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The origin of writing systems: Preclassic Mesoamerica

John S. Justeson

. . . it is vain to hope for the discovery of the first domestic corn cob, the first pottery vessel, the first hieroglyphic, or the first site where some other major breakthrough occurred. Such deviations from the preexisting pattern almost certainly took place in such a minor and accidental way that their traces are not recoverable. More worthwhile would be an investigation of the mutual causal processes that amplify these tiny deviations into major changes in prehistoric cultures.

Flannery (1968b: 85)

WRITING SYSTEMS are here defined as graphic representational systems whose encoding and decoding of information make crucial reference to language. The origin of writing is then the introduction of linguistic information into the coding process by which graphic forms are related to meaning. Because the involvement of linguistic processing might in principle be quite limited, the representational system that first emerges by its introduction is referred to as *INCIPIENT WRITING*.

Mesoamerica is the only New World area in which writing originated by the introduction of linguistic coding into a graphic system of communication, rather than by contact with literate cultures. Its earliest stages are poorly attested, but fragmentary remains do document important aspects of incipient writing here. Several parallels with Sumerian developments have functional significance for the origins of writing, and accord with traditional views on what earliest writing was like.

The evolution of incipient writing: general considerations

Sources of linguistic coding

The emergence of incipient writing requires an association of individual graphic units with individual linguistic units; this is the basic coding convention of developed scripts, more complex associations developing from it via language change or script transfer.

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While individual graphic units in representational art can be put in one-to-one correspondence with linguistic units – for example, depictions of objects with words for such objects or for semantically associated notions – overall the coding conventions are incompatible: groups of graphic units codetermine concepts, and the individual units cannot be made to correspond one-to-one with linguistic units that together code the same concepts.

Incipient writing could not emerge in the absence of some necessity promoting reinterpretation of units in art as linguistic, for the internally adequate interpretive conventions of preliterate graphic representational systems are in conflict with linguistic conventions. Familiar and interpretively adequate coding conventions are unlikely to be replaced by conventions that are radically different and unfamiliar even if the latter are equally adequate. If novel conventions can capture only rare or contextually restricted cases, existing conventions are maintained. Thus, the introduction of linguistic coding into an existing graphic system of representation presupposes the *inadequacy* of the

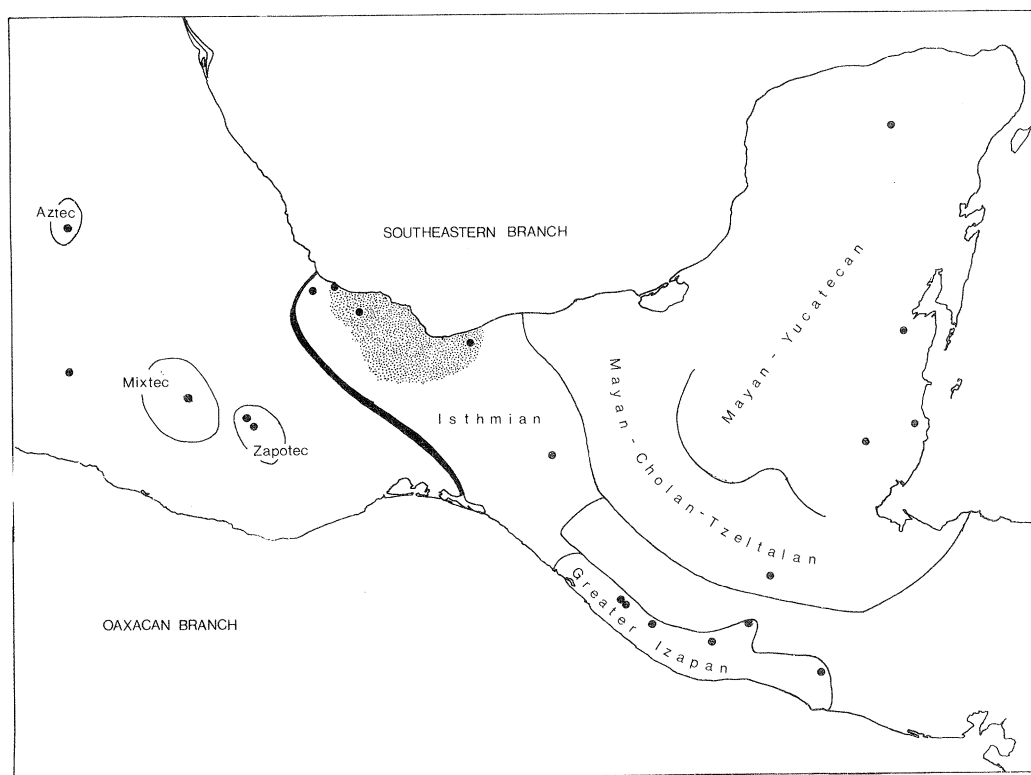


Figure 1 Major Mesoamerican script groups. The heavy line separates the Oaxacan from the Southeastern branch. Boundaries are imprecise, and are based in part on noncontemporaneous data. Some would put the boundary within Mayan further north; the placement relies on Fox and Justeson (1982). The shaded area is the Olmec homeland. Preclassic sites yielding writing are marked with dots. The one in the Aztec region predates the arrival of the Aztec by about 1500 years; the others are associated with the indicated script traditions.

existing coding system and the concomitant adequacy of linguistic coding in some multi-sign contexts. The coding conventions of any one representational system are intrinsically adequate in the contexts of its traditional application, and the idea of applying it to a novel context presupposes the applicability of its conventions. Accordingly, writing probably develops, not within a single graphic system, but rather via conjoint use of more than one graphic system in a single context. Hence, there is no such thing as ‘the first hieroglyph.’

Such conjunction meets two of the preconditions for the emergence of incipient writing. In concatenating elements from distinct graphic systems, the interpretive conventions of any one prior system are inadequate to encode or decode the message; external or higher-order integrative conventions must be invoked. Similarly, with such concatenation, multiple signs are perforce in use, although they need not correspond to linguistic units.

In principle, the only linguistic construction that appears to permit this kind of development is numeration; it does so via juxtaposition of numerals with icons or depictions. This is inconsistent with the interpretive principles of art, where number is depicted by replication, while identification of enumerated items is foreign to a tally system. Language structure does correspond to such juxtaposition, in that numerals and the enumerated are represented by distinct roots or words. Other subsets of conjoined linguistic units can be shown to lack such potential (Justeson and Stephens in preparation). The importance of numeration in the origin of Mesopotamian writing is widely appreciated owing to Schmandt-Besserat’s work on the precursor system of accounting tokens, particularly in her (1981) discussion of numerical tablets. The model advanced here, however, is neither supported nor controverted by her thesis.

Representational conventions of incipient writing

A specific set of representational conventions is implicit in this origin of linguistic encoding. A tally has no intrinsic arrangement with respect to the depiction of the entity enumerated; only relative proximity is pertinent. Thus, sign arrangement can be variable with respect to language. Also irrelevant is the grammatical structure and syntactic role of the words involved. The enumerated entity is represented by one sign, though the word for it may be a compound (e.g., ‘god house’ for ‘temple’) or a root + derivational affix (e.g., ‘earth’ + resultative’ for ‘earthquake’). Thus, neither invariant complex word structure nor syntactic variation is registered; the incipient script exists only at the level of LEXICAL representation. The earliest Mesopotamian and Mesoamerican texts do lack linguistically consistent sign arrangement and grammatical specificity.

