

## ADVANCES IN MAYA EPIGRAPHY

*Victoria R. Bricker*

Department of Anthropology, Tulane University, New Orleans, Louisiana 70118

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### ABSTRACT

During the past twenty years, significant progress has been made in determining the nature of the Maya script, the subjects covered in the monumental inscriptions, the grammatical structure of Maya writing, and the astronomical content of hieroglyphic texts on the monuments and in the codices. The script is unequivocally logosyllabic in nature, consisting of a mixture of logographic, syllabic, and semantic signs. The monumental texts are primarily concerned with dynastic history, including references to the births, marriages, military exploits, accessions to office, and deaths of rulers and their families, as well as the rituals that they performed. The grammar of hieroglyphic texts corresponds closely in structure to that of the Cholan and Yucatecan languages that were spoken in the region where hieroglyphs occur. And the pre-Columbian Maya were accomplished astronomers who produced complex tables for predicting solar and lunar eclipses, the stations of Venus and Mars, and solstices and equinoxes.

### *The Nature of Maya Writing*

The Maya hieroglyphic script was not the only writing system in use during pre-Columbian times in Mesoamerica, a region encompassing the part of Mexico lying south of the Lerma and Panuco rivers, all of Guatemala and Belize, and the western part of Honduras and El Salvador. Other scripts predated and probably served as precursors to Maya writing, notably those attributed to the pre-Classic Olmec and Zapotec civilizations (48-50, 69). At one time or another, the Zapotec, Mixtec, and Aztec writing systems were contem-

poraneous with the Maya script. What distinguishes Maya hieroglyphic writing from the others is that it developed further and became the most phonetic of all the scripts in pre-Columbian Mesoamerica.

Until as recently as 1970, the nature of the writing system was very much in doubt. The dominant view was the one espoused by Thompson (94, 96), namely that Maya writing was based on logograms or word signs. An alternative position, that the Maya script had a syllabic component, was championed by Knorosov, beginning in the 1950s (54–59). But Thompson was better known as an epigrapher of Maya writing, and his views prevailed until his death in 1975.

We now know that the Maya had a mixed writing system, composed of logograms and syllabic signs, whose structure resembled logosyllabic scripts in other parts of the world, such as Sumerian, Linear B, and Japanese (46). The essential characteristics of the Maya script can be described in terms of the different means Maya scribes had at their disposal for writing the word *ahaw* ‘lord, ruler.’<sup>1</sup>

Ahaw is the name of the twentieth day in the Maya week. The Maya script contains numerous examples of its use as a day name. In calendrical contexts, *ahaw* is usually represented by a face enclosed in a frame known as a cartouche (Figure 1a). It is often shown on a pedestal as well (Figure 1b). The cartouche and the pedestal base function as semantic determinatives, indicating that the sign infixed in them refers to one of the days of the Maya week. Only day names receive such treatment in the Maya script.

The day Ahaw can also be represented by the profile head of a young man, who is often depicted with a black dot in his cheek (Figure 1c). In some cases, the head and the shoulders or even the whole body of the young man is shown (Figures 1d and e). Note that in these examples, as well as in the previous ones, the sign is framed by a cartouche.

The five examples that have been presented so far are composed of a logogram, representing the word *ahaw*, and one or two semantic determinatives, which imply that the logogram refers to the day named Ahaw. None of these examples contains any clues to the pronunciation of the word sign.

The next example is more complex, containing a numerical coefficient above the day sign and a phonetic element below it (Figure 1f). The coefficient consists of two bars and three dots. Each bar has the numerical value of 5, and each dot has the value of 1; therefore, the coefficient is 13 ( $2 \times 5 + 3 \times 1$ ). The

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<sup>1</sup> The orthography used in this review is based on the alphabet developed by Spanish priests for Classical Yucatec during the sixteenth century, which is still in use today in the Yucatan peninsula. In this orthography, /c/ corresponds to English /k/, /k/ represents the glottalized form of English /k/, /dz/ represents the glottalized form of English /ts/, and /x/ corresponds to English /sh/. I have departed from the Colonial orthography in only one respect: I use different symbols for English /u/ and /w/ (*ahaw* corresponds to *ahau* in Classical Yucatec).

