corpus of Nahuatl glyphs must be gone through with the polyvalence demonstrated in this paper in mind to see whether or not there are more of signs which could be read phonetically as well as semantically.

An area of further research that presented itself to me as I worked my way through this paper was one which could prove quite fruitful or could turn out to be a blind alley. The idea is that given the enormous amount of Nahuatl writing that we have in Latinate text, it seems we are very well positioned to undertake a computational statistical analysis of a large section of these texts, say for instance the *Cantares Mexicanos* and the *Florentine Codex*, and attempt an analysis of its conceptual metaphors, as described in *The Contemporary Theory of Metaphor* by Lakoff. Also useful in this vein would be *Reflections on Metaphor and Grammar*, also by Lakoff. Given the highly semanticized nature of Nahuatl orthography, it could provide some insight into whether or not there exists a sort of “semantic syntax” in the arrangement of signs, and if so, provide a doorway to examine the form that it takes Lakoff 1996. Nahuatl is a particularly fruitful corpus for this work, given that the rhetorical nature of their poetry is composed of “difrasismos” as in (cf. Bright 1990). Syntactically, these are reminiscent of the frozen idiomatic pairs demonstrated by Cooper and Ross (cf. Cooper 1975), and as such would be quite susceptible to collocation analysis.

Dependent on the results of the analysis, it may be possible to create a working compendium of Nahuatl structural metaphors, which would be something of a breakthrough in its own right, but which would be interesting to compare to a wide spectrum of logograms in an attempt to discern whether or not there are any semantic classes into which they fall or principles along which they are organized.

To return to the Codex Borbonicus itself, the veintena section remains to be examined more closely to determine ways in which it aligns more closely with the rest of the document either in form, theme, or structure.

Additionally, though it is at present beyond my capacities, brain scans of the indigenous children now being taught Mayan writing in Mexican and Central American schools could be very instructive in comparison to the work that has been done on alphabetic reading acquisition, either by the similarities or by their differences. A study published very recently about the intercultural equivalence of handwriting gestures and brain mechanisms in reading is another element that ought to be integrated into this research. Unfortunately the timing of its publication prohibited me from including its conclusions in my section on the neurolinguistics of reading; however it will be included in any further work on the subject.

APPENDIX A

THE CODEX BORBONICUS: THE TRECENA



Figure A.1 Trecena 3

Sign: Deer		Patron: Tepeyollotl with Quetzalcoatl		
tecpayo	chimal	teohualli	tecciztli	Mexica
chiquihuitl	coatl	cuauhxicalli	toatl	copalli
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Deer (Mazatl)	Tlaloc	Xiuhtecuhtli	Blue Hummingbird
2	Rabbit (Tochtli)	Xiuhtecuhtli	Tlaltecuhli	Green Hummingbird
3	Water (Atl)	Itztli (Tecpatl)	Chalchiuhtlicue	Hawk
4	Dog (Itzcuintli)	Piltzintecuhtli	Tonatiuh	Quail
5	Monkey (Ozomatli)	Centeotl	Tlazolteotl	Eagle
6	Grass (Malinalli)	Mictlantecuhli	Mictlantecuhtli	Screech Owl
7	Reed (Acatl)	Chalchiuhtlicue	Centeotl	Butterfly
8	Jaguar (Ocelotl)	Tlazolteotl	Tlaloc	Eagle
9	Eagle (Cuauhtli)	Tepeyollotl	Quetzalcoatl	Turkey
10	Vulture (Cozcacuauhtli)	Tlaloc	Tezcatlipoca	Horned Owl
11	Movement (Ollin)	Xiuhtecuhtli	Chalmecatli	Macaw
12	Flint (Tecpatl)	Itzli	Tlahuizcalpantecuhli	Quetzal
13	Rain (Quiauitl)	Piltzintecuhtli	Ilamatecuhtli	Parrot



Figure A.2 Trecena 4

	Sign: Flower	Patron: Huehuecoyotl with Drummer		
Citalpul	quimilli	xiquipilli	in xochitl in ciuatl	teohualli
caxitl	cuetzpallin quimilli	cohuatl	quimilli	
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Flower (Xochitl)	Centeotl	Xiuhtecuhtli	Blue Hummingbird
2	Crocodile (Cipactli)	Mictlantecutli	Tlaltecuhli	Green Hummingbird
3	Wind (Ehecatl)	Chalchiuhtlicue	Chalchiuhtlicue	Hawk
4	House (Calli)	Tlazotlteotl	Tonatiuh	Quail
5	Lizard (Cuetzpallin)	Tepeyollotl	Tlazotlteotl	Eagle
6	Serpent (Coatl)	Tlaloc	Mictlantecuhli	Screech Owl
7	Death (Miquiztli)	Xiuhtecuhtli	Centeotl	Butterfly
8	Deer (Mazatl)	Itzli	Tlaloc	Eagle
9	Rabbit (Tochtli)	Piltzintecuhtli	Quetzalcoatl	Turkey
10	Water (Atl)	Centeotl	Tezcatlipoca	Horned Owl
11	Dog (Itzcuintli)	Mictlantecutli	Chalmecatli	Macaw
12	Monkey (Ozomatli)	Chalchiuhtlicue	Tlahuizcalpantecutli1	Quetzal
13	Grass (Malinalli)	Tlazotlteotl	Ilamatecuhtli	Parrot

