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Problems and Patterns in the Study of Olmec(oid) Hieroglyphic Writing

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The study of Olmec writing is undergoing a veritable revolution, due to recent findings that have prompted scholars to revisit the question of the Olmec phenomenon and the history of Mesoamerican writing. Initially, such findings led some of the former holdouts and skeptics to concur that the Olmecs had (some form of) writing, potentially ushering in a new era in the study of Mesoamerican history, as well as the comparative study of writing systems. Nevertheless, in Olmec studies, claims of this nature are nothing new. Based on the discovery of Tres Zapotes Stela C, later shown to postdate the Olmec horizon by several centuries (and to constitute an example of Epi-Olmec writing), Matthew Stirling had concluded, in 1965, that the Olmecs had invented writing, an idea that fit nicely with the Olmec as a mother culture paradigm that was gaining ground at the time.[1] In 1966, David Kelley described an intriguing ceramic roller stamp from Tlatilco, an Olmec site in the Valley of Mexico, and concluded that it was evidence for an Olmec script, albeit one that differed significantly from later Mesoamerican scripts.[2] The claim was strengthened, in 1973, by Carlo Gay, who discussed the evidence from ceramic roller stamps, pottery vessels, and greenstone artifacts, and argued that it was in the latter where a full-fledged script, possibly a precursor of the later Mayan script, had finally coalesced.[3] A few scholars exercised more caution, open to the possibility of Olmec writing, while highlighting the fact that the evidence for it was "admittedly slim," as Coe put it.[4]

In the ensuing decades, unfortunately, Olmec texts were treated as iconographic puzzles, the realm of art history, not philology or linguistics.[5] Carlo Gay himself attempted a purely iconographic "decipherment" of the

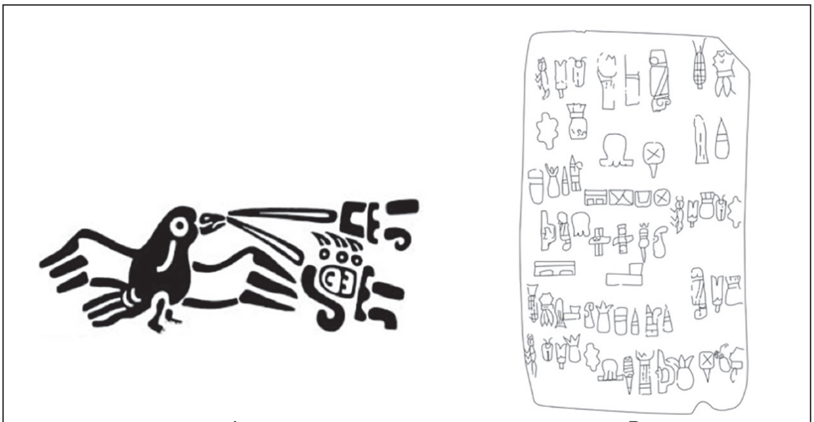
Ahuelicán greenstone tablet: he interpreted the text based on the then-current iconographic understanding of the motifs that make up the signs in the text. Gay apparently assumed that a concatenation of iconographic interpretations of the individual signs was equivalent to a linguistic reading of the text. In fact, to this day, several scholars have analyzed this tablet as a type of map, that is, as a non-glottographic (*i.e.*, semasiograpahic) text, rather than a sequence of (potentially) spoken utterances that would characterize it as glottographic in nature.[6] No one is to blame for this: the putative Olmec texts that were known until the late 1990s were too few, too brief, too fragmentary, at times too idiosyncratic, and generally too diverse, for any coherent approach to be obvious.[7]

In some ways this remains an accurate assessment of the field. Nonetheless, two major advancements have opened up new possibilities for research. First, up until the early 1970s, a cohesive linguistic model that could be tested philologically had not yet come to light. But historical linguistic research during the mid-1970s established a large quantity of Mixe-Zoquean loanwords associated with cultural items related to the spread of Olmec culture, and philological work on Epi-Olmec writing during the 1990s established Zoquean, one of the two branches of Mixe-Zoquean, as the language of the ancient texts that followed the Olmec horizon, which finally provided strong clues to the identity of the Olmecs.[8] Second, as of the early 2000s, several additional discoveries have opened up new areas of investigation. These discoveries—two from the so-called Olmec heartland of the Gulf Coast of Mexico, and another from the Pacific Coast of Chiapas—have finally made it possible to test for chronological patterns in the development of the scripts, structural patterns suggestive of a written language, and "conformity" of putative Olmec and Olmecoid texts documented throughout Mesoamerica.

With this in mind, the present paper aims to address the following questions: What does the early history of Mesoamerican writing tell us about the possibility of a hypothetical, ancestral Olmec script? To what extent is the evidence of Olmec writing cohesive? To what extent can we apply a Mixe-Zoquean model to the earliest evidence of Olmec writing? And where do Olmec writing studies stand today, and what are some prospects and desiderata for future research? I will address each of these questions directly, incorporating the more recent findings into the discussion, and offer some conclusions on the nature of Olmec writing and suggestions for future research.

Recent Discoveries

The first of the three recent discoveries that must be addressed is a ceramic roller stamp (figure 1A) dated to about 650 BCE and discovered by Mary Pohl and her colleagues at the site of San Andrés in the vicinity of the famous site of La Venta.[9] The stamp bears two phrases and has a parallel but heterogeneous structure.[10] As observed by Pohl et al., each phrase emanates from a separate "speech scroll" uttered by a bird; granting some anthropomorphization, this association suggests that the artist who crafted the stamp conceived of the two phrases as spoken language.[11] The second discovery of importance is a serpentinite block (figure 1B), dated to about 900 BCE and discovered in 1999 at the site of Cascajal in the vicinity of the ancient site of San Lorenzo. It was first published in 2006 by María del Carmen Rodríguez Martínez and her colleagues.[12] It is, especially, this second finding, with its unusual length and complex structure, that has led some Mesoamericanists to conclude that the Olmecs did, in fact, have writing.[13]

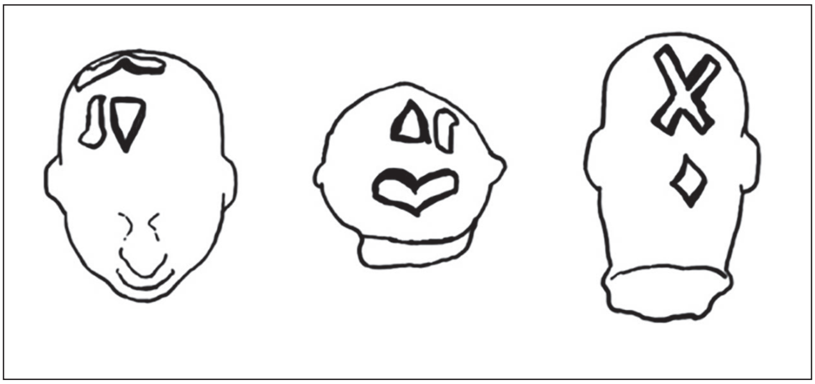


A B

FIGURE 1: A: Impression of the San Andrés roller stamp. B: Cascajal Block inscription.

Both of these discoveries were hailed as final answers to the question of Olmec writing. But, in what has become a trend in Olmec studies, what at first seemed to be the evidence necessary to finally resolve many of the problems that plague students of early Mesoamerican writing systems, have actually generated more questions than they have answers. More than ten years after the initial publication of the Cascajal Block, there exist almost as many approaches to understanding its formatting, internal structure, and possible content as there are scholars studying it. Some of these scholars interpret the text as a semasiographic system, while others highlight the absence of key traits that had been predicted to be present in a full-blown Olmec text, or a full-blown ancestral Mesoamerican, one that could have been a precursor to later Epi-Olmec, Mayan, and Zapotec scripts. Indeed, the presence of unexpected traits and absence of expected ones, have precluded the cohesive understanding of Olmec writing that many of us had hoped this finding would deliver.

The third recent milestone is the discovery by David Cheetham of a ceramic figurine head dated to 1200 BCE from Cantón Corralito, a site located in the Pacific Coast of Chiapas.[14] The figurine head is inscribed with a column of four signs (figure 2), which, despite its brevity, provides sufficient data to test for conformity of its script with that of contemporaneous and subsequent inscriptions.[15]



2: Four-sign inscription on back of ceramic figurine head from Cantón Corralito, Pacific Coast of Chiapas, México.

Altogether, the Cantón Corralito figurine head, Cascajal Block, and the San Andrés roller stamp span several centuries, from about 1200–600 BCE, a period that, it is argued here, saw the development of the key traits shared by the major Mesoamerican script traditions established by the Late Formative period. In order to understand their significance in this regard, it is necessary to say a few words about the key traits shared by the earliest Mesoamerican scripts that scholars can now safely analyze as written languages—Zapotec, Epi-Olmec, and Mayan.