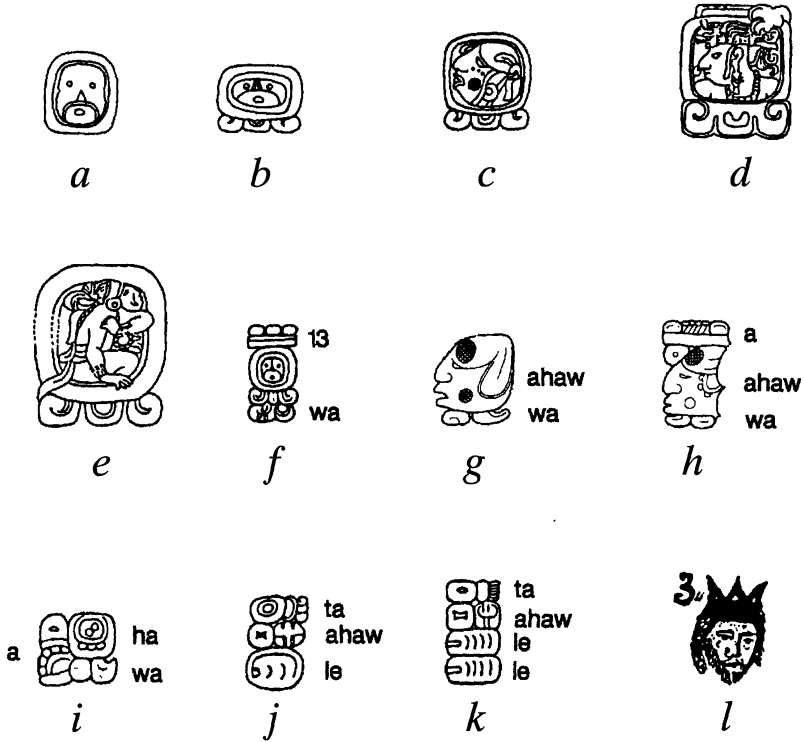


Figure 1 Alternative spellings of *ahaw*. (a) Palenque, Cross Tablet, D3; (b) Yaxchilan, Lintel 31, C4; (c) Copan, Stela C, A2b; (d) Quirigua, Stela D, D14; (e) Copan, Stela 13, A4b; (f) Copan, Stela 6, B7a; (g) Yaxchilan, Lintel 23, O5b (33:136); (h) Yaxchilan, Hieroglyphic Stairway 3, step IV, B3a (33:170); (i) Yaxchilan, Lintel 3, J1 (34:17); (j) Piedras Negras, Stela 3, F5a (Figure 12 in 69); (k) Piedras Negras, Throne 1, G'3 (73); (l) a colonial example (51). [(a-f) From *Maya Hieroglyphic Writing: An Introduction*, by J. Eric S. Thompson. Figure 10, Glyphs 10, 56; Figure 11, Glyphs 24, 33, 34, 59. New edition copyright © 1960, 1971 by the University of Oklahoma Press.]

suffix has the phonetic value **wa**.<sup>2</sup> It is a phonetic complement, telling us that the last consonant in the word is /w/ and that the vowel before the last consonant is very likely to be an /a/, which is in fact the case. The full

<sup>2</sup> The following transcription conventions are used in this review: Phonetic transcriptions of glyphs appear in boldface type, whereas morphemic transcriptions are italicized. For example, the word *chuc-ah* 'he was captured' contains two morphemes, *chuc* 'capture' and *-ah* 'perfective,' but it can be written with three phonetic signs, **chu-ca-h(a)**.

expression, *oxlahun ahaw* or ‘13 lord,’ refers to the last day in the 260-day ritual cycle known as the *tzolkin*.

In all these examples, the sign representing the day Ahaw appears in a cartouche (the pedestal is optional). But the word *ahaw* can also refer more generally to ‘lord’ or ‘ruler,’ and that usage is signaled by the absence of the two semantic determinatives. Figure 1g contains the profile variant of the *ahaw* glyph without the cartouche and pedestal and with the phonetic subfix **wa**. Figure 1h contains one logogram and two phonetic complements. The first phonetic sign represents the sound **a** and complements the first vowel in *ahaw*; the second sign (**wa**) complements the final vowel and consonant in *ahaw*. The word *ahaw* can also be spelled syllabically with three phonetic signs: **a**, **ha**, and **wa** (Figure 1i). In summary, a word such as *ahaw* can be written in at least five different ways: (a) with a logogram, (b) with a logogram and one or more semantic determinatives, (c) with a logogram and one phonetic complement, (d) with a logogram and two phonetic complements, or (e) with three phonetic signs.