The resources of both language and the graphic systems are relevant to the expansion, reduction, or reorganization of incipient writing. Richer messages can be constructed by juxtaposing further icons or depictions with the tallies, such as seals conventionally identifying individuals. With no grammatical representation, spatially segregated clusters of graphic units are required to avoid confusion; the context of the text’s use also serves to reduce ambiguity.

Overtly phonetic spelling has no apparent basis in the representational systems from

which writing emerged; these code meaning only. Phonetic spelling per se requires the scribe, as reader, to derive the meaning of a sign or sign sequence *via* the phonetic values associated with the sign(s). While phonetic representation is implicit via the pronunciation of the words represented, this is a side effect, extrinsic to the existing coding conventions. Phoneticism must originate with the scribe as writer.

Writers spelling phonetically in a lexical script are associating roughly homophonous but semantically diverse words. Prior to phonetic writing, this activity is associated only with actual language use. It is an active part of the competence of language users, regularly applicable but only in certain situations – deliberately in punning, poetry, and mystical discourse, and quixotically in response to speech errors. Audiences can thus provide the scribe a model for deriving multiple – and usually semantically plausible – meanings from roughly homophonous forms that they misinterpret; a reader confronting and correcting the audience error has a *de facto* model for interpreting a sign as feasible for a homophonous word whose representation would be useful. Otherwise, the introduction of this rebus system depends on the content of ritual; mystic discourse appeals to homophony mainly in justifying claims about the natural, social, or moral order, typically associating abstract with concrete notions.

The representational principles of incipient writing readily admit novel content, since the class of depictable, enumerable entities is quite large. Augmented by rebus phoneticism, the lexical range of the script may be reasonably complete, and nonlexical representation, of grammatical particles and even affixes, becomes feasible.

Precursors of Mesoamerican writing

Hieroglyphic writing emerged in southern Mesoamerica c. 1100–600 B.C., during the era of state formation. Graphic precursors are recognized, whose gross functions have been reconstructed from their archaeological contexts. In spite of a meagre corpus, the transition to incipient writing is traceable by several lines of evidence to a specific content class.

Numeral systems

Bar-and-dot numerals (fig. 2a) are among the earliest recognizable written signs in Mesoamerica. They were presumably part of a representational system ancestral to all Mesoamerican scripts, for they descended into all later writing. In fact, they are probably much older than writing (Coe 1965: 756), for they are structured as simple tallies: a bar represented 5, a dot 1, with numerals composed by adding the required number of bars plus 0 to 4 dots. Some descendant systems deviate in details (fig. 2b), and the Maya used a different system as a rare alternative (fig. 2c). Probably because numerals in Mesoamerican languages have a base 20 structure, the tallies were only used to represent numbers 1 to 19; the system was later extended in different ways to represent larger numbers, but a sign for 20 may have been formed in the ancestral system by enclosing the numeral 1 in a roughly rectangular cartouche (fig. 2d).

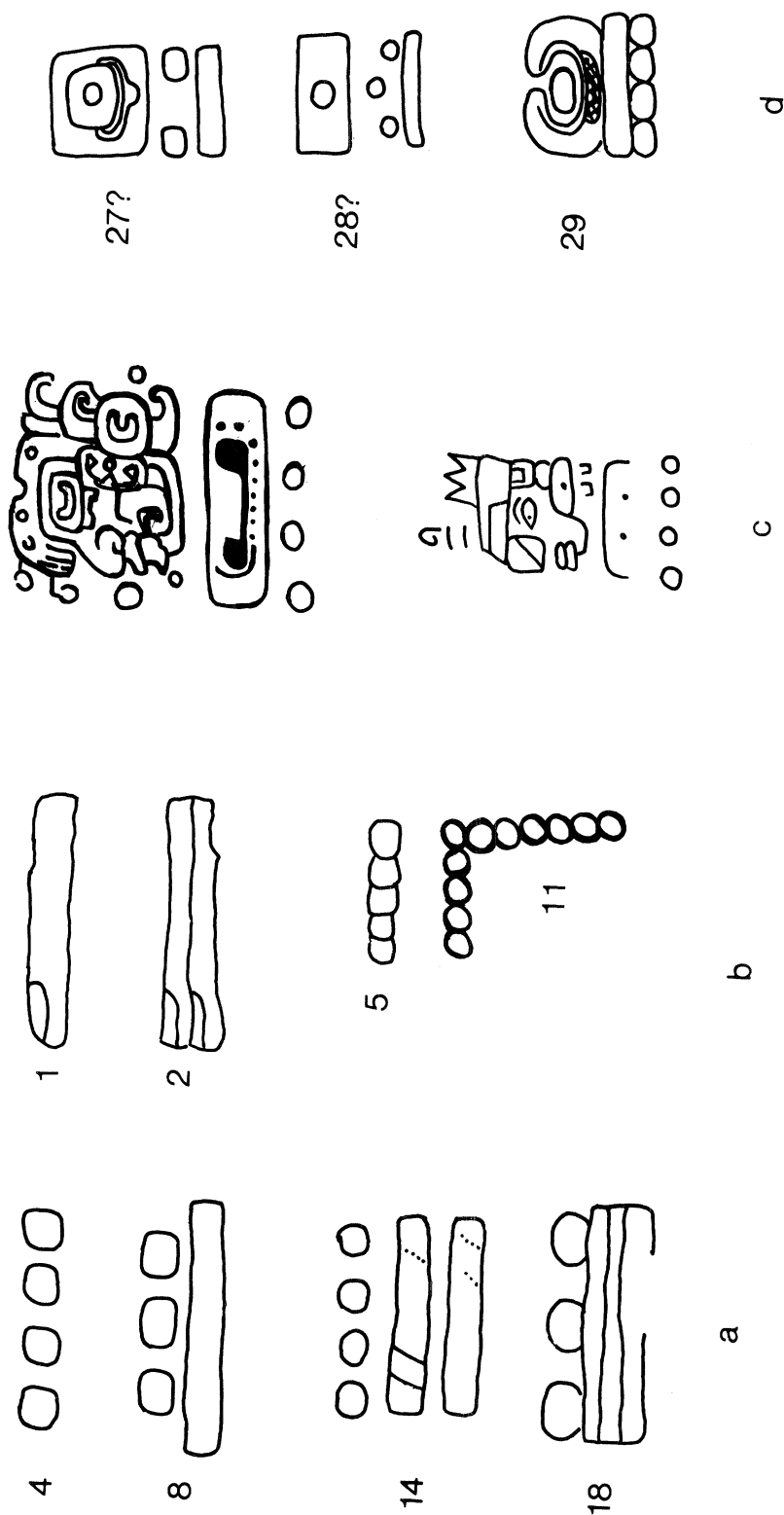


Figure 2 Mesoamerican written numerals. (a) Traditional bar-and-dot numerals, with values. (b) Traditional deviations, using fingers (for 1 and 2 only), and late deviations, using dots without bars. (c) Maya deity signs associated with the numbers 1–12 represented those numbers; some of the same signs occur in Preclassic Mayan (Pomona jade flare) and, seemingly, Isthmian (Tuxtla Statuette) with the associated numerals as semantic determinatives for the deities. (d) Possible '20' signs, in Zapotec (Monte Alban Tablet 14) and Isthmian (Tuxtla Statuette) scripts, with numeral 1 infixed into surrounding cartouche as among the Maya (lower right, '29').