Early Mesoamerican Writing Systems

The two most detailed and systematic classifications of Mesoamerican writing systems are those by Hanns Prem, on the one hand, and a team of scholars made up of John Justeson, William Norman, Lyle Campbell, and Terrence Kaufman, on the other.[16] Subsequently, several authors have continued to test and refine these classifications.[17] Based on these classifications, two early script traditions can be defined for Mesoamerica. By about 500–300 BCE, a Oaxacan tradition with a significant corpus can be defined, consisting of the writing system attested at the site of Monte Albán, and more broadly in the Valley of Oaxaca, where its earliest representative dates to about 650 BCE.[18] This script is referred to as Zapotec; Kaufman and Justeson have proposed a preliminary, partial phonetic and grammatical decipherment of the script, and they argue for a Proto-Zapotec(an) language, one of the many languages of the Otomanguean language family, as the language of the script.[19] Joyce Marcus similarly argues that the Monte Albán (and other Valley of Oaxaca) inscriptions exhibit a Zapotec(an) syntax.[20] By about 400–200 BCE, a Southeastern tradition can be defined, with several representatives: Epi-Olmec (Chiapa de Corzo, Tuxtla Gutiérrez, La Mojarra, Cerro de las Mesas, Tres Zapotes), Greater Izapan (Izapa, Tak'alik Ab'aj, Kaminaljuyu, El Porton), and Lowland Mayan scripts.[21] According to John Justeson and Terrence Kaufman, Epi-Olmec writing represents an early form of Zoquean language (Pre-Proto-Zoquean), that is, a Mixe-Zoquean language that postdates the split of Proto-Mixe-Zoquean into its Mixean and Zoquean branches, but predates the split of proto-Zoquean into later varieties of Zoquean.[22] While the linguistic affiliation of Greater Izapan writing is still unclear, I believe that there are some tantalizing clues from Tak'alik Ab'aj and Kaminaljuyu that point to a Ch'olan-Tzeltalan (Lowland Mayan) language.[23] Finally, Lowland Mayan is now known to have represented, initially, a language from the Ch'olan subgroup of the Mayan language family (by *c.* 300 BCE), and subsequently, in the northern Yucatan peninsula by about 600–700 CE, a written language with, at first sporadic but later increasingly consistent, innovations distinctive of the Yucatecan subgroup of the Mayan language family.

What matters for now is the set of traits that can be used to classify the broader Oaxacan and Southeastern traditions, their respective subtraditions, and, of course, the traits of any hypothetical common ancestor. A more thorough discussion of the traits, their nature whether as motivated or arbitrary, is not possible here, but instead will be provided at a later time. For now, a listing, followed by a geographic and chronological survey of their appearance, will have to suffice. The traits, following the work of the cited authors, and listed in order of discussion and inclusion by them, include[24]:

1. bar-and-dot numerals;
2. vigesimal counting with bar-and-dot numerals;
3. day signs;
4. day sign cartouches;
5. juxtaposition of bar-and-dot numerals and day signs into day counts;
6. columnar formatting;
7. left-to-right, top-to-bottom reading direction;
8. left-facing orientation of signs representing profile heads;
9. part-for-the-whole (segmentation) convention evident especially with examples of segmented parts of the body (*e.g.*, heads, hands);
10. rectangular wrist infixes;
11. shared content pertaining to prerogatives of rulership;
12. logograms; and
13. syllabograms.

Also, it is necessary to limit the present discussion to cases that can be recognized as "texts," characterized by a linear arrangement of signs that exhibit a general uniformity in size and graphic conventions with respect to each other.[25]

Before continuing, I must invoke a disclaimer: to this day scholars are unclear as to what *Olmec* means, and much research continues to be devoted to this problem. Often, archaeologists use the term *Olmec* for material remains (including textual remains) reported from the so-called Olmec heartland (the Gulf Coast of Veracruz and Tabasco), and use other terms (*e.g., Olmecoid, Olmec-style*, etc.) for local materials associated with Olmec art style from outside that region, including, for example, the Mexican states of Guerrero (Oxtotitlan, Juxtlahuaca), Estado de Mexico (Tlatilco, Tlapacoya, Gualupita), Puebla (Las Bocas, Necaxa), Morelos (Chalcatzingo), and Chiapas (Cantón Corralito, Izapa, Xoc, Padre Piedra, Pijijiapan), as well as the Pacific Coast of Guatemala (La Blanca, Tak'alik Ab'aj) and El Salvador (Chalchuapa). This distinction is applied systematically to the study of early Mesoamerican writing in John Justeson's work, and below I consider its utility.[26]

The Early Formative: Beginning Steps Toward Mesoamerican Writing

Next, I discuss the chronological and geographic patterns for the appearance of some of the thirteen traits identified above. This requires starting with the Early Formative period (1200–900 BCE). During this time, evidence of writing has been found primarily on clay media: ceramic figurines, ceramic roller stamps, and some ceramic vessels. Most of it comes from *outside* the Olmec heartland. The majority of such evidence lacks context, consisting of looted artifacts from sites such as Tlatilco (State of Mexico) and Las Bocas (Puebla), to which I will return shortly.

The best archaeological documentation from this period is the ceramic figurine head from Cantón Corralito from the Pacific Coast of Chiapas, dated to about 1200 BCE.[27] It exhibits a four-sign text with a columnar format (figure 3A)—trait 6 listed above.[28] While this is not a very arbitrary trait, being common in early writing systems from around the world, it is present in other ceramic figurines, such as an unprovenienced example reportedly from Las Bocas (figures 3B and C), which exhibits an eight-sign columnar text.[29] The two texts share signs, including a X-shaped sign and a diamond-shaped sign, the latter occurring three times in the figurine from Las Bocas. I propose here that these inscribed figurines attest to the same script. In fact, two ceramic figurine heads from Veracruz (figures 3D and E) also exhibit examples of the same signs.[30] It appears that the same signary was used on Olmec artifacts at sites in the Olmec heartland and Olmecoid artifacts outside the Olmec heartland, in ceramic figurine inscriptions, during the Early Formative period.[31] I will ascribe the examples from Cantón Corralito and San Lorenzo to a *Ceramic Figurine Script Tradition A*, distinguishing them from a *Ceramic Figurine Script Tradition B*, the latter represented by the figurine from Las Bocas, whose text exhibits a very different style. None of the signs in these figurine texts exhibit a pictorial quality like that of later Mesoamerican *hieroglyphic* scripts: there are no cases in which it is possible to determine with certainty the pictorial identity of the signs. They are all rather abstract and most are symmetrical, a characteristic that is not usually evident in signs depicting hands, feet, or heads in profile, which became common later. For that reason, traits 8, 9, and 10 cannot yet be confirmed in this script tradition.

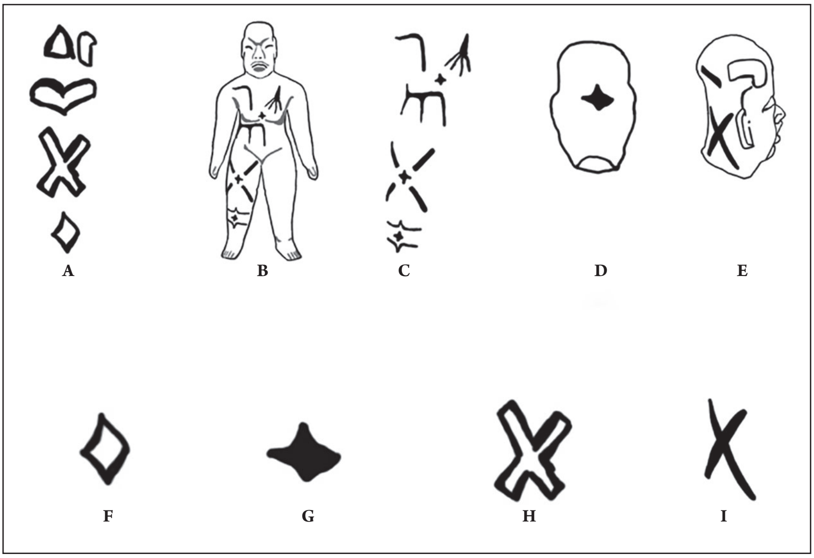


FIGURE 3: A: Example of Ceramic Figurine Script A from Cantón Corralito, Pacific Coast of Chiapas. B: Standing male figure, reportedly from Las Bocas, Puebla. C: Incised characters on standing male figure. Drawing by the author. D: Other example from San Lorenzo with a diamond-shaped sign identical to bottommost sign on Cantón Corralito figurine head. E: Unprovenienced example from Gulf Coast of Mexico with at least three signs, including an X-shaped sign identical to one occurring on Cantón Corralito figurine head. F–G: Diamond-shaped signs shared by Cantón Corralito and San Lorenzo examples. H–I: X-shaped signs shared by Cantón Corralito and San Lorenzo figurine heads.