The region where examples of the Maya script have been found was populated by people speaking languages belonging to the Cholan and Yucatecan families; speakers of a Tzeltalan language also may have inhabited the region (e.g. 6:103, 130, 178). In these languages, words have four basic shapes: CVC, CVVC, CVCVC, and VCVC (C = consonant, V = vowel). Thus the word *ahaw* is composed of two consonants and two vowels in the following order: VCVC. The syllabic spelling in Figure 1i contains two types of syllables, V (**a**) and CV (**ha**, **wa**). In order to adapt such syllables to Maya words, which always end in consonants, it was necessary to insert at the end of the word an extra vowel, which was never pronounced. This extra vowel is written in parentheses in transcriptions of syllabic spellings of Maya words [e.g. **a-ha-w(a)**].

The principle of vowel insertion at the end of words was first demonstrated by Knorosov (54–59) in the 1950s. More recently, it has been shown that the pre-Columbian Maya employed two other principles of writing that are shared with logosyllabic scripts in other parts of the world: consonant insertion and consonant deletion (7). The first principle is exemplified in Figure 2i, where the prepositional phrase *ti caanal* ‘above’ is written as **ti caan-(n)a-l(u)**. An extra consonant, /n/, has been inserted after the logogram **caan** so that the *-al* suffix can be spelled syllabically as **na-l(u)**.

An example of consonant deletion appears in Figure 1j, where we find the symbolic or geometric variant of the *ahaw* glyph. It can be read as *ta-ahaw-le*, which is an abbreviation of the prepositional phrase *ta-ahaw-lel* ‘in rulership’ or ‘in office.’ The suffix *-lel* derives the abstract noun *ahaw-lel* (literally, ‘rulership, lordship’) from the common noun *ahaw* ‘ruler, lord.’ Figure 1k illustrates the full logosyllabic spelling of *ta ahaw-lel* as **ta ahaw-le-l(e)**. It

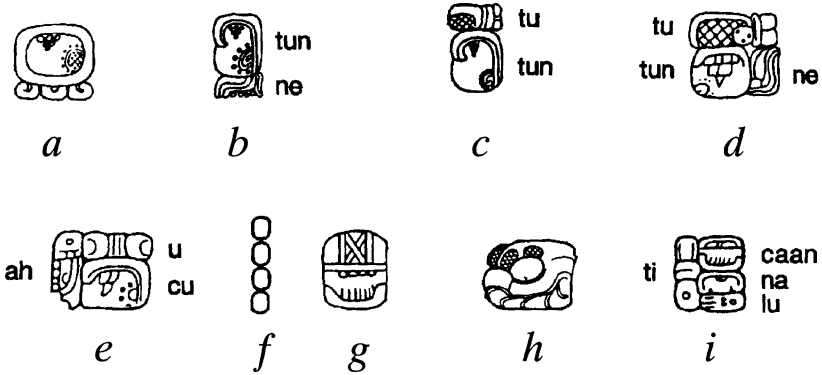


Figure 2 Polyvalence and homonymy. (a) *cawac* (Piedras Negras, Stela 12, A16b); (b) *tun* '360-day year' (Quirigua, Stela E, C11); (c) *tun* '360-day year' (Piedras Negras, Throne 1, L); (d) *tun* '360-day year' (Yula, Lintel 1, B2); (e) *ah-uc* 'Mr. Uc' [Yaxchilan, Lintel 42, G3 (32:93)]; (f) *can* '4'; (g) *caan* 'sky' (Copan, Stela Q, E4); (h) *can* 'snake, serpent' [Machaquila Structure 4, stone F (Figure 39 in Reference 29)]; (i) *ti caanal* 'in the sky' [Yaxchilan, Lintel 1, F1 (34:13)]. [(a–d, g) From *Maya Hieroglyphic Writing: An Introduction*, by J. Eric S. Thompson. Figure 4, Glyph 22; Figure 10, Glyph 38; Figure 31, Glyph 64; Figure 32, Glyph 30; Figure 33, Glyph 31. New edition copyright © 1960, 1971 by the University of Oklahoma Press.]

invokes the principle of vowel insertion, adding an extra vowel at the end of the expression so that the *-lel* suffix can be spelled with two syllabic signs.