Iconographic sources of written forms

Precursors to writing appear by c. 1100 B.C., in Olmec-style iconography. Indeed, Mesoamerican writing was always a pictorial art, and scribes were often (perhaps always) artists. According to early Spanish sources written forms were primarily painted with fine brush on bark paper or deer hides; Mesoamerican words for and portrayals of the act of writing (including the logogram for **e'ihb* 'to write' < 'to stripe') reflected this technology. Furthermore, most signs in all Mesoamerican scripts, except perhaps the Isthmian system, were transparently depictive and were related stylistically to local pictorial canons.

Elements of traditional Olmec iconography are found divorced from normal depictive context at this time, used as a not-fully-depictive form of representational art (Prem 1971: 126–7, 1973; Proskouriakoff 1971: 147–8; Justeson *et al.* 1985: 35–6), via two recurrent patterns. One is the use of individual elements as icons with conventional meaning, typically infixed into faces or bodies in depictive art (Coe 1976: 111). Conceptually categorizing entities or actions (Joralemon 1971, 1976), these icons expand the interpretive framework of depictive art. The other pattern is the depiction of disembodied faces, or a complex of headgear and/or accoutrements, placed in normal position with respect to disembodied arms or hands making traditional gestures or actions (fig. 3a-d). Arrangement therefore respects the conventions of traditional iconography; the essential deviation is that the retained complexes of depicted elements focus attention specifically on the statuses and activities they convey in depictive context. In this focusing, each complex forms a spatial unit separate from other complexes (fig. 3e), and each spatial unit corresponds to one concept that was only implicit in more depictive presentations.

Thus, a novel representational form was coalescing in the context of traditional iconography via minor deviations from straightforward depictive conventions. This form apparently led to a more abstract sign system, but not immediately or exclusively to writing. Its juxtaposition of semantically associated units that implicitly codetermined a concept (and thus segmented it from the overall 'message' of the depiction) would have promoted recognition of the separate units as forming a unified graphic constellation that overtly signalled the concept; thus, spatial juxtaposition reinforces a segmenting trend. Conversely, attempts properly to segment meanings codetermined by independent icons – which, differently associated, codetermine different sets of concepts – selects for physical correlates of the intended grouping, with juxtaposition and depictive models being the options. A segmental trend thereby reinforces juxtaposition, especially when involving elements with no rigid depictive model. Thus, concept segmentation and icon juxtaposition were mutually reinforcing trends that would tend to produce a nondepictive representational system of conventional and sometimes depictive icons, with semantic relations signalled by juxtaposition.

Such a developed icon system, attested on the lower register of the Humboldt Celt (fig. 3f), arose probably by 900 B.C. It was seemingly an esoteric representational system within or allied with the interpretive framework of depictive art. Its organization of traditional iconographic elements seems decidedly nonlinguistic, as expected from the origin of the system: since juxtaposed signs jointly signal a concept by codetermining it

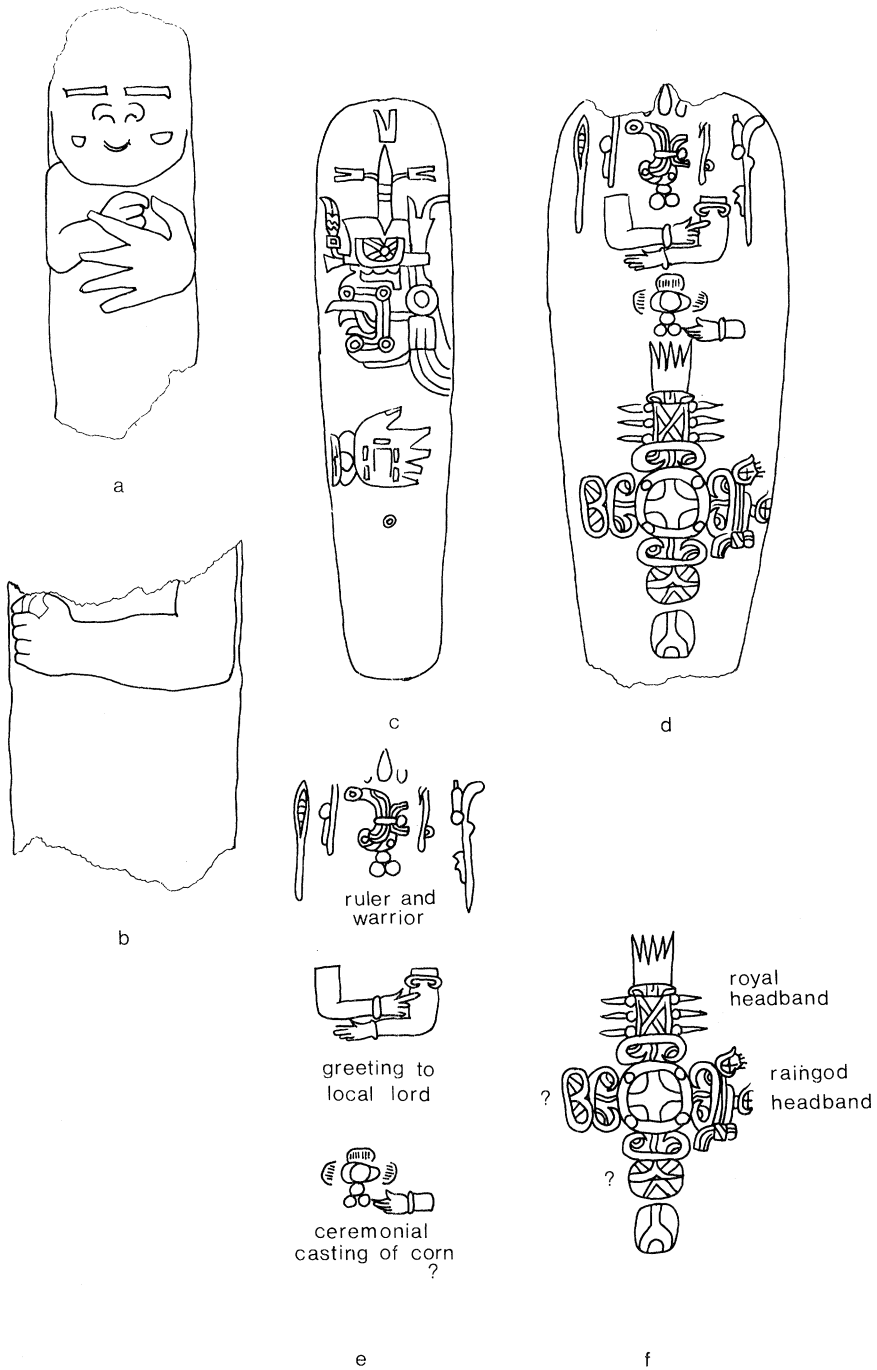


Figure 3 Iconographic precursors of writing. San Lorenzo Monuments (a) 41 and (b) 42, from the Olmec homeland, showing disembodied hands or arms [after Coe and Diehl 1980: figs 478–9]; (c) celt of unknown provenience [after Coe 1965: fig. 19]; (d) the Humboldt Celt [after Coe 1965: fig. 18]; (e) spatial segregation of icon groups on (d) probably arranged in an action sequence involving both a traditional Mesoamerican greeting gesture and a scattering rite that, among the Maya, was the prerogative of rulers; (f) lower register of (d): nondepictive format.

semantically, rarely could the compound be interpreted linguistically by literal readings of the individual signs.