In addition to the figurines, writing has been found on ceramic stamps, some of them cylindrical roller stamps, dating to the Early Formative period. I define a *Ceramic Stamp Script A*, on the basis of the famous example from Tlatilco, which was described by Kelley as "unlike any previously known" from Mesoamerica.[32] This text, seen in figure 4A, is too far removed, formally, from its contemporaries and from later Mesoamerican writing, aside from a possible instance of a three-dot sign for the numeral 3 and a dotted cross that resembles the star sign of later Mesoamerican scripts. For now, it constitutes the lone example of this type.[33] The remaining examples are more stylistically alike but exhibit important differences. Two of them (figures 4B and C) are similar in their separation of the text into blocks.[34] I will refer to these as *Ceramic Stamp Script B*. The first one of these also bears a possible instance of the star sign of later Mesoamerican scripts, and perhaps two other signs, whose pictorial motivation could not be determined. The second of these (figure 4C) shows a head glyph, which appears to be oriented vertically, along with another glyph. Neither member of this *Ceramic Stamp Script B* group can be dated, so it is possible that they could actually date to the Middle Formative. The other two texts (Figures 4D and E) do not appear to be neatly segmented into obvious glyph-block units, but they are suggestive of a rough, glyph block–like organization; it is not always clear whether their orientation is vertical or horizontal.[35] I will refer to these as *Ceramic Stamp Script C*. The later, Middle Formative San Andrés ceramic roller stamp (figure 4F) belongs to this last type.[36]

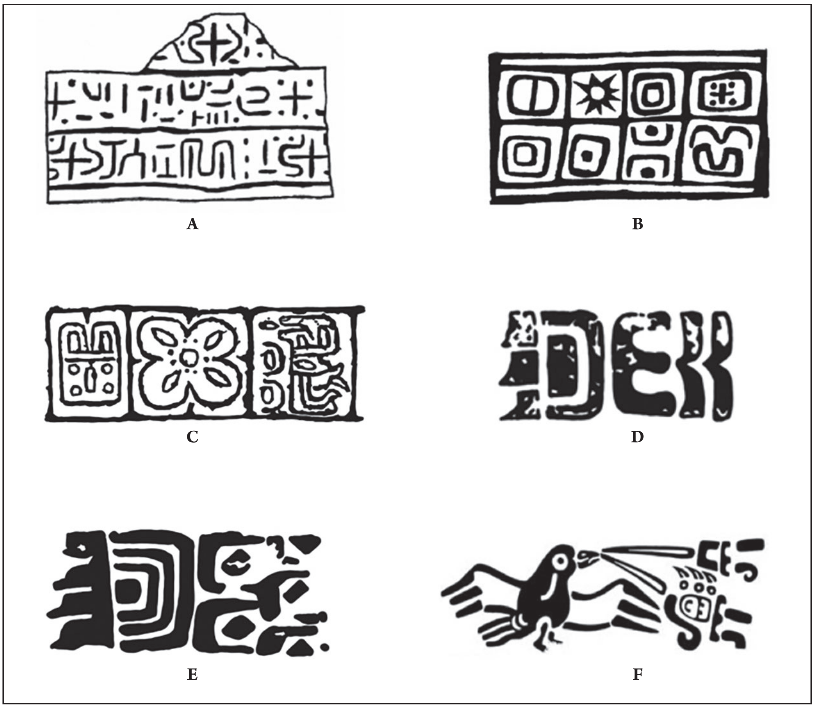


FIGURE 4: A: Ceramic roller stamp from Tlatilco, State of Mexico, Mexico, Early Formative (1200–1000 BCE), housed at the Milwaukee Public Museum. B: Ceramic roller stamp from Tlatilco, State of Mexico, Mexico. C: Clay seal from Tlatilco. D: Clay seal from Las Bocas. E: Clay seal from Las Bocas. F: Impression on clay seal from San Andrés.

Despite the aforementioned formatting and stylistic differences between and within the two major groups examined so far—ceramic figurines and stamps—there are similarities in their signaries. First, a three-pronged sign that appears on a ceramic roller stamp from Las Bocas (figure 5A), also appears on a standing ceramic figurine also from Las Bocas (figure 5B). A wave-like sign that appears on a ceramic figurine head from Cantón Corralito (figure 5C) also appears, doubled, on a ceramic stamp from Las Bocas (figure 5D). A two-sign sequence that appears on the stamp from Las Bocas (figure 5J) resembles a two-sign sequence on the San Andrés stamp (figure 5K). And a two-element sign that makes up the first sign of the text on a figurine head from Cantón Corralito (figure 5H) closely resembles a sign that occurs twice on the San Andrés roller stamp, also occurring in an initial position in each case in that text (figure 5I). The already mentioned diamond-shaped sign that occurs on the ceramic figurine heads from Cantón Corralito (figure 5E) and San Lorenzo (figure 5F) may also occur, three times, on the standing figurine from Las Bocas, Puebla (figure 5G). And finally, the already described X-shaped sign attested at Cantón Corralito (figure 5L) and the figurine from the Xalapa Museum in Veracruz (figure 5M), is also present on at least two different figurines from Las Bocas (figures 5N and O). These close similarities point to two conclusions: with the exception of the *Ceramic Stamp Scripts A* and *B*, the stylistic differences found in the texts across different media (two ceramic roller stamps types, two ceramic figurine types) would appear to be merely that, stylistic differences; and the distinction between Olmec and Olmecoid may not be substantial, at least not in regard to the signary of these texts. Indeed, the texts from Cantón Corralito in Chiapas, Las Bocas in Puebla, and San Lorenzo and San Andrés in Veracruz, show general conformity in their signary, accounting for the major differences present as well in the San Andrés stamp, which will be discussed below. Can this analysis be extended to texts on other types of media?

Beginning Steps Toward Mesoamerican Writing

I will now examine the evidence for the Middle Formative period (900–400 BCE). First, I discuss the case of the Cascajal Serpentinite Block, dated to about 900 BCE, and, thus, marking the transition between the ceramic script tradition and the spread of writing to different media that followed.

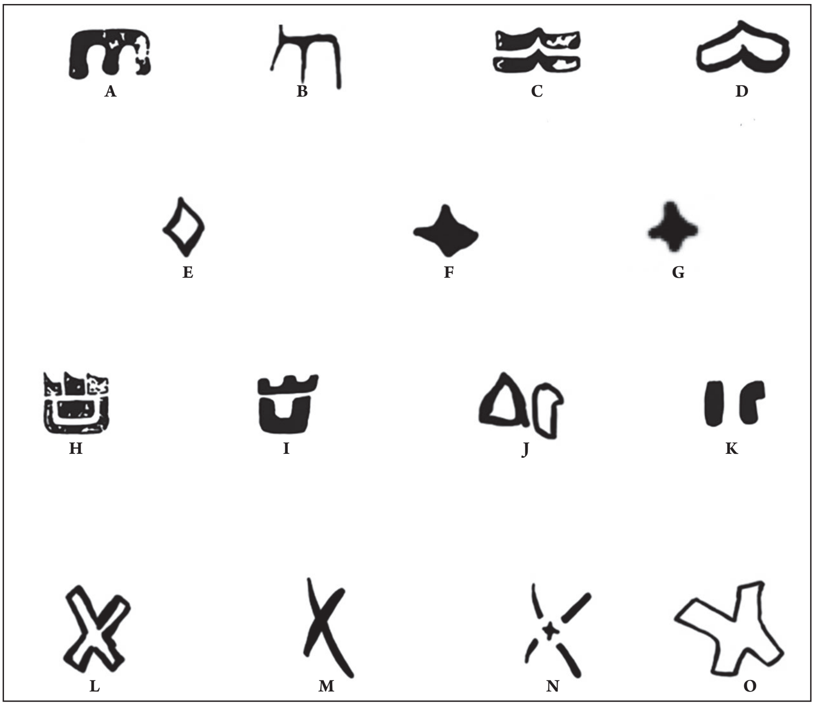


FIGURE 5: A–B: Shared sign from ceramic stamp and figurine from Las Bocas. C–D: Shared sign from Cantón Corralito ceramic figurine and ceramic stamp from Las Bocas, respectively. E–F: Shared signs on stamps from Las Bocas and San Andrés, respectively. G–H: Signs from ceramic figurine from Cantón Corralito and ceramic roller stamp from San Andrés, respectively. I–K: Diamond-shaped signs on ceramic figurines from Cantón Corralito, San Lorenzo, and Las Bocas, respectively. L–O: X-shaped signs on ceramic figurines from Cantón Corralito, Xalapa Museum, and two different from Las Bocas, respectively.

The Cascajal Block (figure 1B) is significant for several reasons, some already highlighted by Rodríguez Martínez and her colleagues.[37] First, they defined 28 distinct signs in this lengthy inscription on which there are a total of 62 characters. Second, they noted the presence of several "repeated, short, isolable sequences within larger groupings." Third, they also refer to "a pattern of linear sequencing of variable length," although their paper does not clarify how this point differs from the "larger groupings." Fourth, they also proposed "a consistent reading order," specifically, from top-to-bottom, left-to-right, in rows, with the orientation of the block pointing up, based on the orientation of the signs that represent "vegetal icons, which sprout to the top." If these authors are correct, the text would not display

Trait 6, columnar formatting, but row formatting instead; it would display Trait 7, left-to-right and top-to-bottom reading direction. The fact is that some of the earlier ceramic stamps also may attest to a row formatting, so this would not necessarily represent an innovation. Lastly, the Cascajal Block may constitute the earliest example of Mesoamerican writing on a medium other than clay—and specifically, the earliest known greenstone inscription.

Other authors, including myself, have differed in their analysis of the text formatting and reading direction.[38] I have written that "iconically motivated grapheme orientation is not always a reliable guide to the orientation of the text," pointing to cases in Epi-Olmec and Mayan writing where signs may lie on their side instead of pointing up, the way they would in nature.[39] Instead, I attempted to determine the reading formatting and direction based on patterns of repetition of sign sequences throughout the text, focusing on instances in which such sequences cut across lines. This approach led me to conclude that the block is supposed to stand horizontally, rather than vertically, and that such reorientation yields columns, rather than rows, read from top-to-bottom, left-to-right, much like later Mesoamerican script writing (*e.g.*, Epi-Olmec, Zapotec, Mayan), and thus consistent with Traits 6 and 7. Martha Macri; David Freidel and Kent Reilly; and John Justeson[40] have oriented the block vertically, in the same fashion as Rodríguez Martínez, et al., but they have analyzed a very different internal structure from that proposed by Rodríguez Martínez et al., or by me. At least five proposals for the formatting and reading order of the inscription have been published. The text is clearly very irregular in its linear organization, and it lends itself to multiple analyses. I prefer not to delve into the details of their respective analyses here. Instead, I will review some of the approaches and opinions these authors express regarding the nature of the script.