It should be clear from these examples that reliance on open syllables of the form CV for writing a language in which words typically ended in consonants meant that in spelling a word syllabically, scribes had only two options at their disposal: They could insert an extra vowel at the end of the word (Figure 1k), or they could abbreviate the word by dropping the final consonant (Figure 1j). There are many more examples of vowel insertion than of consonant deletion in the Maya script, suggesting that the former was the preferred option. A recent inventory of known syllabic signs that also can function as phonetic complements appears in Coe (22:280–81).

Another characteristic of Maya writing is that some signs are polyvalent (i.e. they can have more than one reading) (27). For example, the so-called Cawac glyph has three very different readings: **cawac**, **tun**, and **cu**. The first reading comes from its use as a day sign, which is signaled by the cartouche and pedestal in Figure 2a (Cawac was the nineteenth day in the Maya twenty-day week). The second reading is implied by the phonetic complements, **tu** and **ne**, in Figure 2b–d. The same sign has the phonetic value **cu** in the syllabic spelling of *ah-uc* 'Mr. Uc' as **ah-u-c(u)** in Figure 2e. This means that a single sign can have as many as two logographic readings and one syllabic reading.

The converse is also true, namely that a single reading can be represented by several iconographically different signs. The script contains three signs for **can** that are shown in Figure 2*f-h*. The first is an ideogram representing the numeral four (four dots), which was *can* in Classical Yucatec. The second is the logogram for *caan* ‘sky.’ The third represents the head of a serpent, which was *can* in Classical Yucatec. Houston (41) has provided evidence of the use of each of these signs for representing a fourth word with a similar pronunciation, *can* ‘captive.’ These examples demonstrate not only the use of several different logograms for representing a single word but also the use of a rebus principle that greatly extends the utility of such signs in the Maya script.

In summary, Maya writing is structurally similar to many Old World logosyllabic scripts, including the use of semantic determinatives, vowel insertion, consonant insertion, consonant deletion, polyvalence, phonetic complementation, and rebuses. Most of the discoveries leading to our present understanding of the nature of Maya writing were based on Knorosov’s original insight that the script had a significant syllabic component.

### *The Grammar of Maya Writing*

The Maya script contains evidence of many of the grammatical rules that characterize the Cholan and Yucatecan languages. The major form classes are essentially the same: nouns, adjectives, transitive verbs, intransitive verbs, positional verbs, particles, and numerals.

Nouns occur in three morphological environments in Maya writing: (a) They may be inflected for possession with pronominal prefixes; (b) they may be quantified with numerical prefixes; or (c) they may appear with neither of these affixes, corresponding, in that guise, to the so-called absolute form of nouns in Maya languages. An example of an absolute noun, *te* ‘tree,’ appears in Figure 3*a*. Inflected nouns usually take one of the three allomorphs of the third-person possessive pronoun in hieroglyphic texts: *u-*, *uy-*, or *y-*. The first variant occurs with consonant-initial stems, e.g. *u-te* ‘his tree’ (Figure 3*b*). The other two variants are found with vowel-initial stems, e.g. *y-atan* ‘his wife’ and *y-al* ‘her child’ (Figures 8*a* and *b*). Figure 3*d* contains an example of a quantified noun: *waclahun-kin* ‘sixteen days.’

The best examples of adjectives in the script are color words such as *chac* ‘red’ and *yax* ‘green.’ The ceiba tree (*Ceiba pentandra* [L.] Gaertn.), which is known as *yax te* or *yax che* (literally, ‘green tree’) in the Cholan and Yucatecan languages, is mentioned occasionally in Maya hieroglyphic texts (Figure 3*c*).