This system was a foundation for the emergence of incipient writing. By conveying meaning segmentally, rather than in the integrated fashion of traditional depictive art, its conventions conformed closely to those by which concepts are encoded via language. By juxtaposing icons to convey such meanings, it provided a model for conjoining iconographic elements with bar-and-dot tallies. Indeed, some graphic units on the Humboldt Celt would be used as signs in Preclassic texts (Justeson *et al.* 1985: 36–7).

This system parallels the Predynastic Egyptian iconography on palettes and maceheads celebrating military victories of rulers. Grasping arms are fused with ‘tribal’ standards in iconographic context (Arnett 1983); roughly contemporaneous with Narmer’s Palette, famed for its hieroglyphic spelling of his name, Narmer’s Macehead shows conventional numerals paired with depictions of captives and booty (Quibell 1900: 9).

The social context of the emergence of Olmec(oid) writing

The Olmec style was an ‘elite horizon style’ of c. 1200–800 B.C (Early Preclassic). Widely diffused on portable objects, impeccably Olmec art was eventually produced for local elite on objects of local manufacture (here called *OLMECOID*). In fact, Olmec-style writing and precursors of writing occur mainly on portable objects, all or most found outside the Olmec homeland. Early Preclassic numerals, found only accompanying Olmec-style iconography, are all on such objects except for a possible instance on an Olmecoid mural (fig. 4); they may have been introduced by a non-Olmec group using Olmec representational systems. Thus, interacting non-Olmec elites were probably coparticipants in the development of the incipient ‘Olmec’ script via their participation in the use and possibly production of its Olmec-style precursors.

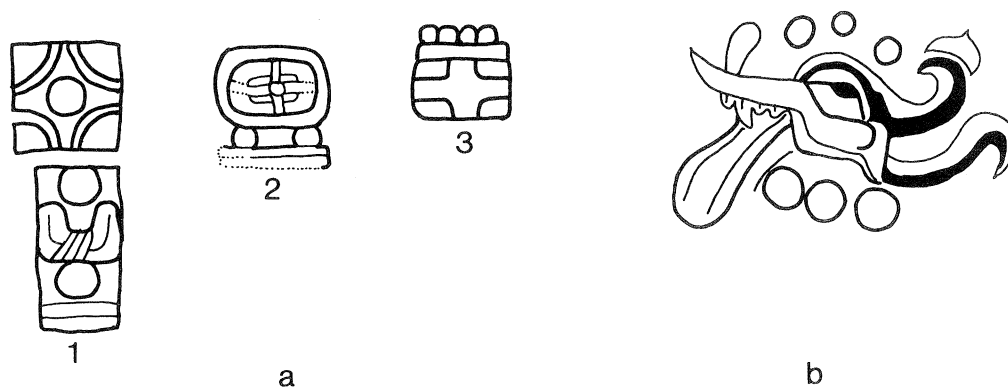


Figure 4 Possible Olmec(oid) day names, (a-1) from a celt of unknown provenience [after Joralemon 1971: fig. 37], compared with early cruciform day signs: (a-2) Monte Alban Stela 17 and (a-3) Cerro de las Mesas Stela 8; (b) possible day 3 (or 6?) Alligator on Oxtotitlan murals [after Grove 1970: fig. 15].

The portable, Olmec-style objects bearing writing and its precursors were of the same types as the other Olmec artifacts imported or produced by elites of non-Olmec chiefdoms. Among the Olmec, they were used in ritual ceremonies in elite precincts (Drucker 1952; Drucker, Heizer, and Squier 1959: 133–91). They were apparently acquired by non-Olmec elites to consolidate or increase their local power and status by publicizing and dramatizing their affiliation with Olmec power and prestige (Flannery 1968a; Drennan 1976, 1983). At times they were accompanied by associated Olmec ceremonies; Olmec participation in these rituals, or local elite use of Olmec language in them, is suggested by ethnographic parallels (Flannery 1968a; Fash 1982). It is therefore significant that according to early sources scribes were elite males, and normally (perhaps always) ritual specialists.

Accordingly, Olmecoid writing probably originated with complex society outside the Olmec homeland, as one aspect of a visual system used ceremonially to legitimate and reinforce elite power and prestige; this would remain the principal function of Mesoamerican writing. The contexts probably differed for homeland Olmec writing mainly in reinforcing differences *within* the elite. By way of comparison, Schmandt-Besserat (1982) argues that the use of the token system which preceded writing in Sumer was in the context of ceremonial ritual, associated with the emergence of a redistributive economy, that enhanced the power and prestige of political leaders.

Introducing linguistic encoding

If 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. Ritual day names consist of a name, from a set of 20 (the *VEINTENA*) that succeed each other on a daily basis, and of a number between 1 and 13 (the *TRECENA*), also succeeding each other on a daily basis. Thus, the two cycles, numerals and names, operate independently; days in the *veintena* are not enumerated by the numerals of the *trecena*. Before writing, these day names could only be represented by separately recording the numeral and the referent of the *veintena* name (mainly, plants and animals).

The earliest uses of numerals are for these day names and, less often, for associated calendric statements; the latter always included numerals, and numerals were always infrequent in other contexts (economic records are rare and late, in tribute lists). Conversely, most early inscriptions record the day names, and many record little else; likely examples appear in Olmecoid iconography. As the only element of content shared by all Mesoamerican scripts, apart from numerals, the day names are probably inherited from the ancestral representational system. This status is reflected also in the primitive conventions for spelling *veintena* names – almost always by a single sign (usually depictively and never by rebus) that reflected their semantic referent; the two exceptions are logographic sign pairs. Among groups whose day names are known, their spellings do not indicate grammatical affixes or compound word structures.



Figure 5 Lexical representation in day names. (a) Nahua (Aztec) $k^waw-\chi i$ for the day Eagle, with absolutive suffix $-\chi i$ not indicated; compare with (b) a compound word containing $k^waw-\chi i$, viz., $koska+k^waw-\chi i$ for the day Vulture; (c) sign depicting snake's head, for Lowland Mayan $\#čak+čan$ or $*čik+čan$, compound words for types of snake; (d) the Mayan day name $\#e\theta+nab'$ 'sharp-edged lance (blade)' spelled by a sign for stone + a sign possibly for $e\theta'$.

The ritual context for the use of emerging writing also implicates the ritual calendar as part of the content conveyed during the manipulation and display of the objects bearing writing. Throughout Mesoamerica the ritual specialists were calendar priests; the greater part of their work was to use the ritual calendar to time projected events or to assess the likely outcome of events occurring on a given day. Thus, the graphic system that was becoming script was probably in the hands of calendar priests in charge of Olmec-inspired rituals. This association would continue: Mesoamerican scribes were always the calendar priests.