Martha Macri does not question the claim of Rodríguez Martínez and her co-authors that the Cascajal Block provides evidence of a writing system; she merely suggests a different organization of the text. Macri suggests 16 units consisting of 1–8 signs each, and she argues that the text is not continuous, but, rather, composed of "discrete segments" possibly representing "individual words or phrases."[41] Freidel and Reilly divide the text into three registers, read in boustrophedon fashion, and they analyze the document semasiographically, arguing that it is not composed of linguistic discourse, but instead, that each register represents a layout—a map—of the items present within a ritual bundle. In this regard they follow Kent Reilly's analysis of the Ahuelicán Greenstone Tablet as a type of map, a representation of the layout of the site of La Venta.[42]

Lastly, in his discussion of the precursors of Mesoamerican writing, Justeson contends that the text on the Cascajal Block exhibits traits that are not consistent with a bone fide writing system and also traits that are not consistent with a script ancestral to the later Epi-Olmec, Zapotec, and Mayan scripts.[43] First, he points out that "while certain symbol groups recur, sign order within them is not entirely consistent," pointing to examples such as those in figure 6A.[44] Second, he notes that

> [t]he frequency distribution of symbols is completely uncharacteristic of signs in writing: in Mesoamerican texts of comparable length (even excluding numerals), as in other script traditions, most signs by far occur only once, but only 25 percent of the Cascajal tablet's symbols do so.[45]

Third, he notes, text on the Cascajal Block deviates from later Mesoamerican scripts, in that it includes "no animal heads (nor *pars pro toto* symbols of any sort)," nor does it include "numerical notations."[46] He argues, instead, that the Cacajal signary "shares far more with the specialized subsystem of abbreviated celt iconography, with its excised symbolic elements, than with writing."[47] Quite significantly, Justeson highlights the presence of pairings of "symbols" within the text that "were sometimes clearly interpretable iconographically," such as the pairing of the knuckleduster and torch signs, seen in figure 6B, a pairing that is common in Olmec iconography (including celt iconography), as seen in figure 6C, as well as a pairing of "the only two eye symbols on the tablet," which would thus be motivated iconographically, and a pairing of two signs that are likely indicative of status or rulership, which also occurs iconographically.[48] Thus, Justeson regards several such groupings, some of which recur, as iconographically, rather than linguistically, motivated.

I respond to some of these points next. The irregular patterns of the co-occurrence of certain signs isolated by Justeson are actually to be expected in a logophonetic script, where phonograms may be used as phonetic complements to a logogram in a variety of permutations: preposed complement, postposed complement, both preposed and postposed complements, both preposed complements, and both postposed complements.[49]

FIGURE 6: A: Two similar sign sequences from Cascajal Block. B: Sign sequence from Cascajal Block. C: Iconographic pairing of same objects as in the sequence from Cascajal Block, present on standing figure from San Cristobal Tepotlaxco, Puebla, Mexico, at the Dumbarton Oaks Collection, Washington, D.C.

Such patterns occur in both Epi-Olmec and Mayan texts, in fact. Thus, if we assume that the first sign in the sequence shown in figure 7A is a logogram, and that the two following signs are syllabograms that fully spell the word represented by the logogram, a situation like that in figure 7B, where the first sign in the sequence—a Mayan logogram MAN —is followed by two phonetic complements—ma-na—that fully spell it out, would result.[50] Similarly, continuing with the sequence of the same three signs in figure 7C, rearranged in a different order, one could posit that the first sign, the presumed logogram, is now preceded and followed by two phonetic signs, much in the same way as in the Mayan spelling ma-MAN-na in figure 7D.[51] If this is the correct analysis, then the Cascajal Block could offer internal, structural evidence for the presence of Traits 12 and 13, logograms and syllabograms, respectively.

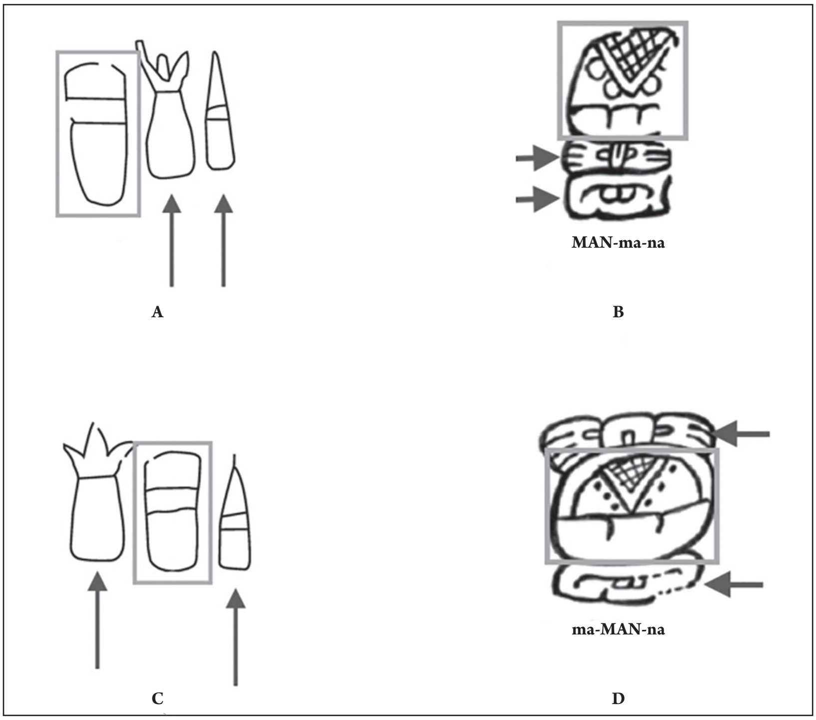


FIGURE 7: A: Sequence of three signs in the Cascajal Block showing X-a-b arrangement. 7B: Mayan spelling of MAN-ma-na showing X-a-b arrangement, where a and b are syllabograms, ma and na, and X is a logogram, MAN. C: Sequence of three signs in Cascajal Block showing a-X-b arrangement. D: Mayan spelling of ma-MAN-ma showing a-X-b arrangement, where a and b are syllabograms, ma and na, and X is a logogram, MAN.

The point about the frequency of distribution is puzzling, and I do not have an explanation to offer at this time. The absence of portrait head signs (whether animal or human) is puzzling too, especially given the length of the text. There are a few Olmec texts, introduced below, that lack of signs depicting heads of any sort, but such texts are typically very brief. There is an animal sign in the Cascajal Block, depicting an ant, shown full-figure. However, Justeson claims here that there is no *pars pro toto* convention in evidence, corresponding to Trait 9, despite the fact that he himself argues that the Cascajal text is likely a member of the "specialized subsystem of abbreviated celt iconography, with its excised symbolic elements" that became widespread on greenstone media during the Middle Formative period.[52] Also, there exist plenty of examples of excised (*i.e.*. abbreviated, part-for-the-whole) motifs among the signs in the Cascajal text, such as the eye symbols mentioned by Justeson, as well as another eye sign that I have identified.[53] Furthermore, to be able to claim that a sign is an example of a part-for-the-whole abbreviation, it is first necessary to know its value (*e.g.*, its lexical value if logographic; its acrophonic derivation if phonographic). Since we currently do not know the values of the signs in the Cascajal Block, we cannot yet know which ones are examples of this convention. Last, I also find the absence of obvious numerical notations to be extremely unusual. However, this is consistent with the ceramic figurine and script tradition from the Early Formative, which also lack evidence for Traits 1–5.

One more point raised by Justeson in "Early Mesoamerican Writing Systems" deserves attention: the possible iconographic motivation for sign pairings within the Cascajal Block. Rodríguez Martínez and her colleagues had already remarked that

> [s]everal paired sequences, such as the eyes or a throne sign paired with an evident mat sign, both common tropes for rulership in Mesoamerica, point to poetic couplets that are otherwise well attested in formal discourse of the region."[54]

They further add, "if valid, the Cascajal examples would illustrate the earliest known couplets in Mesoamerica, a feature not yet seen in other Olmec icons."[55] By couplets they are referring to diphrastic kennings, paired phrases that convey a third concept, either metonymically or metaphorically. Michael Carrasco and Joshua Englehardt, for their part, have elaborated on the possible mat-and-throne pairing, arguing that it is, in fact, evidence of a diphrastic kenning, or couplet, referring to rulership.[56] I think it is possible that the couplets in the Cascajal Block are indeed linguistically-motivated, and, in turn, that the parallel iconographic pairings alluded to by Justeson could actually be linguistically-motivated devices that became iconographically embedded, rather than the reverse. If these couplets are correctly identified as such, and correctly matched to examples from later Mesoamerican scripts, it would be evidence of Trait 11, shared content pertaining to the prerogatives of rulership, and furthermore, they could serve as a launchpad for decipherment.

The aforementioned observations lead me to the following conclusions about the Cascajal Block script: it is clearly related, pictorially, to Olmec and Olmecoid art and iconography, including the abbreviated celt iconography; it exhibits traits that are consistent with orthographic conventions of logosyllabic scripts; it lacks traits that are hypothesized to have been present in the ancestor script that gave rise to the earliest, confirmed logosyllabic scripts that were in place by about 400 BCE (Zapotec, Epi-Olmec, Mayan), in spite of the inscription's unusual length; and it bears traits, such as the possible diphrastic kennings, that are suggestive of linguistic encoding.