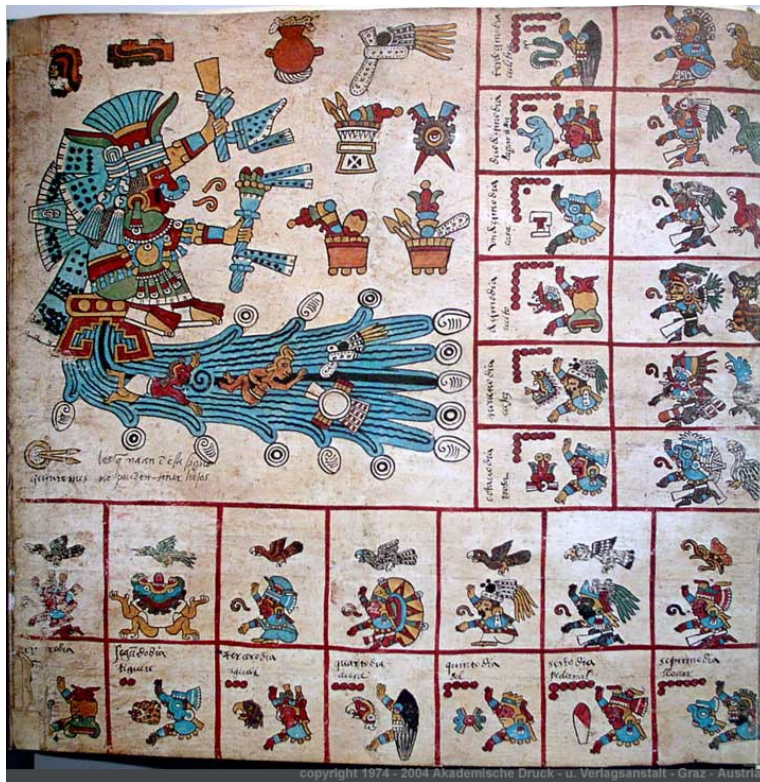


Figure A.3 Trecena 5

Sign: Reed		Patron: Chalchiuhtlicue		
tetl	Momoztli	octli	huitzitzconcal	caxitl
Citalpul	yollotl	caxitl	Nahua x2	huitzitzconcal
chimal	Xeluzatl			
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Reed (Acatl)	Tepeyollotl	Xiuhtecuhtli	Blue Hummingbird
2	Jaguar (Ocelotl)	Tlaloc	Tlaltecuhli	Green Hummingbird
3	Eagle (Cuauhtli)	Xiuhtecuhtli	Chalchiuhtlicue	Hawk
4	Vulture (Cozcacuauhtli)	Itzli	Tonatiuh	Quail
5	Movement (Ollin)	Piltzintecuhtli	Tlazolteotl	Eagle
6	Flint (Tecpatl)	Centeotl	Mictlantecuhtli	Screech Owl
7	Rain (Quiauitl)	Mictlantechutli	Centeotl	Butterfly
8	Flower (Xochitl)	Chalchiuhtlicue	Tlaloc	Eagle
9	Crocodile (Cipactli)	Tlazotlteotl	Quetzalcoatl	Turkey
10	Wind (Ehecatl)	Tepeyollotl	Tezcatlipoca	Horned Owl
11	House (Calli)	Tlaloc	Chalmecatl	Macaw
12	Lizard (Cuetzpallin)	Xiuhtecuhtli	Tlahuizcalpantechutli1	Quetzal
13	Serpent (Coatl)	Itzli	Ilamatecuhtli	Parrot



Figure A.4 Trecena 6

Sign: Death		Patron: Tecciztecatl with Tezcatlipoca		
tlacochtli	zacatapayolli	tecciztli	cochotl	quimilli
Citapul	temecayo	tlecuazaco	Nahua x2	mazatl
cipactli	tecciztli	al'ahuactli	mecatli	apilolli
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Death (Miquiztli)	Piltzintecuhtli	Xiuhtecuhtli	Blue Hummingbird
2	Deer (Mazatl)	Centeotl	Tlaltecuhli	Green Hummingbird
3	Rabbit (Tochtli)	Mictlantechutli	Chalchiuhtlicue	Hawk
4	Water (Atl)	Chalchiuhtlicue	Tonatiuh	Quail
5	Dog (Itzuintli)	Tlazotlteotl	Tlazolteotl	Eagle
6	Monkey (Ozomatli)	Tepeyollotl	Mictlantecuhtli	Screech Owl
7	Grass (Malinalli)	Tlaloc	Centeotl	Butterfly
8	Reed (Acatl)	Xiuhtecuhtli	Tlaloc	Eagle
9	Jaguar (Ocelotl)	Itzli	Quetzalcoatli	Turkey
10	Eagle (Cuauhtli)	Piltzintecuhtli	Tezcatlipoca	Horned Owl
11	Vulture (Cozcacuauhtli)	Centeotl	Chalmecatli	Macaw
12	Movement (Ollin)	Mictlantechutli	Tlahuizcalpantecuhtli	Quetzal
13	Flint (Tecpatl)	Chalchiuhtlicue	Ilamatecuhtli	Parrot

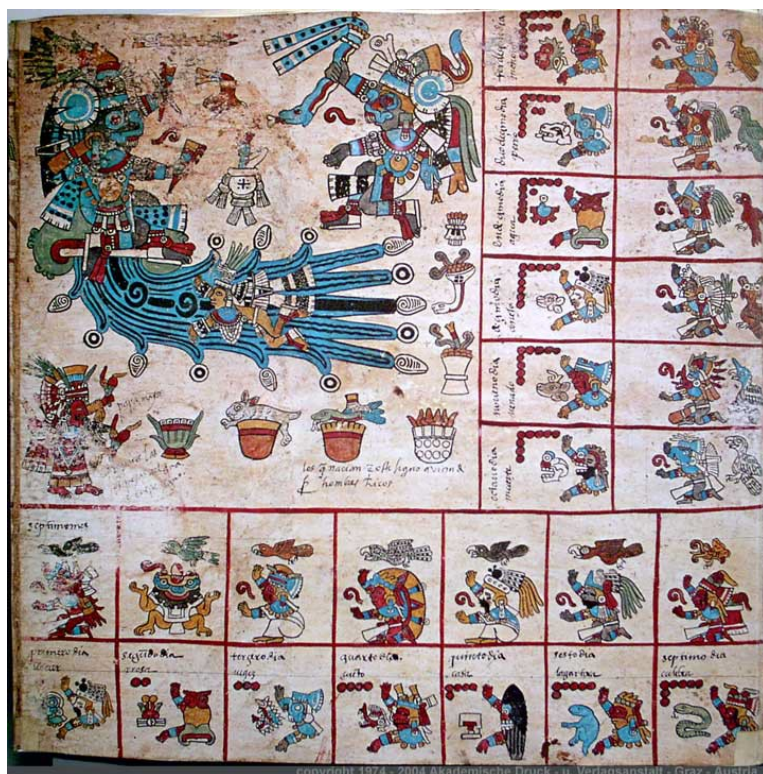


Figure A.5 Trecena 7

Sign: Rain		Patron: Tlaloc		
tlacohtli	tiocelotl cotztetl	teotolli x2	xiquipilli	quimilli
tlecomic	tlecuazco	toatl/chohcholli	tochtli	xochitl
Teuctamacazqui				
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Rain (Quiauitl)	Tlazotlteotl	Xiuhtecuhtli	Blue Hummingbird
2	Flower (Xochitl)	Tepeyollotl	Tlaltecuhli	Green Hummingbird
3	Crocodile (Cipactli)	Tlaloc	Chalchiuhtlicue	Hawk
4	Wind (Ehecatl)	Xiuhtecuhtli	Tonatiuh	Quail
5	House (Calli)	Itzli	Tlazotlteotl	Eagle
6	Lizard (Cuetzpallin)	Piltzintecuhtli	Mictlantecuhtli	Screech Owl
7	Serpent (Coatl)	Centeotl	Centeotl	Butterfly
8	Death (Miquiztli)	Mictlantechutli	Tlaloc	Eagle
9	Deer (Mazatl)	Chalchiuhtlicue	Quetzalcoatl	Turkey
10	Rabbit (Tochtli)	Tlazotlteotl	Tezcatlipoca	Horned Owl
11	Water (Atl)	Tepeyollotl	Chalmecatl	Macaw
12	Dog (Itzuintli)	Tlaloc	Tlahuizcalpantechutli1	Quetzal
13	Monkey (Ozomatli)	Xiuhtecuhtli	Ilamatecuhtli	Parrot