A scribe is in apparent control over what he inscribes. Verification that a given ritual result was achieved, and fairly, therefore requires that *previously* inscribed material be available at the opening of the ritual; this, in turn, means public observability that the ritual specialist lacks apparent control over the specific item he selects from the available material. With ritual pronouncements construed as supernaturally sanctioned, their publicly demonstrated authenticity fosters public support. Since the ritual calendar was used to schedule secular events, graphic representation of a day name as an outcome of a ritual could be used to promote a public perception of supernatural sanction for the timing of that event (in the case of public ritual, typically involving group action such as war against a neighboring chiefdom). Implicit in a sanction for the timing of public action is sanction for the action per se. Representation of day names therefore assists an elite in consolidating power over group action in the guise of scheduling.

A secondary referent of ritual day names was an individual born on that day. This provides a way to select individuals ritually for public duties or powers, and, more important, to identify them in an Olmec-style medium. As Olmec iconography helps to legitimize, consolidate, celebrate, and perhaps advance the power of the local elite generally, its identification of particular elite individuals could be used to enhance their personal power over their rivals. Inscribing representations of day names on celts potentially strengthens the personalization of authority in the emerging non-Olmec state.

Earliest Mesoamerican writing

Script traditions (Map fig. 1)

Only two Olmec(oid) texts are known, each consisting of only three signs; one lengthy text reputedly exists on an unpublished, illegally excavated artifact. A handful of

ostensibly glyphic notations occur in iconographic context. All these date between 1100 and 400 B.C.

Two descendant script traditions flanked the Olmec homeland by c. 600–300 B.C. In the OAXACAN branch, a few inscriptions are of later Middle Preclassic date (500–200 B.C.), and a couple of dozen from the Late Preclassic, c. 200 B.C.–A.D. 100. An earlier Middle Preclassic dating of San José Mogoté Monument 3 (Flannery and Marcus 1983: 57), to 700–500 B.C., is stratigraphically secure (Flannery, pers. comm.); seeming anachronisms (Whittaker 1983: 104–05; Arostegui 1984; Justeson et al. 1985: 34) may be later provincial variants. Middle Preclassic Oaxacan writing was ancestral to subsequent Oaxacan and Central Mexican scripts, attested in hundreds of manuscripts and monuments.

The SOUTHEASTERN script tradition is of comparable antiquity, with El Porton Monument 1 dating from the Middle (just possibly Late) Preclassic (Sharer and Sedat 1973); about two dozen texts are found scattered throughout the Southeastern area in the Late Preclassic (300 B.C.–A.D. 250). It had two sub-traditions: a conservative, ISTHMIAN branch, and a more innovative one with contiguous Greater Izapan and Maya divisions. 2000–3000 Mayan texts survive from later periods.

Some frequent signs shared by Oaxacan and Southeastern scripts had nondepictive features whose meaning or rationale was not iconically motivated (fig. 6b); their presence was therefore by convention, pointing to historical retention. Thus, both traditions probably developed from an ancestral incipient script, not separately from the shared Olmecoid iconography. For culture-historical reasons, that ancestral script was probably Olmec(oid).

Characteristics of the ancestral script

If all Mesoamerican scripts descend from one ancestral writing system, most of the features they have in common are plausibly descended from the ancestral script. Ancient Mesoamerican scripts parallel early Old World systems in their columnar format, left-to-right and top-to-bottom reading order, and depictive signs. In Mesoamerica shared substantive features include numerals from 1 to 19, days in the ritual calendar, and personal and (in Oaxaca) place names, with topical emphasis on sacrificial rites, accession to political power, and the ritual prerogatives of rulership. The scripts also share a number of depictive signs (fig. 6a).

Most Mesoamerican signs fall into two form classes based on their proportions – roughly square MAINSIGNS and more elongated ones (so-called ‘affixes,’ usually not representing linguistic affixes). Lower numerals were the most frequent model for the elongated class. Multi-sign groupings typically accompany scenes depicting a single major human figure, an outgrowth of the association of monumental writing with rulership; columnar format was presumably due to the vertical axis this pairing provides. Early texts in row format, always consisting of a single row, are effectively multicolumnar; cylindrical objects – mostly pedestals (‘altars’), vessels and ear flares – typically show this kind of format. These spatial contexts may have helped to promote the organization of Mesoamerican signs into a rigidly linear, textual format.

Writing was from left to right in columns. In some cases, a text occurs in separate

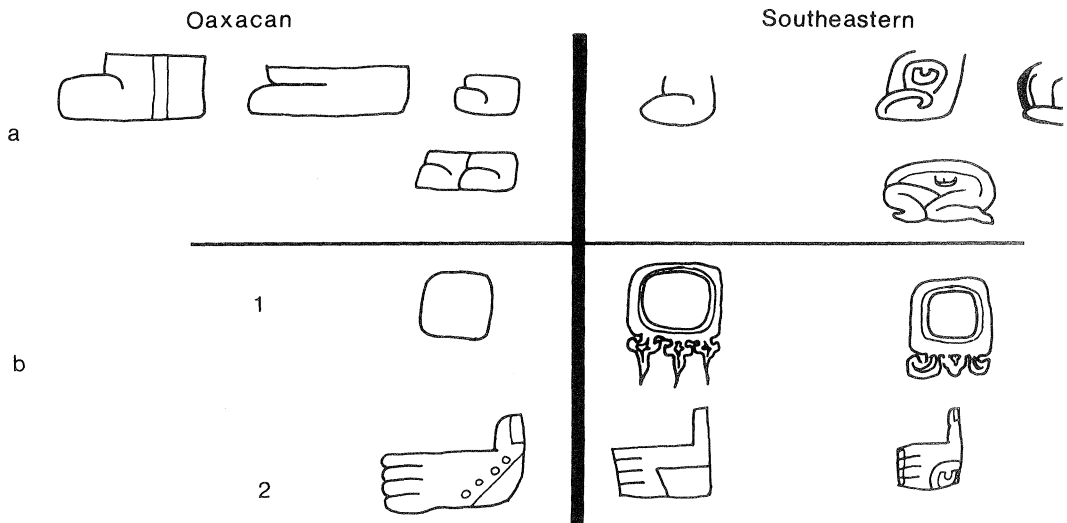


Figure 6 Signs shared by the Oaxacan and Southeastern Mesoamerican traditions. (a) Seating in office, depicting the posture used by Mesoamerican rulers in the iconography of accession. (b) Shared nondepictive elements are [1] a cartouche (with optional tripartite appendages in the Mayan/Greater Izapan scripts), which surrounds the sign for ritual calendar day names as a semantic determinative; [2] a field infixed, lower right, in a hand sign (among the Maya, 'to have, hold, grasp').

sections, each of which follows this ordering, but with the arrangement of text segments determined by their relation to iconography. Subsidiary texts, typically written in smaller scale and among the Maya often in lower relief, may be read after a main text regardless of relative position of the text segments.

A uniform set of representational principles governs the most ancient content categories appearing in later scripts, in spite of the differences within and among these scripts in their spelling conventions. These categories, then, seem to form an orthographic substrate preserving ancestral representational principles of Mesoamerican writing, accurately recoverable because in later scripts their relation to language is known precisely. This substrate suggests that early Mesoamerican signs represented only referential lexemes – no grammatical affixes or particles, and nothing phonetic; the earliest texts accord with the same conventions. The absence of grammatical representation may reflect the linguistic diversity of the elites who shared the iconography from which Olmec(oid) writing emerged.