During the Middle Formative period there is a cessation of ceramic figurine inscriptions. Ceramic stamps continue, with the San Andrés roller stamp, dating to about 650 BCE, as the prime example. Perhaps unexpectedly, it is in the style of the much briefer inscription of the San Andres roller stamp on which one may find evidence of some of the arbitrary traits of the hypothetical Olmec(oid) ancestral script. As already noted, this stamp shares signs with the traditions from the Early Formative ceramic figurines and stamp scripts, but it also bears evidence of new traits not attested in its Early Formative predecessors. Pohl and her co-authors propose the presence of a day count, consisting of a three dots for the numeral 3, preceding a sign that resembles the Mayan sign for the twentieth day sign, lord, ruler (figure 8A).[57] If so, it points to the presence of numerals, perhaps the bar-and-dot numeral tradition (Trait 1), day signs (Trait 3), and day counts (Trait 5). This example is by no means the only one. Bar-and-dot numeration is attested early, by about 900–700 BCE, at Chalcatzingo, Morelos, where Monument 24 exhibits several glyph blocks, some of them exhibiting signs inside of cartouches (Trait 4), one of which is underlain by two bars, probably for 10'(figure 8B).[58] While at Oxtotitlán Cave, Guerrero, Painting 3 provides evidence of the use of three dots for 3 (figure 8C).[59] Within the Olmec heartland, La Venta Monument 13, dated to about 650 BCE and also discussed further below, may bear a single dot, presumably for the numeral 1 (figure 8D).[60] The earliest likely Zapotec inscription, San José Mogote Monument 3, dated to 650 BCE, exhibits a possible day count, perhaps used to name the portrayed individual, and consisting of a day sign within a cartouche and a dot for 1 (figure 8E).[61] By 500–300 BCE, all major scripts (Zapotec, Epi-Olmec, Greater Izapan, Lowland Mayan) bear examples of both bars and dots. It would seem, then, that the calendrical legitimation of rulership was not one of the motivations for the innovation and spread of writing in Mesoamerica: to date, no archaeologically documented example of a text inscribed with a plausible calendrical notation dates to the Early Formative.

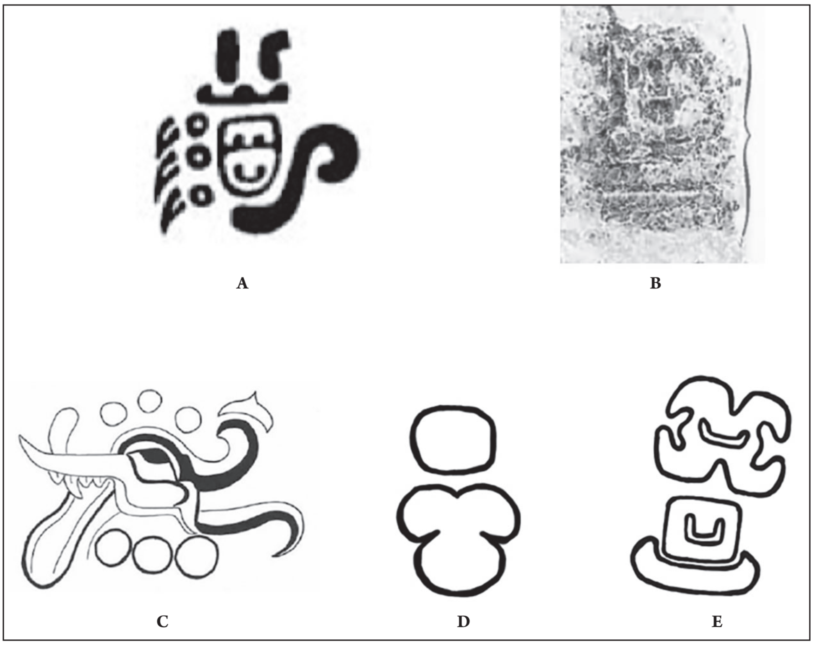


FIGURE 8: A: Detail from San Andrés ceramic roller stamp showing five signs, including three dots for 3 to the left of a possible day sign. B: Detail of Monument 24 showing possible day sign inside cartouche, underlain by two bars, likely for 10. C: Painting 3 from Oxtotitlan Cave, Guerrero, Mexico. D: Detail of Monument 13 showing juxtaposition of possible dot for 1 to a possible but unidentifiable day sign. E: Possible example of day count with numeral 1 postposed to day sign on San José Mogote Monument 3.

When one examines the presence of bar-and-dot numeration in relation to the signs with which such numerals are juxtaposed, an interesting pattern emerges: in some texts the bar or dot numeral follows the day sign, while. in others, it precedes it. On Chalcatzingo Monument 24, the two bars on Glyph 3 are placed beneath, and thus, presumably, after, the day sign and its cartouche (figure 8B). On Oxtotitlan Painting 3, the three dots that are linearly arranged (figure 8C) are also underneath the likely day sign for sea monster (likely corresponding to first day of ritual calendar); this is also the case with San José Mogote Monument 3, arguably already a Zapotec inscription by 650 BCE.[62] Whereas at on the San Andrés roller stamp, with its likely numeral 3 (figure 8A), and La Venta Monument 13, with its possible numeral 1 (figure 8D), the numerals are juxtaposed to the left of, and thus presumably before, the day signs. Consequently, there is a geographic pattern: the Olmecoid examples at Chalcatzingo (Morelos) and Oxtotitlan (Guerrero) exhibit postposed numerals; the Olmec examples at La Venta and San Andrés (Veracruz) exhibit preposed numerals. Could this point to a difference in linguistic affiliation?

To answer these questions it is necessary to note, as Justeson and his colleagues did in their 1985 monograph, that the numerals juxtaposed with day signs in the ritual calendar do not enumerate quantities: the Mayan day count 3 *Ajaw* does not mean 3 instances of *Ajaw*', but serves, instead, as a qualifier.[63] When used as enumerators or counters, numerals typically precede the noun in most Mesoamerican languages, according to Justeson and his co-authors. This is the case in Mayan and Mixe-Zoquean, and normally also in Otomanguean languages, for instance. However, in the context of day counts, the numerals do not actually count the day with which they are juxtaposed, instead they qualify it. In such context, Colonial Zapotec texts postpose the numeral to the day name, whereas Mayan and Mixe-Zoquean languages prepose it. Based on this crucial difference, it is possible that the Olmecoid texts from Chalcatzingo in Morelos and Oxtotitlan in Guerrero could have represented a different language from that attested in the La Venta and San Lorenzo regions of Veracruz. The former could have represented an Otomanguean language, perhaps an early form of Zapotecan, while the latter could likely represent a Mixe-Zoquean language. The case of San José Mogote Monument 3, likely the earliest Zapotecan inscription, strengthens this position. I further explore the implications of this preliminary hypothesis below.

It is worth observing that texts from the first half of the Middle Formative period—on a variety of media—exhibit a columnar format, for example, see painting A-1 from Oxtotitlán (figure 9A), a cave wall painting, and the Ahuelicán Greenstone Tablet (figure 9B), a squarish serpentinite tablet.[64] John Justeson and Peter Mathews have argued previously for a crucial role of celts in promoting the columnar formatting of early writing in Mesoamerica.[65] However, as I previously noted, painting A-1 from Oxtotitlán and the Ahuelicán Greenstone Tablet exhibit a columnar formatting even when there was no natural constraint promoting such a formatting.[66] And, of course, as this paper shows, columnar formatting was already present on ceramic figurines during the Early Formative period. Also, evidence of Traits 8 and 9 becomes more abundant (Trait 8 refers to the direction of profile heads); however, to date there is only one example that clearly points to the left (figure 9C), with other examples either pointing to the right, possibly due to artistic constraints of the entire monument on which they are present (figure 9D), or exhibiting a face from the front, not profile (figure 9E).[67] Isolated hands and feet also appear during this period (figures 9F and G), possibly representing actions, given their position in their respective texts.[68] A text-initial hand sign in painting A-1 from Oxtotitlán (figure 9F) is in a position consistent with verb-initial word order in Otomanguean languages. By the same token, a foot sign as text-final in Monument 13 from La Venta (figure 9G) is in a position consistent with verb-final word order of Mixe-Zoquean languages, following Alfonso Lacadena's analysis.[69] A roller stamp from Tlatilco (figure 9H), of unknown context, and, therefore, currently undated, also exhibits a profile head glyph.[70]