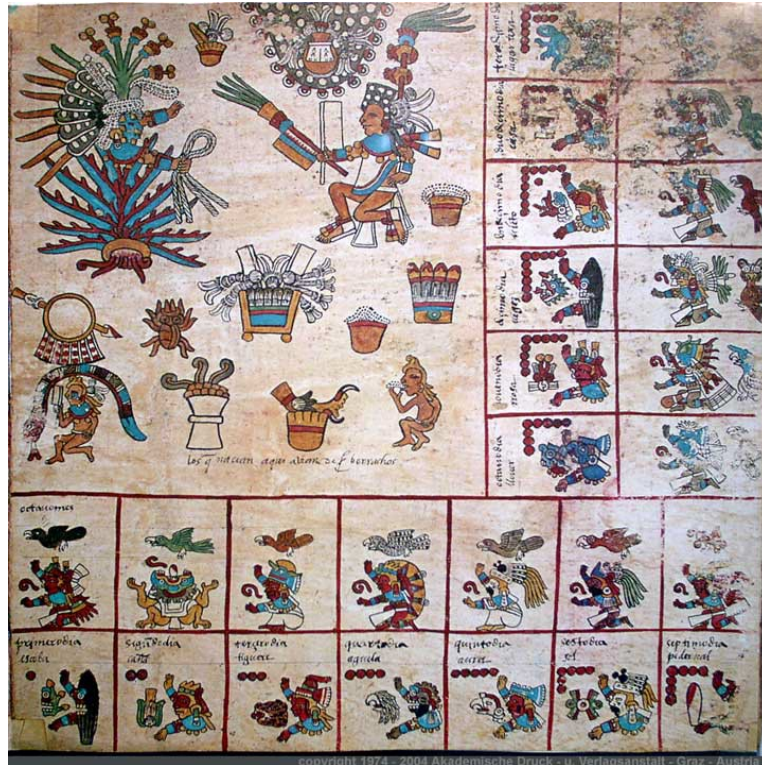


Figure A.6 Trecena 8

Sign: Grass		Patron: Mayahuel		
Cenoyohual	apiolli ihuiteteyo		caxitl	octli x2
Cuauhxicalli	ipetlactl	Nahua x 2	tlecuazco	iocelotl cotztetl
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Grass (Malinalli)	Itzli	Xiuhtecuhtli	Blue Hummingbird
2	Reed (Acatl)	Piltzintecuhtli	Tlaltecuhli	Green Hummingbird
3	Jaguar (Ocelotl)	Centeotl	Chalchiuhtlicue	Hawk
4	Eagle (Cuauhtli)	Mictlantechutli	Tonatiuh	Quail
5	Vulture (Cozacauauhtli)	Chalchiuhtlicue	Tlazolteotl	Eagle
6	Movement (Ollin)	Tlazotlteotl	Mictlantecuhtli	Screech Owl
7	Flint (Tecpatl)	Tepeyollotl	Centeotl	Butterfly
8	Rain (Quiauitl)	Tlaloc	Tlaloc	Eagle
9	Flower (Xochitl)	Xiuhtecuhtli	Quetzalcoatl	Turkey
10	Crocodile (Cipactli)	Itzli	Tezcatlipoca	Horned Owl
11	Wind (Ehecatl)	Piltzintecuhtli	Chalmecat	Macaw
12	House (Calli)	Centeotl	Tlahuizcalpantechutli1	Quetzal
13	Lizard (Cuetzpallin)	Mictlantechutli	Ilamatecuhtli	Parrot



Figure A.7 Trecena 9

Sign: Serpent		Patron: Xiuhtecuhtli and Tlahuizcalpantecuhtli		
atl tlacochtli		tocatl	teoxpalli	tlachinolli
cuauhxicalli, mitl, omitl, tlepalaplotl cohuatl				
chiquihuitl	amacuexpalli	amacalli	chiquihuitl x2	tochtli
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Serpent (Coatl)	Chalchiuhtlicue	Xiuhtecuhtli	Blue Hummingbird
2	Death (Miquiztli)	Tlazotlteotl	Tlaltecuhli	Green Hummingbird
3	Deer (Mazatl)	Tepeyollotl	Chalchiuhtlicue	Hawk
4	Rabbit (Tochtli)	Tlaloc	Tonatiuh	Quail
5	Water (Atl)	Xiuhtecuhtli	Tlazotlteotl	Eagle
6	Dog (Itzcuintli)	Itzli	Mictlantecuhtli	Screech Owl
7	Monkey (Ozomatli)	Piltzintecuhtli	Centeotl	Butterfly
8	Grass (Malinalli)	Centeotl	Tlaloc	Eagle
9	Reed (Acatl)	Mictlantecuhli	Quetzalcoatl	Turkey
10	Jaguar (Ocelotl)	Chalchiuhtlicue	Tezcatlipoca	Horned Owl
11	Eagle (Cuauhtli)	Tlazotlteotl	Chalmecatli	Macaw
12	Vulture (Cozcacuauhtli)	Tepeyollotl	Tlahuizcalpantecuhli1	Quetzal
13	Movement (Ollin)	Tlaloc	Ilamatecuhtli	Parrot