In the script, as in the Cholan and Yucatecan languages, there are different inflectional paradigms for transitive, intransitive, and positional verbs. Transitive verbs are two-place predicates, requiring the specification of both subject and object, whereas the other two types of verbs can only be inflected for subject. Two kinds of tense/aspect inflection are represented in the script:

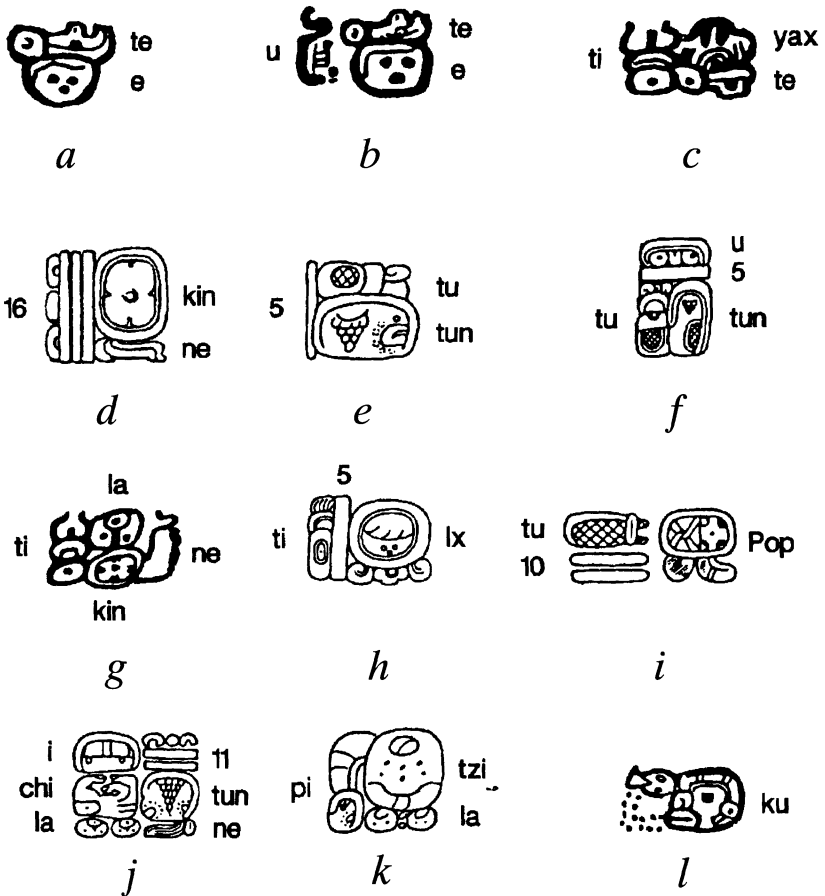


Figure 3 Nominal and adjectival glyphs. (a) *te* 'tree' [Madrid Codex, p. 42c (after 97:308)]; (b) *u-te* 'his tree' [Madrid Codex, p. 42c (after 97:308)]; (c) *ti yax-te* 'in the ceiba tree' [Madrid Codex, p. 67b (after 97:144)]; (d) *16-kin* '16 days' [Palenque, Foliated Tablet, D17 (Figure 153 in Reference 85)]; (e) *5-tun* '5 [360-day] years' (Copan, Temple 11, north door, west panel); (f) *u-5-tun* 'the fifth [360-day] year' [Piedras Negras, Stela 3, F4-E5 (Figure 12 in Reference 69)]; (g) *ti lak-in* 'in the east' [Dresden Codex, p. 30c (after 97:70)]; (h) *ti-5-ix* 'on 5 Ix' [Yaxchilan, Lintel 46, B2 (32:101)]; (i) *tu-10-pop* 'on the tenth of Pop' (Yula, Lintel 2, G2-H2); (j) *ich'il 11-tun* 'in [the] eleventh [360-day] year' (Chichen Itza, Monjas, Lintel 4A, D1); (k) *pitzil* 'ballgame' (after Figure 34a in Reference 89); (l) *ku* 'god' [Madrid Codex, p. 82c (after 97:388)]. [(e, i, j) After *Maya Hieroglyphic Writing: An Introduction*, by J. Eric S. Thompson. Figure 33, Glyph 29; Figure 38, Glyph 6; Figure 39, Glyph 4. New edition copyright © 1960, 1971 by the University of Oklahoma Press.]