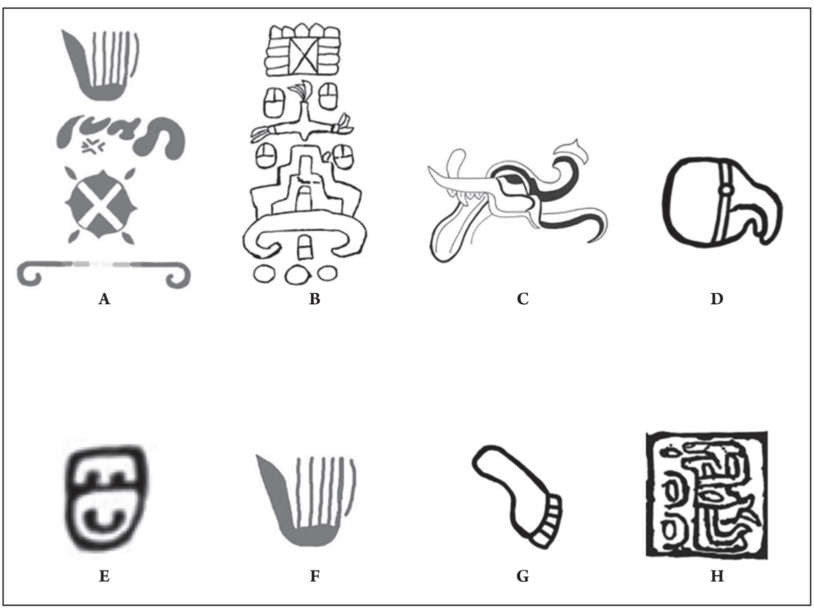


FIGURE 9: A: *Painting A-1 from Oxtotitlan Cave, Guerrero, Mexico*. B: Inscription *on Ahuelicán Greenstone Tablet.* C. *Possible ritual calendar day sign from Painting 3 at Oxtotitlán.* D: *Sign in shape of bird head in profile from La Venta Monument 13.* E: *Possible sign in shape of a human face for the twentieth day of the ritual calendar present on the San Andrés roller stamp.* F: *Sign in shape of a hand from Painting A1 from Oxtotitlán.* G: *Sign in shape of a foot or footprint from La Venta Monument 13.* H: *Sign on Tlatilco stamp showing a head in profile.*

Cohesion of Evidence and Possible Linguistic Models

During the Early Formative period, there apparently existed at least two script traditions, one of which likely became extinct and the other continued on. Whether from the Olmec heartland or elsewhere, most ceramic inscriptions on figurines and stamps exhibit conformity of the sign inventory, and some also agree in their columnar formatting, Trait 6. However, several key traits that have been ascribed to the earliest Mesoamerican writing, based on their universal presence in the better-known scripts from the Late Formative and Classic periods, Traits 1–5 as well as Traits 8–10, are so far absent during this time. The absence of an obvious pictorial nature in the signary of the Early Formative ceramic script tradition is remarkable and unexpected, so much so that previous scholars did not even articulate it as a shared trait, but simply assumed it.

By the end of this period, around 900 BCE, the Cascajal Block text from the Olmec heartland changed things, to some extent; while it is consistent with earlier texts in its absence of bar-and-dot numerals, day signs, and day counts, it differs dramatically in its clear pictorial nature. Like the Tlatilco inscription discussed by Kelley, which bears no obvious relation to coeval or subsequent Mesoamerican inscriptions, the Cascajal Block's signary seemingly appears out of nowhere, bearing strong iconographic similarities to the abbreviated celt iconographic tradition, as noted by Justeson, but not with the previous ceramic script tradition.[71] Thus, it is suggestive of a major departure, the innovation of a new script, likely in coordination with the abbreviated celt iconographic tradition. But it is also clear that later Mesoamerican scripts inherit characteristics from the Cascajal Block's inscription, including specific signs, and possibly sign pairings, corresponding to diphrastic kennings.

The Cascajal Block lacks evidence of signs resembling heads of people or animals, a trait that supports its early dating; soon after, by the beginning of the Middle Formative, a number of inscriptions attest to this and other traits that had been previously assumed to have been present in the earliest Mesoamerican script. The San Andrés roller stamp bears evidence of continuity with the signary of the earlier ceramic stamp script tradition, while introducing innovative traits in the form of the bar-and-dot numerals (Trait 1), day signs (Trait 3), and the juxtaposition of these two into day counts (Trait 5). These traits, in addition to day sign cartouches (Trait 4), appear elsewhere, also during the Middle Formative period, on texts found on a wide variety of media, at both Olmec heartland sites (*e.g.*, La Venta Monument 13) and elsewhere (Oxtotitlán Paintings 3 and A-1, Chalcatzingo Monument 24, Ahuelicán Greenstone Tablet). A major distinction, nevertheless, between Olmec texts, characterized by the use of preposed bar-and-dot numerals, and Olmecoid texts, characterized by postposed bar-and-dot numerals, emerges during this time.

This distinction could have been based on linguistic affiliation, supporting Justeson's suggestion that local languages could have been influential in early Mesoamerican writing, and following Justeson and his colleagues' observations regarding the postposed numeral qualifiers in the context of day counts in Colonial Zapotec texts, contrasted with their preposed position in Mixe-Zoquean and Mayan texts in the same contexts. Based on this crucial difference, it is possible that the Olmecoid texts from Chalcatzingo in Morelos and Oxtotitlan in Guerrero, as well as San José Mogote Monument 3 from the Valley of Oaxaca, could have represented a different language from that attested in the La Venta and San Lorenzo regions of Veracruz. The former set could have represented an Otomanguean language, specifically a Zapotecan language in the case of Monument 3, while the latter would likely represent a Mixe-Zoquean language. Such linguistic affiliations are plausible, given Kaufman's recent discussion of historical homelands for the various early branches of the Otomanguean linguistic stock.[72]

The emerging picture is complex: different coeval scripts, with fundamentally different signaries (non-pictorial *vs.* pictorial), emerged; some became extinct, some were innovated several centuries after the first scripts appeared, and subsequently, characteristics of different scripts were chosen and amalgamated into a form of writing that would become more familiar, more Mesoamerican. In such a scenario, there may not have existed a single, ancestral script that exhibited all of the traits shared by the Late Formative Zapotec, Epi-Olmec, and Mayan scripts. Instead, it is more and more likely that such scripts were the result of multiregional evolution with significant diffusion, leading to convergence of traits. If by 650 BCE the earliest Zapotec inscription already documents the expected day count pattern of a day sign with postposed bar-and-dot numeral, then it is possible that by this time, too, a Mixe-Zoquean language was attested at La Venta, on Monument 13, also dated to 650 BCE, where a possible instance of a bar-and-dot numeral preposed to a day sign may be present. This would be consistent with the evidence from the Epi-Olmec script that evolved not long after, in the same region, as reviewed earlier, and represents a pre-proto-Zoquean language, according to Justeson and Kaufman.[73]

Where Do Olmec Writing Studies Stand Today?

A number of conclusions can be drawn. Mesoamerican writing began during the Early Formative period, by about 1200 BCE, initially manifested in ceramic stamps and figurines. This early ceramic stamp and figurine text tradition is widely distributed, but it is more common to be seen at sites outside the Olmec heartland that were stylistically affiliated with the Olmecs. Some of the traits that various scholars have hypothesized to have been present in an early ancestral "Olmec" script are absent during this early period, and do not become attested until around 900–700 BCE. The Cascajal Block text lacks several such traits, supporting its early dating to about 900 BCE. Several key texts, from Ahuelicán, Chalcatzingo, Oxtotitlán, San Andrés, and La Venta, date to 900–500 BCE, and attest to the appearance of most of the traits shared by the later Zapotec, Epi-Olmec, and Mayan traditions. If the latter three scripts descended from a single ancestral script, such a script would have been in place by about 700 BCE, given that the earliest stylistically Zapotec text, San José Mogote Monument 3, is reliably dated to 650 BCE, significantly earlier than the earliest stylistically Epi-Olmec text, the Chiapa de Corzo sherd dated to between 450–300 BCE, or the earliest text from the Maya region, El Portón Monument 1, dated to about 400 BCE. Nevertheless, the difference in the placement of the bar-and-dot numerals with respect to the day sign in Olmecoid texts (Chalcatzingo, Oxtotitlán) compared to Olmec texts (San Andrés, La Venta), and the general contemporaneity of such placement with the earliest Zapotec text, suggests that already by 700 BCE a major division, probably based on linguistic affiliation, was underway: some Olmecoid texts may have been based on an Otomanguean language, while Olmec texts were likely based on a Mixe-Zoquean language. Some of the shared traits discussed by previous authors, such as the so-called "wrist infix," do not appear until 500–300 BCE, supporting the contention that some of the shared traits were the result of later convergence due to diffusion, rather than traits inherited from a common ancestor. Thus, a model for a single, ancestral, Olmec(oid) script seems less likely than a model for several scripts, perhaps exhibiting linguistically-motivated differences from an early time that gradually converged over time, formally, as a result of social interaction.

Despite the fact that many Olmec specialists have favored iconographic approaches to linearly structured Olmec texts, as already recounted, I would admonish Olmec specialists to apply a linguistic framework. Perhaps with the exception of celts, which exhibit clear parallelism between embodied and disembodied depictions of standing anthropomorphic figures, and thus are largely iconographically motivated, a linguistic model should be applied to linearly structured texts, of which many examples are known, even if most are extremely brief. A Mixe-Zoquean model should be the null hypothesis, especially for Olmec texts; a Mixe-Zoquean model, in conjunction with an Otomanguean model, for Olmecoid texts. Justeson's perceptive proposition that Olmec texts were likely written in Mixe-Zoquean, whereas Olmecoid texts were likely written in "local, non-Olmec languages," merits rekindling.[74]

Notes

1. See Matthew Stirling, "Great Stone Faces of the Mexican Jungle," *The National Geographic Magazine*, vol. 78, no. 3 (1940), pp. 309–334.

2. See David H. Kelley, "A Cylinder Seal from Tlatilco," *American Antiquity* no. 31 (1966), pp. 744–746.

3. See Carlo T. E. Gay, "Olmec Hieroglyphic Writing," *Archaeology*, no. 26 (1973), pp. 278–288.

4. See Michael D. Coe, "The Olmec Style and its Distribution," in *Handbook of Middle American Indians*, vol. 3, edited by G. Willey (Austin: University of Texas Press, 1965).