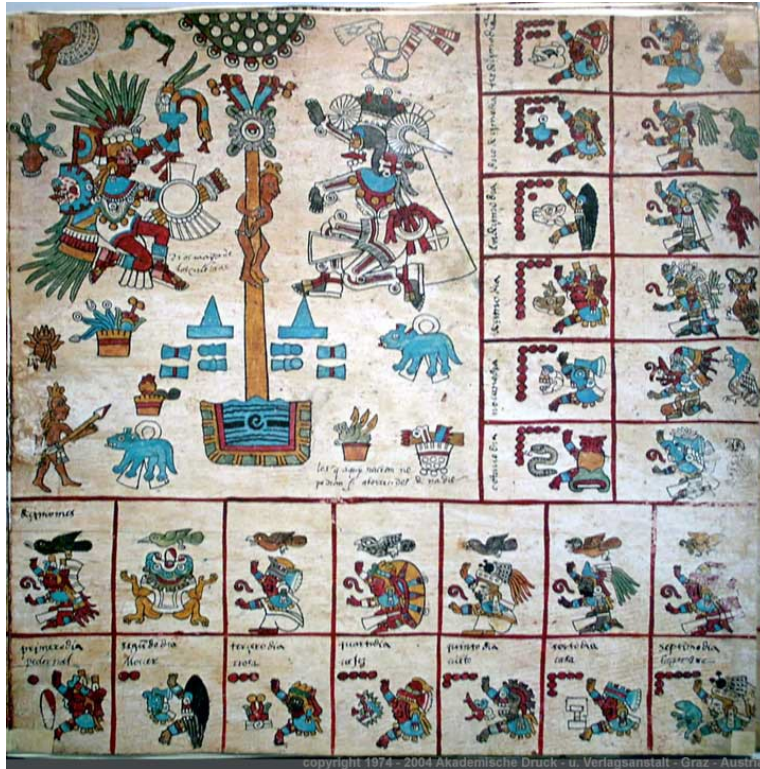


Figure A.8 Trecena 10

Sign: Flint		Patron: Mictlantecuhtli and Tonatiuh		
Unidentified	coatl	Cenoyohual	micca quimiliuhcayotl	apiloli
Quapatlanqui	Nahua	Citalpul	chiquihuitl	tocatl
amacalli x2	amacuexpalli x2	tochtli x2	quetzal	micalini
	quimilli mitl	chiquihuitl		omitl
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Flint (Tecpatl)	Xiuhtecuhtli	Xiuhtecuhtli	Blue Hummingbird
2	Rain (Quiauitl)	Itzli	Tlaltecuhli	Green Hummingbird
3	Flower (Xochitl)	Piltzintecuhtli	Chalchiuhtlicue	Hawk
4	Crocodile (Cipactli)	Centeotl	Tonatiuh	Quail
5	Wind (Ehecatl)	Mictlantecuhtli	Tlazolteotl	Eagle
6	House (Calli)	Chalchiuhtlicue	Mictlantecuhtli	Screech Owl
7	Lizard (Cuetzpallin)	Tlazotlteotl	Centeotl	Butterfly
8	Serpent (Coatl)	Tepeyollotl	Tlaloc	Eagle
9	Death (Miquiztli)	Tlaloc	Quetzalcoatl	Turkey
10	Deer (Mazatl)	Xiuhtecuhtli	Tezcatlipoca	Horned Owl
11	Rabbit (Tochtli)	Itzli	Chalmecatl	Macaw
12	Water (Atl)	Piltzintecuhtli	Tlahuizcalpantecuhtli	Quetzal
13	Dog (Itzuintli)	Centeotl	Ilamatecuhtli	Parrot

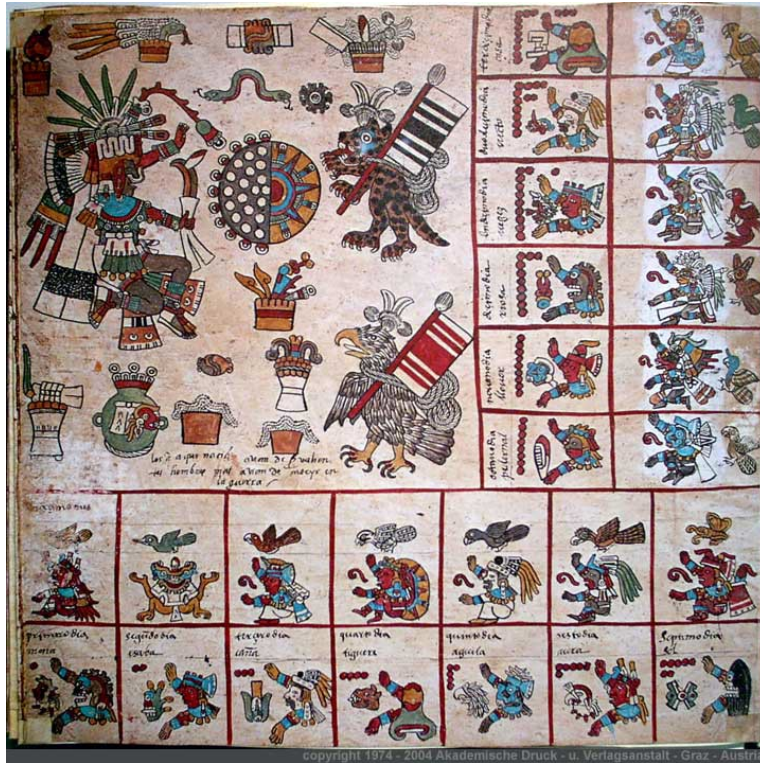


Figure A.9 Trecena 11

Sign: Monkey		Patron: Patecatl with Eagle and Jaguar		
chiquihuitl	yollotl	huitzitzoncal	coatl	tetl
coatl	Citalpul	chiquihuitl	tecpayo	pan
ihuiteteyo	in yetlahuizcalehua	ocelotl	cuauhtli	tlecomic x2
tetl	ocxtl x2	apiolli	chiquihuitl	chahcohuilia
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Monkey (Ozomatli)	Mictlantechutli	Xiuhtecuhtli	Blue Hummingbird
2	Grass (Malinalli)	Chalchiuhtlicue	Tlaltecuhli	Green Hummingbird
3	Reed (Acatl)	Tlazotlteotl	Chalchiuhtlicue	Hawk
4	Jaguar (Ocelotl)	Tepeyollotl	Tonatiuh	Quail
5	Eagle (Cuauhtli)	Tlaloc	Tlazotlteotl	Eagle
6	Vulture (Cozcacuauhtli)	Xiuhtecuhtli	Mictlantecuhtli	Screech Owl
7	Movement (Ollin)	Itzli	Centeotl	Butterfly
8	Flint (Tecpatl)	Piltzintecuhtli	Tlaloc	Eagle
9	Rain (Quiauitl)	Centeotl	Quetzalcoatl	Turkey
10	Flower (Xochitl)	Mictlantechutli	Tezcatlipoca	Horned Owl
11	Crocodile (Cipactli)	Chalchiuhtlicue	Chalmecatl	Macaw
12	Wind (Ehecatl)	Tlazotlteotl	Tlahuizcalpantecuhtli1	Quetzal
13	House (Calli)	Tepeyollotl	Ilamatecuhtli	Parrot



Figure A.10 Trecena 12

Sign: Lizard		Patron: Itztlacolihqui most items in this trecena are ezmoloni (bleeding)		
unidentified	tlecuazco	tlacochtli	xiquilli	octli
atl	tetl	chimal	tecciztli	huitztli
chiquihuitl	huitztli	omitli	Nahua motepapatlachoa x2	
coatl	atl	icuah mazatl	unidentified	
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Lizard (Cuetzpallin)	Tlaloc	Xiuhtecuhtli	Blue Hummingbird
2	Serpent (Coatl)	Xiuhtecuhtli	Tlaltecuhthli	Green Hummingbird
3	Death (Miquiztli)	Itzli	Chalchiuhtlicue	Hawk
4	Deer (Mazatl)	Piltzintecuhtli	Tonatiuh	Quail
5	Rabbit (Tochtli)	Centeotl	Tlazolteotl	Eagle
6	Water (Atl)	Mictlantecuhthli	Mictlantecuhtli	Screech Owl
7	Dog (Itzuintli)	Chalchiuhtlicue	Centeotl	Butterfly
8	Monkey (Ozomatli)	Tlazotlteotl	Tlaloc	Eagle
9	Grass (Malinalli)	Tepeyollotl	Quetzalcoatl	Turkey
10	Reed (Acatl)	Tlaloc	Tezcatlipoca	Horned Owl
11	Jaguar (Ocelotl)	Xiuhtecuhtli	Chalmecatli	Macaw
12	Eagle (Cuauhtli)	Itzli	Tlahuizcalpantecuhthli1	Quetzal
13	Vulture (Cozcacu-auhtli)	Piltzintecuhtli	Ilamatecuhtli	Parrot