The history of Mesoamerican representational conventions

Olmec

Identification of the Olmec as Mixe-Zoquean is based primarily on linguistic archaeology, i.e., from language distribution and correlations of linguistic with cultural diffusion (Campbell and Kaufman 1976); Olmecoid texts probably represented local, non-Olmec languages. The tiny Olmec corpus is effectively unread, but probably all its signs

represented concepts or lexemes; certainly almost all are either depictions, standard icons or numerals, and one is seemingly ancestral to a Mayan logogram for 'sun, day'. Word order may not have been fixed in Olmec texts, since numerals can be suffixed to day signs; prefix position would be expected, unless the examples are Zapotec.

Oaxacan script history

(based upon, but except as noted not drawn from, work by Caso 1928, 1947; Prem 1971; Marcus 1976, 1980, 1983; and Whittaker 1980, 1982, 1983.)

The earliest Oaxacan inscriptions were most likely Zapotec. In addition to distributional considerations, the distinctive use of numerals as suffixes to day names agrees with Zapotec usage alone (Whittaker 1983: 127). Mixtec and later Nahuatl (Aztec) among others were written in descendant scripts. Most early Zapotec signs were highly depictive. Calendrical statements, place names, and a few securely interpreted 'event' signs represented roots and words with referential meaning transparently related to the depiction. Most of the uninterpreted signs are also most likely logographic, given their epigraphic contexts.

The basic orthographic system of lexical signs was never expanded to represent grammatical affixes in Zapotec or Mixtec writing, and probably not to independent grammatical particles. Elsewhere, these extensions depend upon rebus phoneticism; the two postulated examples of rebus in Zapotec I consider to be misanalyzed, but Mixtec examples do occur. Grammatical extensions may also depend upon the grammars of the languages represented. In Zapotec and Mixtec, grammatical changes lead to extensive consonant mutation; as in heavily fusional languages generally, no invariant basic form can be isolated for many roots and grammatical affixes. Empirically and theoretically, simple phonetic signs appear to arise by analogical use of grammatical signs, and presuppose prior rebus phonetic spelling (Justeson 1982); there is no evidence for simple phonetic spellings in prehispanic Zapotec or Mixtec usage.

Sign order is fixed in day names and month counts, with numerals always suffixed in the Preclassic below the sign to which they pertain; this is in keeping with Zapotec word order in the case of day names – the most ancient and the most frequent context of numerals – but not in enumerations. Sign order sometimes appears to be depictively rather than linguistically motivated (fig. 7). Lexical status for the referent of a sign grouping seems to be signalled by its forming a topologically connected spatial unit. Signs in such compounds are fused to each other, overlap each other or are infixes one into the other; separate signs in the compound are not separated by space. This is habitual for place names and year names. Numeral suffixes are often juxtaposed without intervening space, and units following the numeral are never significantly closer to it than the numeral is to the sign to which it is suffixed; sometimes, longer groupings are also treated in this fashion. Objects held in hands are in contact with the hands in what are most likely verb + object predicates, while verb + subject fusion is likely in the case of some 'seating in power' statements (fig. 7).

The absence of grammatical representation restricts the complexity of texts, inhibiting expansion of a textual tradition. Zapotec passages were never more than a half-dozen

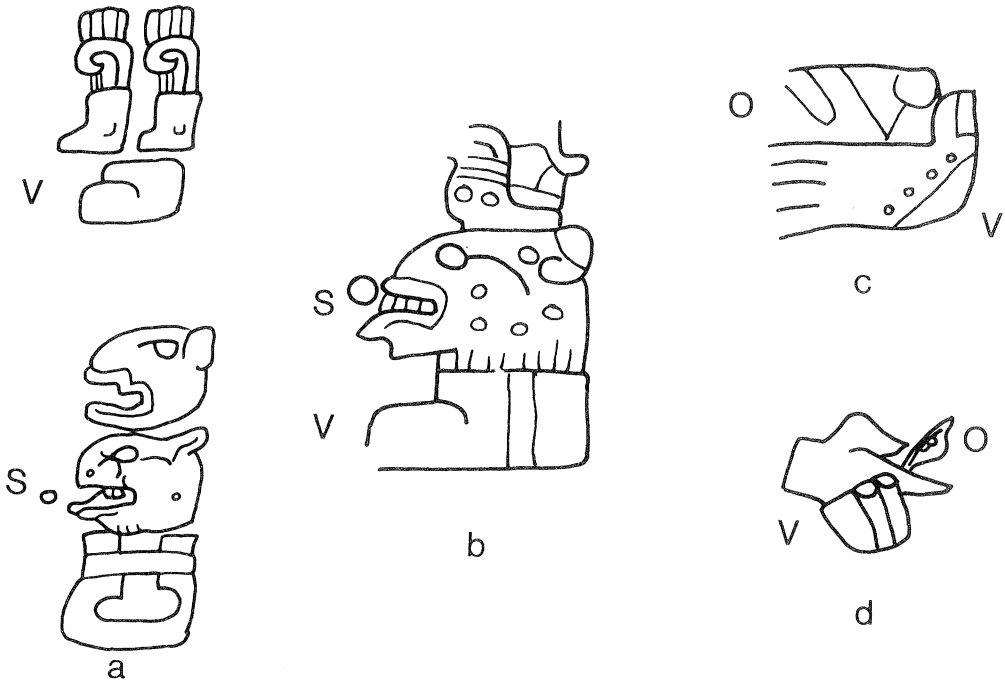


Figure 7 Nonlinguistic sign arrangement. Verbs (V) occur before subjects (S) in Zapotec, as in (a) 'Jaguar accedes', Monte Alban Danzante 55; the same event is stated (b) in subject-verb order, with the jaguar-head name sign surmounting haunches, Monte Alban Stela 15. (c), (d) Objects held in or cast by hands are rendered depictively, object (O) before verb (Monte Alban Stela 15 and the Lápida de Bazán).

signs long. Extended narratives were usually broken into 1- and 2-sign passages, interrupted by calendrical statements that anchor events historically; relational information was inferred, from the referential content and sequence within a historical framework and from iconographic accompaniment. This was a basis for script 'devolution' in the Classic period (Whittaker 1977): referential content came to be carried mainly by iconography, with day names and year names providing the historical framework, and sequence indicated via successive scenes. Dates and names formerly set into text as portions of connected sentences were associated rather with depictions. Because clear association of different names and dates with the appropriate depictions depends on *dissociation* from other names, reduction of the expressed referential content promotes loss of the textual format; even numerals and *veintena* names became only loosely associated in day name spellings. Formally and linguistically, the system was tantamount to that of incipient writing.

The Mixtec apparently expanded the representational system to accommodate rebus lexical spellings of forms that were not readily depictable or whose depictive signs represented various semantically related words such as 'spring' vs. 'lake' (Smith 1973: ch. 4, 1983: 241). These forms distinguished among Mixtec place names that were otherwise identical. Tonal differences were ignored in rebus (*ibid.*); much tonal variation is morphophonemically conditioned in Mixtec (Bradley 1970).