5. This statement is still applicable today. See below for discussion of Freidel and Reilly's approach to the analysis of the Cascajal Block. David Freidel and Kent Reilly, "The Flesh of God: Cosmology, Food, and the Origins of Political Power in Ancient Southeastern Mesoamerica," in *Pre-Columbian Foodways: Interdisciplinary Approaches to Food, Culture, and Markets in Ancient Mesoamerica*, edited by John Staller and Michael Carrasco (New York: Dordrecht, 2010; and Heidelberg, London: Springer, 2010), pp. 635–680.

6. Kent Reilly, "Cosmología, soberanismo y espacio ritual en la Mesoamérica del Formativo," in *Los Olmecas en Mesoamérica,* edited by John Clark (Mexico: Citibank, 1994), pp. 238–259.

7. And it could very well be the case that some putative Olmec texts are indeed non-glottographic in nature.

8. See Lyle Campbell and Terrence Kaufman, "A Linguistic Look at the Olmecs," *American Antiquity*, 41 (1976), pp. 80–89; and John S. Justeson, and Terrence Kaufman, "A Decipherment of Epi-Olmec Hieroglyphic Writing," *Science* 259 (1993), pp. 1703–1710.

9. See Mary E. D. Pohl, Kevin O. Pope, Christopher von Nagy, "Olmec Origins of Mesoamerican Writing," *Science* 298 (2002), pp. 1984–1987.

10. Figure 1A shows the drawing by Ajax Moreno in figure 2 in Pohl et al., "Olmec Origins of Mesoamerican Writing," p. 1985. It is used here with permission of Mary Pohl.

11. In Mesoamerican art and writing, it is very common for text and image to interact. So-called speech scrolls, akin to speech bubbles in contemporary comics, are typically rendered as volutes emanating from a being's mouth, and are indicative of speech or song, and in the writing traditions of the area, they are often connected to glyphic captions. The use of speech scrolls emanating from non-human characters has precedents, and, thus, it should be assumed that the speech scrolls emanating from the bird on the San Andrés stamp are indicative of spoken quotes.

12. See María del Carmen Rodríguez Martínez, Ponciano Ortiz Ceballos, Michael D. Coe, Richard A. Diehl, et al., "Oldest Writing in the New World," *Science* 313 (2006), pp. 1610–1614.

13. The drawing of the Cascajal Block used here was prepared and provided by John Justeson.

14. See David Cheetham and John E. Clark, "Investigaciones recientes en Cantón Corralito: Un possible enclave olmeca en la costa del Pací co de Chiapas, México," in *XIX Simposio de Investigaciones Arqueológicas en Guatemala, 2005*, edited by Juan Pedro Laporte, Bárbara Arroyo, and Héctor E. Mejía, (Guatemala, Ministerio de Cultura y Deportes, Instituto de Antropología e Historia 2006), pp. 3–8; and David Cheetham, "Early Olmec Figurines from Two Regions: Style as Cultural Imperative," in *Mesoamerican Figurines: Small-Scale Indices of Large-Scale Social Phenomena*, edited by Christina T. Halperin, Katherine A. Faust, Rhonda Taube and Auore Giguet (Gainesville: University Press of Florida, 2009), pp.149–179.

15. Figure 2 shows a drawing by the author after a photograph in figure 6 of David Cheetham and John Clark, "Investigaciones recientes en Cantón Corralito," p. 8.

16. Hans J. Prem, "Calendrics and Writing," in *Observations on the Emergence*

of Civilization in Mesoamerica, edited by Robert F. Heizer and John A. Graham, University of California Archaeological Research Facility. Contribution 11 (Berkeley: University of California, 1971), pp. 112–132; Hans J. Prem, "A Tentative Classification of Non-Maya Inscriptions in Mesoamerica," *Indiana* 1 (1973), pp. 29–59; John S. Justeson, William M. Norman, Lyle Campbell, and Terrence Kaufman, "The Foreign Impact on Lowland Mayan Language and Script," Middle American Research Institute, Publication 53 (New Orleans, La.: Tulane University, 1985). The latter assumed Prem's classification and elaborated upon it with refinements that were possible due to the discovery of additional data not available when Prem worked out his classification, or the reanalysis of the dates (radiometric, stratigraphic, stylistic) for certain key texts. I assume the terminology by the Justeson et al., and point out where those authors differ from Prem, and why.

17. John S. Justeson, "The Origin of Writing Systems: Preclassic Mesoamerica," in *World Archaeology, Early Writing Systems* 7 (1986), pp. 437–458; John S. Justeson and Peter Mathews, "Evolutionary Trends in Mesoamerican Hieroglyphic Writing," *Visible Language* 24 (1990), pp. 88–132; John S. Justeson, "Early Mesoamerican Writing Systems," in *The Oxford Handbook of Mesoamerican Archaeology*, edited by Deborah L. Nichols & Christopher A. Pool (Oxford: Oxford University Press, 2012), pp. 830–844; and Alfonso Lacadena García-Gallo, "La escritura olmeca y la hipótesis del Mixe-Zoque: implicaciones lingüísticas de un análisis estructural del Monumento 13 de La Venta," in *Olmeca: Balance y perspectivas: Memoria de la Primera Mesa Redonda*, edited by María Teresa Uriarte and Rebecca B. González Lauck (Mexico City: Universidad Nacional Autónoma de México, 2010), pp. 607–626.

18. For validation of the dating of San José Mogote Monument 3 to *c.* 650 BCE see Kent V. Flannery and Joyce Marcus, "The Origin of War: New ^{14}C Dates from Ancient Mexico," *Proceedings of the National Academy of Sciences* 100 (2003), pp. 11801–11805.

19. For a summary of their work on the phonetic decipherment and linguistic structure of Zapotec writing, see Terrence Kaufman and John Justeson, "Zapotec," in *The Cambridge Encyclopedia of the World's Ancient Languages*, edited by Robert D. Woodard (Cambridge: Cambridge University Press, 2004), pp. 1109–1111.

20. Joyce Marcus, "Mesoamerica: Scripts," in *Encyclopedia of Language & Linguistics*, Second Edition, volume 8, edited by Keith Brown (Elsevier, 2006), pp. 16–27.

21. For a report on an incised Middle Formative pot sherd with possible

Olmecoid or Epi-Olmec writing at the site of Rancho Bufalo, Chiapas, Mexico, see Jeffrey Dobereiner and Socorro del Pilar Jiménez Álvarez, "Possible Middle Preclassic Writing on the Olmec-Maya Cultural Frontier, Rancho Búfalo, Chiapas, Mexico," *Mexicon* 37 (2015), pp. 154–159. The pot sherd, associated with Mamón-style ceramics, and thus likely dating to *ca.* 600–400 BCE, contains only three signs, but I agree with the authors that it likely was part of a much lengthier text originally.

22. John S. Justeson, and Terrence Kaufman, "A Decipherment of Epi-Olmec Hieroglyphic Writing"; John S. Justeson, "A Newly Discovered Column in the Hieroglyphic Text on La Mojarra Stela 1: A Test of the Epi-Olmec Decipherment," *Science* 277 (1997), pp. 207–210; Kaufman and Justeson, *Epi-Olmec Hieroglyphic Writing and Texts*; and Terrence Kaufman, "Epi-Olmec," in *The Cambridge Encyclopedia of the World's Ancient Languages*, edited by Robert D. Woodard (Cambridge: Cambridge University Press, 2004), pp. 1071–1108.

23. See David F. Mora-Marín, "The Grammar, Orthography, Content, and Social Context of Late Preclassic Mayan Portable Texts," unpublished Ph.D. Dissertation, University at Albany, New York (2001); and David F. Mora-Marín, "Kaminaljuyu Stela 10: Script Classification and Linguistic Affiliation," *Ancient Mesoamerica* 16 (2005), pp. 63–87.

24. See especially Hans J. Prem, "A Tentative Classification of Non-Maya Inscriptions in Mesoamerica"; John S. Justeson, "The Origin of Writing Systems"; John S. Justeson, and Peter Mathews, "Evolutionary Trends in Mesoamerican Hieroglyphic Writing"; and John S. Justeson, "Early Mesoamerican Writing Systems."

25. I am excluding from the present study the abbreviated celt iconographic tradition discussed by John Justeson in "The Origin of Writing Systems"; John S. Justeson and Peter Mathews, "Evolutionary Trends in Mesoamerican Hieroglyphic Writing"; and John S. Justeson, "Early Mesoamerican Writing Systems." That said, I concur with those authors in regarding the abbreviated celt iconographic tradition as related to the contemporary script traditions, at the very least as an iconographic source for the development of signs, but possibly also as a source of graphic conventions.

26. John S. Justeson, "The Origin of Writing Systems," p. 447.

27. See David Cheetham and John E. Clark, "Investigaciones recientes en Cantón Corralito"; and David Cheetham, "Early Olmec Figurines from Two Regions."

28. Figure 3A is a drawing by the author based on photograph in David

Cheetham and John E. Clark, "Investigaciones recientes en Cantón Corralito," p. 8.

29. Figure 3B is a drawing by the author based on photograph in Michael Coe and Karl Taube, eds., *The Olmec World, Ritual and Rulership* (Princeton, N.J.: The Art Museum, Princeton University, 1995), p. 314.

30. Figure 3D is a drawing by the author based on photograph in figure 6.20 in David Cheetham, "Early Olmec Figurines from Two Regions." Figure 3E is a drawing by the author based on photograph of artifact on display at the Xalapa Museum.