Figure A.11 Trecena 13

Sign: Movement		Patron: Tlazolteotl		
chiquihuitl	Nahua coauhqui	mamaltin	coatl	petalzolcoatl
quimilli	Tlecomic	tocatl	Citalpul	tzonpantli
tlecuazco	Yollotl	cuaitl		
Day	Daysign (Nahuatl)	Lord of The Night	Lord of the Day	Volatile
1	Movement (Ollin)	Centeotl	Xiuhtecuhtli	Blue Hummingbird
2	Flint (Tecpatl)	Mictlantecutli	Tlaltecuhli	Green Hummingbird
3	Rain (Quiauitl)	Chalchiuhtlicue	Chalchiuhtlicue	Hawk
4	Flower (Xochitl)	Tlazotlteotl	Tonatiuh	Quail
5	Crocodile (Cipactli)	Tepeyollotl	Tlazolteotl	Eagle
6	Wind (Ehecatl)	Tlaloc	Mictlantecuhli	Screech Owl
7	House (Calli)	Xiuhtecuhtli	Centeotl	Butterfly
8	Lizard (Cuetzpallin)	Itzli	Tlaloc	Eagle
9	Serpent (Coatl)	Piltzintecuhtli	Quetzalcoatl	Turkey
10	Death (Miquiztli)	Centeotl	Tezcatlipoca	Horned Owl
11	Deer (Mazatl)	Mictlantecutli	Chalmecatl	Macaw
12	Rabbit (Tochtli)	Chalchiuhtlicue	Tlahuizcalpantecutli1	Quetzal
13	Water (Atl)	Tlazotlteotl	Ilamatecuhtli	Parrot



Figure A.12 Trecena 14

Sign: Dog		Patron: Xipe Totec		
tlecomic, amacalli, omitl, popoca		pan toztli		
cencoatl	ce itzuintli	cuauhxicalli	eyi cuauhtli	n̄'ahui ollin
unidentified	chiquihuitl	m̄'amaltin	ihuiteteyo	
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Dog (Itzuintli)	Tepeyollotl	Xiuhtecuhtli	Blue Hummingbird
2	Monkey (Ozomatli)	Tlaloc	Tlaltecuhli	Green Hummingbird
3	Grass (Malinalli)	Xiuhtecuhtli	Chalchiuhtlicue	Hawk
4	Reed (Acatl)	Itzli	Tonatiuh	Quail
5	Jaguar (Ocelotl)	Piltzintecuhtli	Tlazolteotl	Eagle
6	Eagle (Cuauhtli)	Centeotl	Mictlantecuhtli	Screech Owl
7	Vulture (Cozcacuauhtli)	Mictlantechutli	Centeotl	Butterfly
8	Movement (Ollin)	Chalchiuhtlicue	Tlaloc	Eagle
9	Flint (Tecpatl)	Tlazotlteotl	Quetzalcoatl	Turkey
10	Rain (Quiauitl)	Tepeyollotl	Tezcatlipoca	Horned Owl
11	Flower (Xochitl)	Tlaloc	Chalmecatl	Macaw
12	Crocodile (Cipactli)	Xiuhtecuhtli	Tlahuizcalpantechutli	Quetzal
13	Wind (Ehecatl)	Itzli	Ilamatecuhtli	Parrot

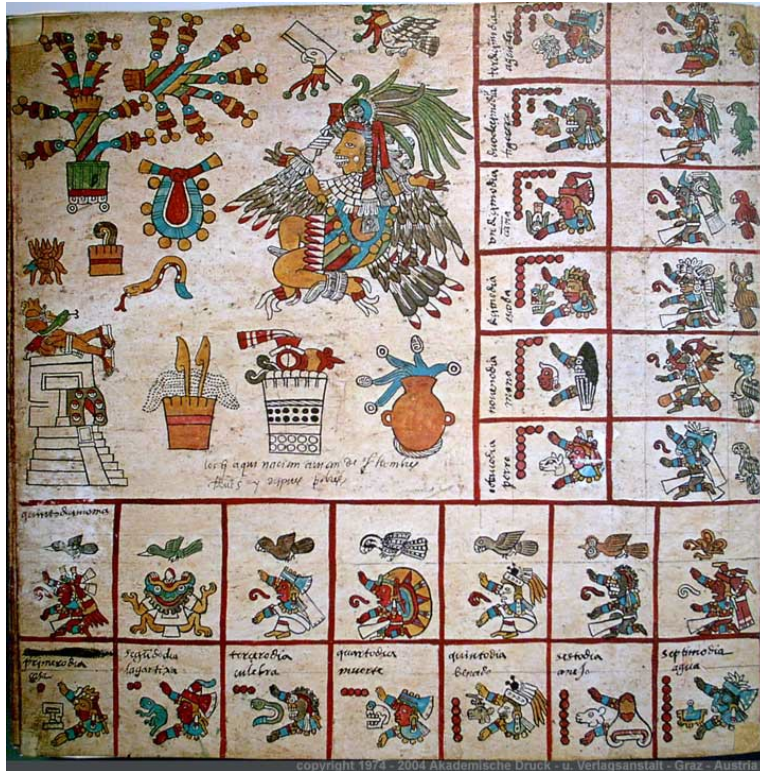


Figure A.13 Trecena 15

Sign: House		Patron: Itzpapalotl		
unidentified		flowering tree x2	pan toztli	coatli
toctli	hiquihuitl popoca cenoyohual capulli			
octli	tlecomic, yollotl, omitl atl			
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	House (Calli)	Piltzintecuhtli	Xiuhtecuhtli	Blue Hummingbird
2	Lizard (Cuetzpallin)	Centeotli	Tlaltecuhthli	Green Hummingbird
3	Serpent (Coatl)	Mictlantechutli	Chalchiuhtlicue	Hawk
4	Death (Miquiztli)	Chalchiuhtlicue	Tonatiuh	Quail
5	Deer (Mazatl)	Tlazotlteotl	Tlazotlteotl	Eagle
6	Rabbit (Tochtli)	Tepeyollotl	Mictlantecuhtli	Screech Owl
7	Water (Atl)	Tlaloc	Centeotl	Butterfly
8	Dog (Itzuintli)	Xiuhtecuhtli	Tlaloc	Eagle
9	Monkey (Ozomatli)	Itzli	Quetzalcoatli	Turkey
10	Grass (Malinalli)	Piltzintecuhtli	Tezcatlipoca	Horned Owl
11	Reed (Acatl)	Centeotli	Chalmecatli	Macaw
12	Jaguar (Ocelotl)	Mictlantechutli	Tlahuizcalpantechutli1	Quetzal
13	Eagle (Cuauhtli)	Chalchiuhtlicue	Ilamatecuhtli	Parrot