The Aztec expanded the lexical script by using rebus phoneticism extensively to represent locative derivational suffixes in place names. These suffixes were sometimes the only features differentiating the Aztec town names; none were fusional. Just before the Spanish Conquest, there is evidence for one probable phonetic complement, used where sign interpretation was otherwise potentially ambiguous – the only simple phonetic usage outside the Maya region. Phonetic spelling in post-hispanic extensions of the native tradition became quite extensive in some regions (Nicholson 1973).

Southeastern Mesoamerican scripts

(except as noted, based on Justeson 1982)

The Mixe-Zoque attribution of the practically uninterpreted non-Maya Southeastern inscriptions is based on linguistic archaeology. Its Isthmian subgroup appears to have been Zoquean (Lowe 1977; Justeson and Mathews 1985); the Greater Izapan was seemingly Mixean (Kaufman 1976; Campbell and Kaufman in preparation; Justeson *et al.* 1985: 4, 24), with some sites possibly Mayan.

In Lowland Maya texts, documented phonological and lexical innovations show that only the Cholan-Tzeltalan and Yucatecan subgroups of Mayan languages were represented (Fox and Justeson 1982); this fits the distribution of languages in the area at the time the Spanish arrived and evidence from lexical diffusion. Hieroglyphic writing was probably never used by any other Mayan linguistic group (Justeson and Campbell 1981); distributionally, the Preclassic Greater Izapan and/or Maya texts near regions now occupied by other Mayan groups are best attributed to speakers of Mixean or, if Mayan, of early Cholan-Tzeltalan (*ibid.*; Campbell 1978; Fox and Justeson 1982; Justeson *et al.* 1985: 67).

The Southeastern scripts, like their major arts, derive stylistically from Olmec writing and iconography. The Isthmian area has especially close affinities to the Olmec: in Olmec times it was culturally unified, from the point of view of ceramic traditions, with the Olmec homeland a subregion within it (Coe and Diehl 1980: ch. 4). The Southeastern tradition may have differentiated after c. 250 B.C.: a shared system of positional notation for recording dates arose during 255–54 or 235 B.C. (Justeson *et al.* 1985: 76 n.32). Shared aspects of its use were bases for innovations distinctive of the Greater Izapan/Mayan subgroup, and are attested between c. 200 B.C. and A.D. 36.

The script was apparently adopted by Cholan-Tzeltalan speakers from Mixean speakers in the context of Greater Izapan civilization by c. A.D. 1, establishing the Mayan use of hieroglyphs; Yucatecan speakers adopted the script from Cholan-Tzeltalan (Fox and Justeson 1982, 1984: 76; Campbell 1984) by c. A.D. 100 at the latest (Justeson, Norman, and Hammond in press). Much lexical diffusion accompanied both instances of script transfer. Isthmian signs are more frequently abstract or conventionalized than those of other Mesoamerican scripts; given the direct cultural descent of Isthmian from Olmec, this may relate to the formally abstract Olmec icon system. Mayan signs with clear Isthmian correlates are logographic, although some came to have phonetic usage (fig. 8).

Basic root forms in the (essentially agglutinative) Mixe-Zoquean and Mayan languages are readily isolated: grammatical mutation and infixation was limited, and only involved

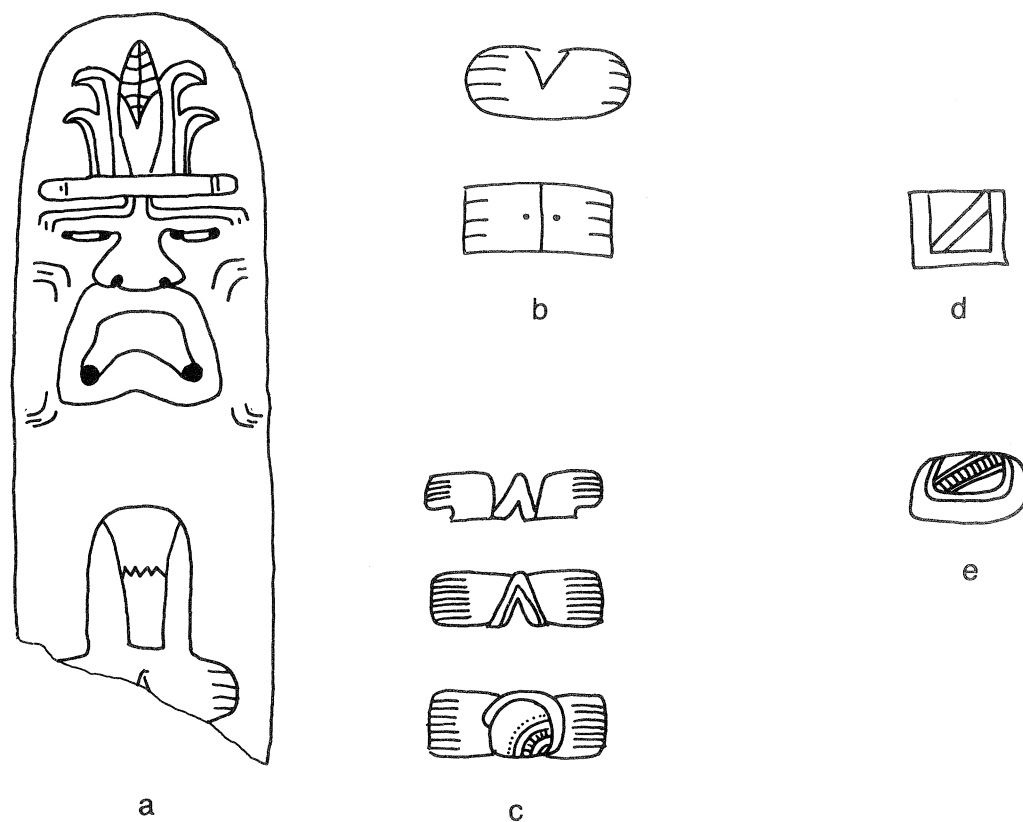


Figure 8 Isthmian/Mayan signs. (a) Feet on (ancestral Southeastern?) El Sitio celt [after Coe 1976: fig. 13], (b) excised and inverted as sign in the celt's text and in later Isthmian text; (c) early Maya forms, first used for 'great' (MZ **mah*) and, with YEAR determinative, #*may* '20 (of years)', later also phonetic *ma*. (d) Isthmian and (e) Maya sign for month Mac.

phonetically weak consonants and vowel length [widely disregarded orthographically in developed as well as rudimentary scripts (Justeson 1977: 67–8, 71–3)]. Preclassic Southeastern scripts (especially Mayan) did represent grammatical morphemes, and correlatively expanded their textual traditions.

Mayan texts in the Preclassic date from c. A.D. 1–250. None includes simple phonetic sign usage. Some grammatical affixes were represented, initially by rebus via other logograms. At least some, such as numeral classifiers, were only represented sporadically. Derivational affixes seem to have been represented before inflectional affixes. There was a tendency to represent affixes that were functionally and phonetically similar in Cholan and Yucatecan, but not those that were radically different; some shared forms (such as *-ih* on 3rd person completive intransitives) may have been generalized for related grammatical functions marked differently in the two subgroups.