31. David Cheetham, "Early Olmec Figurines from Two Regions."

32. David H. Kelley, "A Cylinder Seal from Tlatilco," p. 744.

33. I prepared the drawing in figure 3A after figure 1 in David H. Kelley, "A Cylinder Seal from Tlatilco," p. 744.

34. I prepared figure 4B after illustration on p. 285 in Carlo T. E. Gay, "Olmec Hieroglyphic Writing" *Archaeology* 26 (1973), pp. 278–288; and figure 4C is based on print in figure 19f on p. 54 of Peter David Joralemon, "The Olmec Dragon: A Study in Pre-Columbian Iconography," in *Origins of Religious Art and Iconography in Preclassic Mesoamerica*, edited by H. B. Nicholson (UCLA Latin American Center Publications. Los Angeles, 1976), pp. 27–71.

35. I prepared figure 4D based on Peter David Joralemon, "The Olmec Dragon: A Study in Pre-Columbian Iconography" (figure 7n on p. 38). I prepared figure 7E based on Peter David Joralemon, "The Olmec Dragon: A Study in Pre-Columbian Iconography" (figure 7o on p. 38).

36. Figure 4F is based on drawing by Ajax Moreno in figure 2 in Pohl et al., "Olmec Origins of Mesoamerican Writing," p. 1985.

37. Rodríguez Martínez et al., "Oldest Writing in the New World," p. 1612.

38. David F. Mora-Marín, "Early Olmec Writing: Reading Format and Reading Order," *Latin American Antiquity* 20 (2009), pp. 395–414.

39. David F. Mora-Marín, "Early Olmec Writing," p. 398.

40. See Martha Macri, "The Cascajal Block: Sign Ordering," *Glyph Dwellers*, no. 22 (2006), pp. 1–4; David Freidel and Kent Reilly, "The Flesh of God: Cosmology, Food, and the Origins of Political Power in Ancient Southeastern Mesoamerica," in *Pre-Columbian Foodways: Interdisciplinary Approaches to Food, Culture, and Markets in Ancient Mesoamerica*, edited by John Staller and Michael Carrasco (New York, Dordrecht, Heidelberg, London: Springer, 2010), pp. 635–680; and John S. Justeson, "Early Mesoamerican Writing Systems."

41. Martha Macri, "The Cascajal Block: Sign Ordering," p. 1–4.

42. Kent Reilly, "Cosmología, soberanismo y espacio ritual en la Mesoamérica del Formativo," in *Los Olmecas en Mesoamérica,* edited by John Clark (Mexico: Citibank, 1994), pp. 238–259.

43. John Justeson, "Early Mesoamerican Writing Systems," p. 840.

44. *Ibid.* I based figures 6A and B on the drawing in John Justeson's "Early Mesoamerican Writing Systems," figure 63.5b, with permission of that author. I based figure 6C on figure 6b in Linda Schele's "The Olmec Mountain and Tree of Creation in Mesoamerican Cosmology," in *The Olmec World, Ritual and Rulership*, pp. 105–117.

45. *Ibid.* Justeson, "Early Mesoamerican Writing Systems," p. 840.

46. *Ibid.*

47. *Ibid.*

48. *Ibid.*

49. See David F. Mora-Marín, "Full Phonetic Complementation, Semantic Classifiers, and Semantic Determinatives in Ancient Mayan Hieroglyphic Writing," *Ancient Mesoamerica* 19 (2008), pp. 195–213.

50. Figure 7A is based on a drawing of the Cascajal Block by John Justeson and used with his permission; figure 7B is based on a drawing in David F. Mora-Marín, "Full Phonetic Complementation, Semantic Classifiers, and Semantic Determinatives in Ancient Mayan Hieroglyphic Writing," p. 199, figure 2.

51. Figure 7C is based on a drawing of the Cascajal Block by John Justeson and used with his permission; figure 7D is based on drawing in David F. Mora-Marín, "Full Phonetic Complementation, Semantic Classifiers, and Semantic Determinatives in Ancient Mayan Hieroglyphic Writing," p. 199, figure 2.

52. John Justeson, "Early Mesoamerican Writing Systems."

53. David F. Mora-Marín, "Iconographic Motivations of the Cascajal Signary: Implications for Decipherment and History of Mesoamerican Writing," unpublished manuscript distributed in 2006.

54. Rodríguez Martínez et al., "Oldest Writing in the New World," p. 1613.

55. *Ibid.*

56. Michael Carrasco and Joshua Englehardt, "Diphrastic Kennings on the Cascajal Block and the Emergence of Mesoamerican Writing," *Cambridge Archaeological Journal*, no. 22 (2015), pp. 1–22.

57. Figure 8A is based on figure 2 in Pohl et al., "Olmec Origins of Mesoamerican Writing," p. 1985, which was drawn by Ájax Moreno and used with Mary Pohl's permission.

58. Figure 8B shows detail of a photograph in Jorge Angulo, "The Chalcatz-

ingo Reliefs: An Iconographic Analysis," in *Ancient Chalcatzingo*, edited by David C. Grove (Austin: University of Texas Press, 1987), pp. 132–158.

59. Figure 8C is a drawing from David C. Grove, "The Middle Preclassic Period Paintings of Oxtotitlán, Guerrero," http://www.famsi.org/research/grove/index.html (2007).

60. I based figure 8D on figure 61 in Philip Drucker, *La Venta, Tabasco: A Study of Olmec Ceramics and Art* Bureau of American Ethnology, *Bulletin* no. 153, (1952).

61. I based figure 8E on figure 2 in Joyce Marcus, "The Origins of Mesoamerican Writing," *Annual Review of Anthropology* 5 (1976), pp. 35–67.

62. This example is complicated. The three dots at the bottom of the possible day sign are neatly lined up, as would be expected in a bar-and-dot numeral. However, three dots also are present on top of the putative day sign: these are not neatly aligned, and thus may not have been intended as a numeral. But if they were, two options open up: perhaps the notation was meant to be bilingual, with the pre-posed, irregular numeral 3 consistent in position with the texts from the Olmec heartland, and the postposed, regular numeral 3 consistent with the Olmecoid texts from outside that region, a possibility raised by Mary Pohl (personal communication, 2017); or it is possible that the six dots together function as a numeral 6, and that the bars for 5 were innovated later, an option considered by John Justeson in "The Origin of Writing Systems: Preclassic Mesoamerica," p. 444. Nevertheless, the two-bar notation from the roughly contemporaneous Chalcatzingo Monument 24, as wells as the absence of other evidence for dots-only numerals at this stage of Mesoamerican history, argues against this idea.

63. See John S. Justeson et al., "The Foreign Impact on Lowland Mayan Language and Script," Middle American Research Institute, Publication 53 (New Orleans: Tulane University, 1985), pp. 45–46 for a discussion of linguistic placement of numerals. Essentially, the 3 in such an example would be the number of a cycle of thirteen numerals, 1–13, referred to as *trecena*; while the day name, *Ajaw*, would be a day name in a cycle of twenty-day names, referred to as *veintena*. Consequently, 3 *Ajaw* is a juxtaposition of two cycles.

64. Figure 9A is from drawing from David C. Grove, "The Middle Preclassic Period Paintings of Oxtotitlán, Guerrero," http://www.famsi.org/research/grove/index.html (2007), used with permission of the author. I based figure 9B on a photograph in Michael Coe and Karl Taube's *The Olmec World, Ritual and Rulership*, p. 234.

65. See John S. Justeson, "The Origin of Writing Systems"; and John S. Justeson and Peter Mathews, "Evolutionary Trends in Mesoamerican Hieroglyphic Writing."

66. David F. Mora-Marín, "The Grammar, Orthography, Content, and Social Context of Late Preclassic Mayan Portable Texts," p. 22.

67. Figure 9C is a drawing from David C. Grove, "The Middle Preclassic Period Paintings of Oxtotitlán, Guerrero," http://www.famsi.org/research/grove/index.html (2007), used with permission of the author; I based figure 9D on figure 61 in Philip Drucker, *La Venta, Tabasco*; and figure 9e is a drawing by Ajax Moreno in figure 2 of Pohl et al., "Olmec Origins of Mesoamerican Writing," p. 1985and it is used here with permission by Mary Pohl.

68. Figure 9F is a drawing from David C. Grove, "The Middle Preclassic Period Paintings of Oxtotitlán, Guerrero," http://www.famsi.org/research/grove/index.html (2007), used with permission of the author; and I based figure 9G on figure 61 in Philip Drucker's *La Venta, Tabasco*.

69. Alfonso Lacadena García-Gallo, "La escritura olmeca y la hipótesis del Mixe-Zoque."

70. I based figure 9H on the print in figure 19f in Peter David Joralemon's "The Olmec Dragon," p. 54.

71. See David H. Kelley, "A Cylinder Seal from Tlatilco,"; and John S. Justeson, "Early Mesoamerican Writing Systems."

72. Terrence, Kaufman, "Early Oto-Mangean Homelands and Cultures: Some Premature Hypotheses," http://www.albany.edu/ims/pdlma/2015%20Publications/Kaufman-Otomangean%20Woerter%20und%20Sachen.pdf (2015).

73. John Justeson and Terrence Kaufman, "A Decipherment of Epi-Olmec Hieroglyphic Writing."

74. John Justeson, "The Origin of Writing Systems: Preclassic Mesoamerica," pp. 448–449.