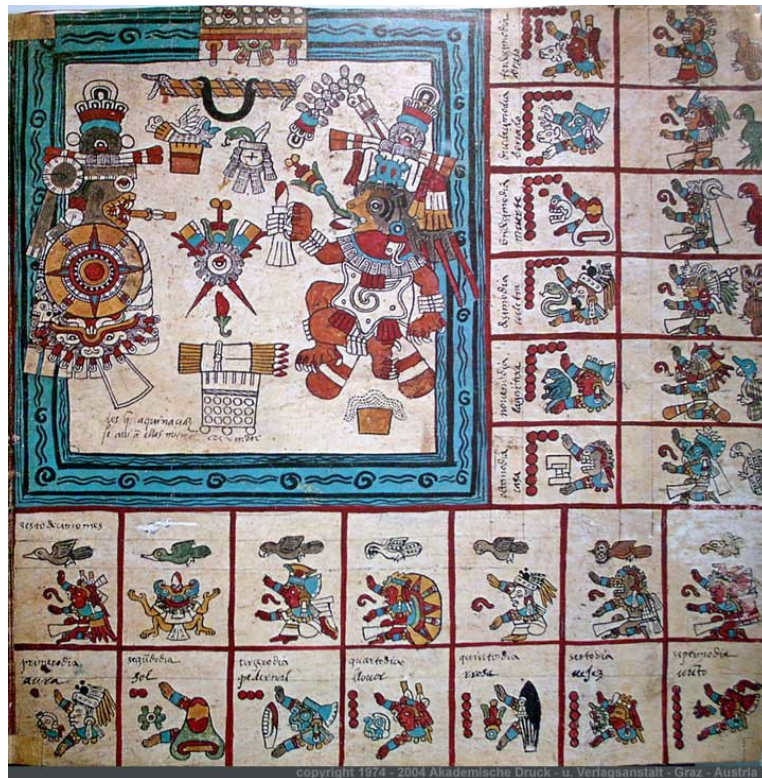


Figure A.14 Trecena 16

Sign: Vulture		Patron: Xolotl with Tlachitonatiuh		
mictlanco	yohualli	cuauhtontli	xiquipilli	coatli
Citalpul	chiquihuitl chohcholi chilli			octli
quimilli tlacochtli tlecomic				
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Vulture (Cozcacuauhtli)	Tlazotlteotl	Xiuhtecuhtli	Blue Hummingbird
2	Movement (Ollin)	Tepeyollotl	Tlaltecuhthli	Green Hummingbird
3	Flint (Tecpatl)	Tlaloc	Chalchiuhtlicue	Hawk
4	Rain (Quiauitl)	Xiuhtecuhtli	Tonatiuh	Quail
5	Flower (Xochitl)	Itzli	Tlazolteotl	Eagle
6	Crocodile (Cipactli)	Piltzintecuhtli	Mictlantecuhtli	Screech Owl
7	Wind (Ehecatl)	Centeotl	Centeotl	Butterfly
8	House (Calli)	Mictlantechutli	Tlaloc	Eagle
9	Lizard (Cuetzpallin)	Chalchiuhtlicue	Quetzalcoatli	Turkey
10	Serpent (Coatl)	Tlazotlteotl	Tezcatlipoca	Horned Owl
11	Death (Miquiztli)	Tepeyollotl	Chalmecatli	Macaw
12	Deer (Mazatl)	Tlaloc	Tlahuizcalpantechutli1	Quetzal
13	Rabbit (Tochtli)	Xiuhtecuhtli	Ilamatecuhtli	Parrot



Figure A.15 Trecena 17

Sign: Water		Patron: Chalchiuhtotolin		
quimilli	Tlacoctli	pan toztli	cuauhxicalli	chiquihuitl
citalli	cencoatl	chiquihuitl tochtli	chiquihuitl ihteteyo	
tlecomic	atl	copalli	capullipopoca	achalchhuitlzc
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Water (Atl)	Itzli	Xiuhtecuhtli	Blue Hummingbird
2	Dog (Itzuintli)	Piltzintecuhtli	Tlaltecuhtli	Green Hummingbird
3	Monkey (Ozomatli)	Centeotl	Chalchiuhtlicue	Hawk
4	Grass (Malinalli)	Mictlantechutli	Tonatiuh	Quail
4	Reed (Acatl)	Chalchiuhtlicue	Tlazolteotl	Eagle
6	Jaguar (Ocelotl)	Tlazotlteotl	Mictlantecuhtli	Screech Owl
7	Eagle (Cuauhtli)	Tepeyollotl	Centeotl	Butterfly
8	Vulture (Cozacuauhtli)	Tlaloc	Tlaloc	Eagle
9	Movement (Ollin)	Xiuhtecuhtli	Quetzalcoatl	Turkey
10	Flint (Tecpatl)	Itzli	Tezcatlipoca	Horned Owl
11	Rain (Quiauitl)	Piltzintecuhtli	Chalmecatl	Macaw
12	Flower (Xochitl)	Centeotl	Tlahuizcalpantechutli1	Quetzal
13	Crocodile (Cipactli)	Mictlantechutli	Ilamatecuhtli	Parrot