Simple phonetic spelling developed c. A.D. 400, roughly as follows. The first phonetic complements arose by generalization from spellings of derivational suffixes attached to logograms; their first use as complements was to logograms whose interpretation was ambiguous or otherwise problematic, but signs frequently used as complements in such

contexts were extended for use elsewhere. The first use of sequent phonetic signs, in fully phonetic spellings or as complements, was for etymologically unanalyzable month names (possibly loanwords); the final sign involved was previously a derivational suffix, but the initial signs were not. Subsequently, rebus representation became a basis for generating simple phonetic sign values, sometimes from prior logograms and sometimes via depictive signs that had not previously been in use. The frequency of phonetic spelling gradually increased, but, since Mayan literacy was interlingual, forms distinctive of Cholan vs. Yucatecan tended to be avoided. Phonetic signs were always a distinct minority by text frequency.

The political function of writing as monumental art affected Mayan representational conventions. Reduction of the aesthetic power of text as perceived by the non-literate public (for whom it correlates with visually apparent formal variability) would have undermined the essential function of public royal inscriptions. Because formal variability is apparent in pictorial scripts, pressure for high formal variability selects for a large sign inventory and/or short texts. Mayan writing paralleled Egyptian in maintaining (in fact expanding) a large inventory of depictive signs; thereby, it tended to retain logographic principles (associated with iconically transparent signs), promoting the development of multiple signs for the same phonetic and/or semantic values (Justeson 1978: 132–3).

Juxtaposition and conflation signalled paired units in Preclassic Southeastern writing. The Maya or Greater Izapans extended this usage, regularly juxtaposing signs to form consistently proportioned, spatially compacted GLYPH BLOCKS as the basic spatial unit of text. Maya glyph blocks had complex internal structure, following regular orthographic rules for arranging elongated signs about, usually, a single mainsign. Previously, elongated signs lay horizontally, above following signs; among the Maya, elongated signs could stand vertically to the left or horizontally above following signs within the block (fig. 9a). This increased potential formal variation in sign arrangement exponentially with the number of elongated signs in the glyph block. Because roots *tended* to be represented by mainsigns, and qualifiers, grammatical morphemes and consonant-vowel syllables by elongated signs, increasing formal variability and increasing phonetic and grammatical representation were mutually reinforcing processes.

Glyph blocks could be arrayed in a variety of linear patterns, read from top to bottom and from left to right. When several columns were adjacent, the columns were paired, a given column being read row by row (fig. 9b). This double-column format, unique to the Mayan/Greater Izapan subgroup of Mesoamerican writing, had developed by A.D. 36 and probably after 255 B.C. The complex internal structure of the glyph block seems to have been an extension from the use in Southeastern scripts of numeral prefixes to the left of day signs, rather than above them, after the final digit of historical dates written in positional notation (Justeson *et al.* 1985: 40). Double-column format was seemingly an independent extension from *quasipositional* notation for dates that would have required a zero sign (invented centuries later); in such dates, a numeral was followed, apparently on the right, by signs for the time periods corresponding to the places in positional notation with non-zero digits.

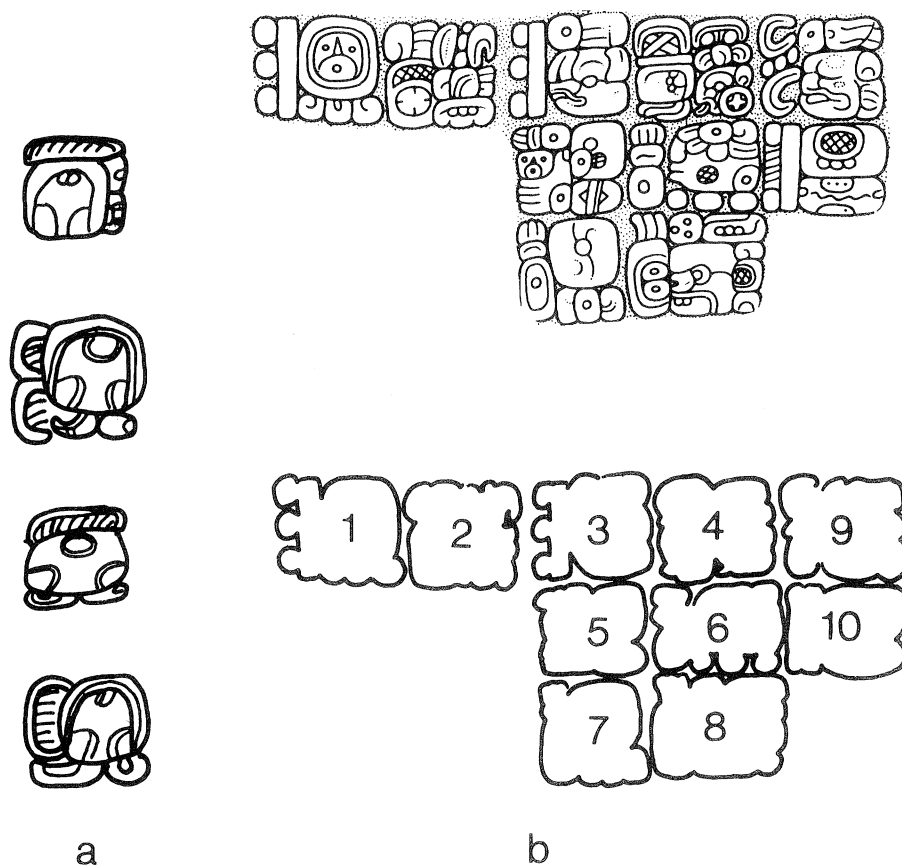


Figure 9 Formal developments in Mayan writing. (a) Complex internal structure of glyph blocks, illustrated by spellings of the Cholan month name *kac'ew* (Yucatec #*'ek*) with the same signs in different arrangements, all read in the same order as *ka-ʼe-w(a)*. (b) Double-column format, illustrated by a section of text from Yaxchilan Lintel 3 (courtesy of Ian Graham and the Corpus of Mayan Hieroglyphic Inscriptions); reading order indicated below.

Other scripts

No other Mesoamerican hieroglyphic script has a known linguistic affiliation, but all appear to be more or less devolved descendants of Oaxacan writing. The script of the Borgia Group of manuscripts, closely related to Mixtec writing, is the only one from which we have ample material. Shifting political and economic alliances from c. A.D. 800 onwards may be reflected in evidence for influence of various script and iconographic traditions on others: Tajín or late Isthmian on Lowland Mayan; peripheral Lowland Mayan on Xochicalco; and a Mixteca-Puebla 'International Style' broadly in Central Mexico.

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3.ix.85

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Abstract

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The origin of writing systems: Preclassic Mesoamerica

This paper focuses on the origins of Mesoamerican writing, analyzing remains of precursor systems in terms of the linguistic and graphic resources for the emergence of written language. This emergence is seen as the outcome of a conjunction of numerals with elements of representational art. Hieroglyphic writing emerged in southern Mesoamerica during the era of state formation, apparently via this process, to represent day names in the ritual calendar; the graphic precursors were numerals and Olmec iconography used in ritual context.

Contrasting evolutionary developments affected two script traditions descended from the rudimentary ancestral script; grammatical differences among the languages represented seem largely responsible for these contrasts. A Oaxacan textual tradition remained relentlessly logographic; it 'devolved' into a captioning adjunct to a richer iconographic system for recording information pertinent to elite activities and prerogatives. A Southeastern Mesoamerican tradition, culminating in Mayan writing, evolved increasingly thorough representation of language and always remained textual.