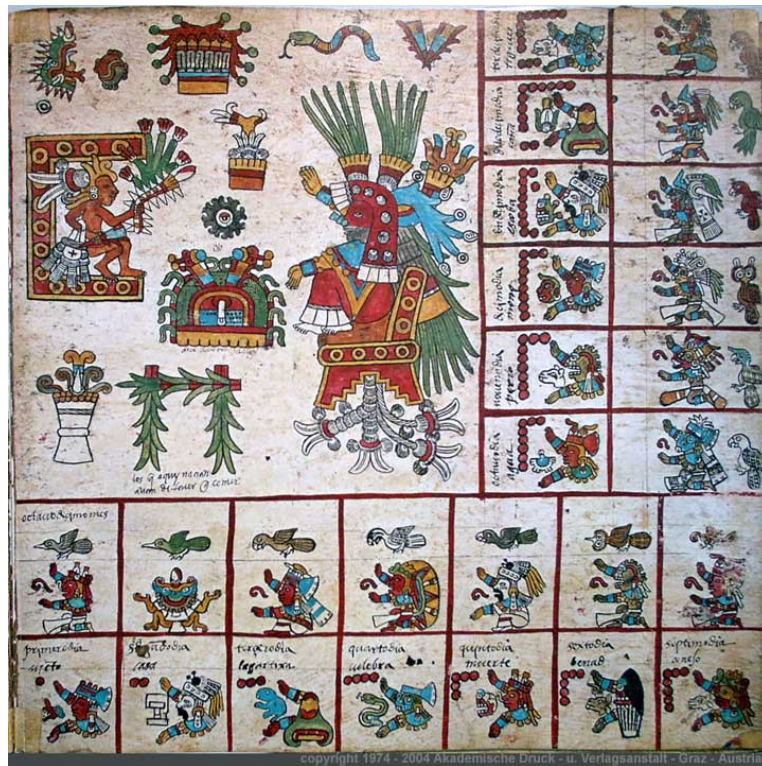


Figure A.16 Trecena 18

Sign: Wind		Patron: Chantico		
c̄'e cipactli	Cuauhxicalli	cencoatl	huitztli	citalli
tetl	chiquihuitl coztetlocelotl, zacatapayolli, tlecomic, capolmecatl teuctlamacazqui,xochitl, macahuatl, m̄'amaltin, calpulli1			
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Wind (Ehecatl)	Chalchiuhtlicue	Xiuhtecuhtli	Blue Hummingbird
2	House (Calli)	Tlazotlteotl	Tlaltecuhli	Green Hummingbird
3	Lizard (Cuetzpallin)	Tepeyollotl	Chalchiuhtlicue	Hawk
4	Serpent (Coatl)	Tlaloc	Tonatiuh	Quail
5	Death (Miquiztli)	Xiuhtecuhtli	Tlazotlteotl	Eagle
6	Deer (Mazatl)	Itzli	Mictlantecuhtli	Screech Owl
7	Rabbit (Tochtli)	Piltzintecuhtli	Centeotl	Butterfly
8	Water (Atl)	Centeotl	Tlaloc	Eagle
9	Dog (Itzuintli)	Mictlantechutli	Quetzalcoatl	Turkey
10	Monkey (Ozomatli)	Chalchiuhtlicue	Tezcatlipoca	Horned Owl
11	Grass (Malinalli)	Tlazotlteotl	Chalmecatli	Macaw
12	Reed (Acatl)	Tepeyollotl	Tlahuizcalpantechutli1	Quetzal
13	Jaguar (Ocelotl)	Tlaloc	Ilamatecuhtli	Parrot



Figure A.17 Trecena 19

Sign: Eagle		Patron: Xochiquetzal with animal		
acxoyatl	tetl	ollamalitztl	Nahua quehcoton	namictilli
chiquihuitl	cencoatl	nagual	tocatl	huitztli
omitl	chiquihuitlpopoca	unidentified	chiquihuitl x2	cuaxicalli
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Eagle (Cuauhtli)	Xiuhtecuhtli	Xiuhtecuhtli	Blue Hummingbird
2	Vulture (Cozcacuauhtli)	Itzli	Tlaltecuhctli	Green Hummingbird
3	Movement (Ollin)	Piltzintecuhtli	Chalchiuhtlicue	Hawk
4	Flint (Tecpatl)	Centeotl	Tonatiuh	Quail
5	Rain (Quiauitl)	Mictlantecuhtli	Tlazolteotl	Eagle
6	Flower (Xochitl)	Chalchiuhtlicue	Mictlantecuhtli	Screech Owl
7	Crocodile (Cipactli)	Tlazotlteotl	Centeotl	Butterfly
8	Wind (Ehecatl)	Tepeyollotl	Tlaloc	Eagle
9	House (Calli)	Tlaloc	Quetzalcoatl	Turkey
10	Lizard (Cuetzpallin)	Xiuhtecuhtli	Tezcatlipoca	Horned Owl
11	Serpent (Coatl)	Itzli	Chalmecatli	Macaw
12	Death (Miquiztli)	Piltzintecuhtli	Tlahuizcalpantecuhtli1	Quetzal
13	Deer (Mazatl)	Centeotl	Ilamatecuhtli	Parrot



Figure A.18 Trecena 20

Sign: Rabbit		Patron: Xiuhtecuhtli with Itztapaltotec		
Cuauhtontli	chiquihuitl, chohcholli copalli			quimilli mitl
cuauhxicalli atl	mazatl cuauhtontli	xiquipilli	huitztli	yollotl
Tecciztli	Zacatapayolli	citalli	caxitl	teotopilli
Day	Day Sign (Nahuatl)	Lords of the Night	Lords of the Day	Volatiles
1	Rabbit (Tochtli)	Mictlantecutli	Xiuhtecuhtli	Blue Hummingbird
2	Water (Atl)	Chalchiuhtlicue	Tlaltecuhli	Green Hummingbird
3	Dog (Itzuintli)	Tlazotlteotl	Chalchiuhtlicue	Hawk
4	Monkey (Ozomatli)	Tepeyollotl	Tonatiuh	Quail
5	Grass (Malinalli)	Tlaloc	Tlazotlteotl	Eagle
6	Reed (Acatl)	Xiuhtecuhtli	Mictlantecuhli	Screech Owl
7	Jaguar (Ocelotl)	Itzli	Centeotl	Butterfly
8	Eagle (Cuauhtli)	Piltzintecuhtli	Tlaloc	Eagle
9	Vulture (Cozcacuauhtli)	Centeotl	Quetzalcoatl	Turkey
10	Movement (Ollin)	Mictlantecutli	Tezcatlipoca	Horned Owl
11	Flint (Tecpatl)	Chalchiuhtlicue	Chalmecatl	Macaw
12	Rain (Quiauitl)	Tlazotlteotl	Tlahuizcalpantecutli1	Quetzal
13	Flower (Xochitl)	Tepeyollotl	Ilamatecuhtli	Parrot

APPENDIX B

THE CODEX BORBONICUS: THE YEAR COUNT



Figure B.1 The First Humans



Figure B.2 Quetzalcoatl and Tezcatlipoca (cf. Bowditch 1900)

Table B.1 Year-Bearing Lords of the Night

Sequence	Attested
1	5
6	3
2	9
7	7
3	4
8	1
4	8
9	5
5	3
1	9
6	6
2	4
7	1
3	8
8	5
4	3
9	9
5	6
1	4
6	1
2	8
7	5
3	2
8	9
4	6
9	4
5	1
1	7
6	5
2	2
7	9
3	6
8	3
4	1
9	7
5	5
1	2
6	8
2	6
7	3
3	1
8	7
4	4
9	2
5	8
1	6
6	3
2	9

7	7
3	4
8	2
4	8
	5

APPENDIX C
VEINTENA RITUALS

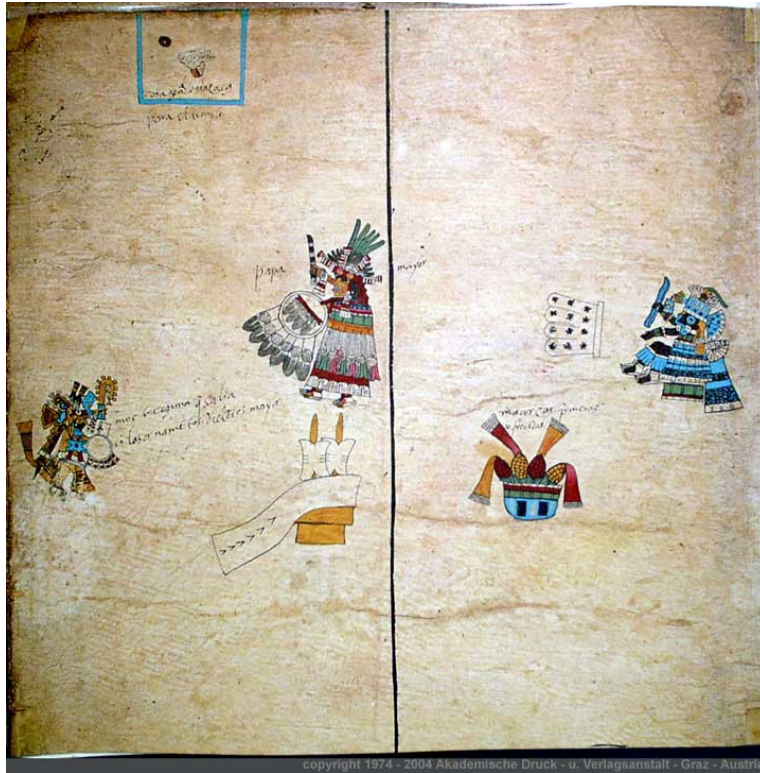


Figure C.1 Atlcahualo, Cuauhitlehua

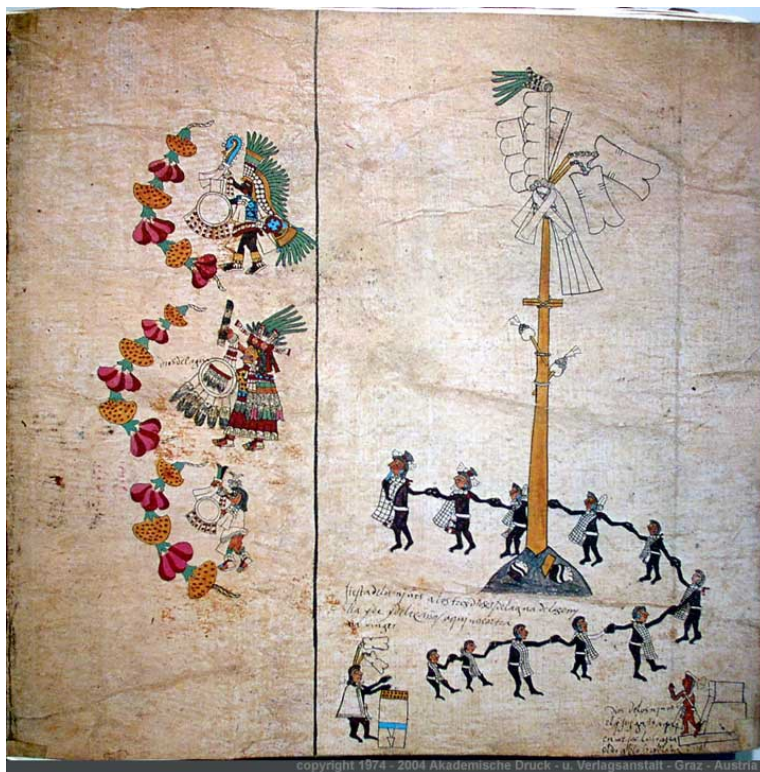


Figure C.2 Huey Miccailhuitontli



Figure C.3 Tepeilhuitl

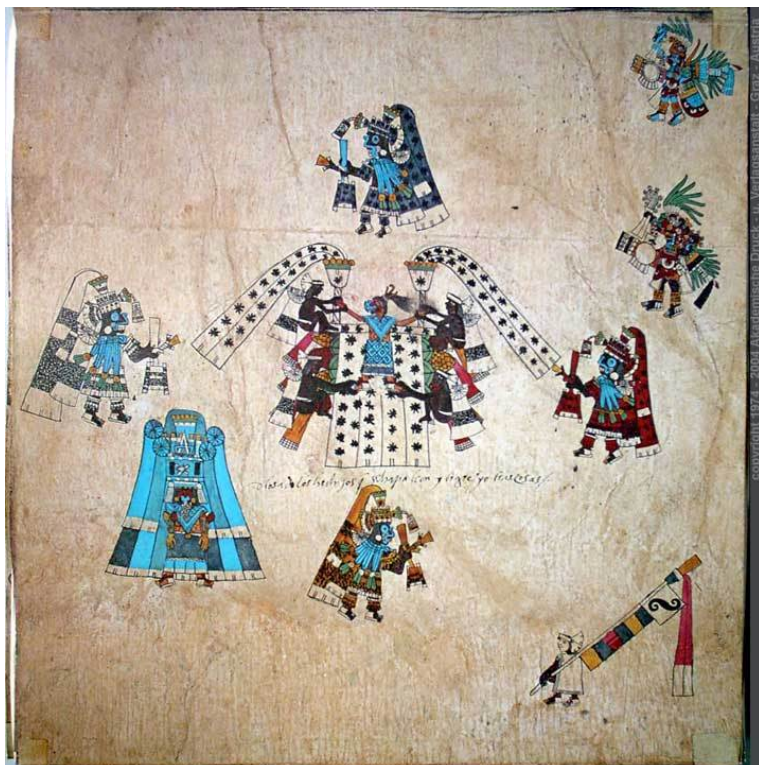


Figure C.4 Quecholli

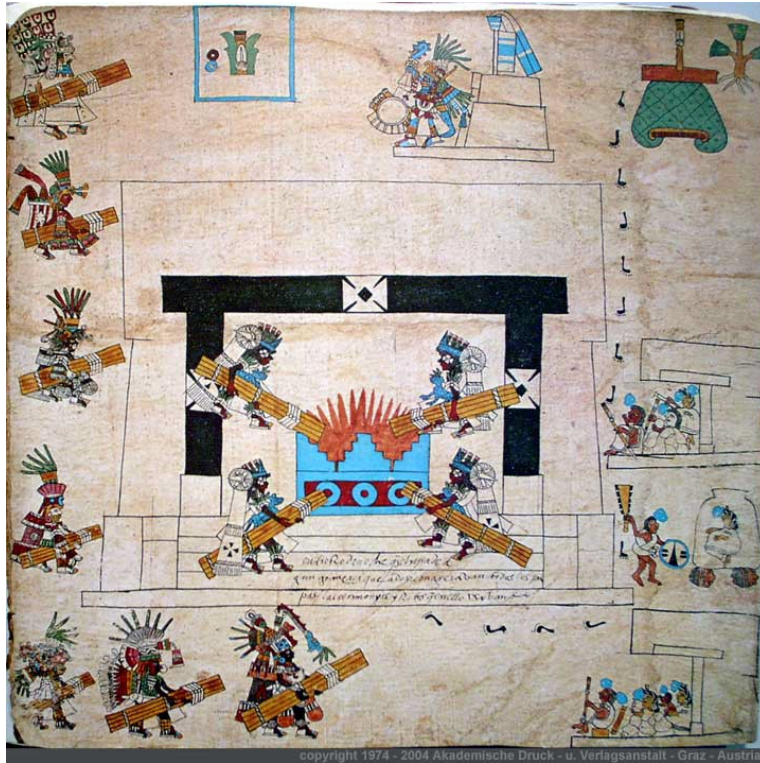


Figure C.5 Tititl

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