perfective and imperfective. Perfective verbs refer to completed action as a whole; imperfective verbs refer to some part of an ongoing action in the present, past, or future, either its beginning, middle, or end. Because the

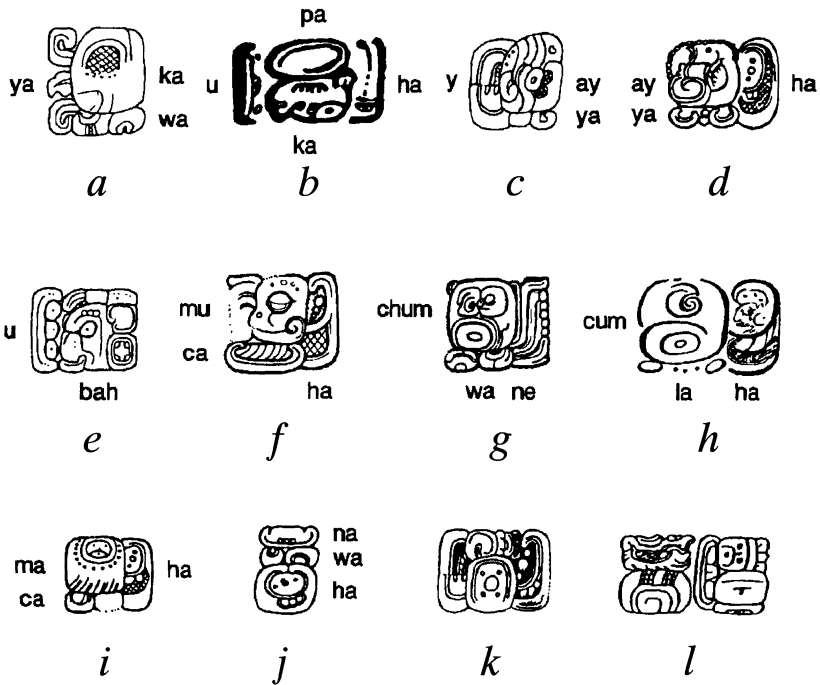


Figure 4 Verbal glyphs. (a) *y-ak-aw-θ* 'he was offering it' [Palenque, Temple of Inscriptions, middle panel, C8 (83)]; (b) *u-pak-ah-θ* 'he planted it' [Dresden Codex, p. 15b (after 97:40)]; (c) *y-ay* 'he was being born' [Palenque, Cross Tablet, E13 (Figure 9 in Reference 85)]; (d) *ay-ah-θ* 'he was born' [Piedras Negras, Stela 3, D6 (Figure 12 in Reference 69)]; (e) *u-bah* 'he was going' [Naranjo, Stela 30, A3 (31:79)]; (f) *muc-ah-θ* 'he was buried' [Dos Pilas, Stela 8, H14 (drawing by Ian Graham)]; (g) *chum-wan-θ* 'he was seated' [Dos Pilas, Stela 8, F14 (drawing by Ian Graham)]; (h) *cum-lah-θ* 'he was seated' [Palenque, Tablet of 96 Glyphs, D5 (Figure 264 in Reference 85)]; (i) *mac-ah-θ* 'she was betrothed' [Piedras Negras, Stela 1, F2 (drawing by John Montgomery)]; (j) *naw-ah-θ* 'she was married' [Piedras Negras, Stela 3, D2b (Figure 12 in Reference 69)]; (k) "death" [Palenque, Palace Tablet, N7 (Figure 8 in Reference 71)]; (l) "death" [Yaxchilan, Stela 12, B2 (drawing by Linda Schele)].

inscriptions are largely historical in nature, the past is usually the temporal referent of both kinds of verbs.

The only indisputable examples of transitive verbs in the script are inflected with third-person singular subjects (*u-*, *uy-*, *y-*) and objects (*-θ*),<sup>3</sup> and they are marked with *-Vw<sup>4</sup>* (imperfective) and *-ah* (perfective) suffixes. The verb *y-ak-*

<sup>3</sup> Linguists use the symbol *-θ* to mean that the pronoun is a zero form; that is, it is not expressed, even though we assume its presence.

<sup>4</sup> *V* represents a vowel.



*aw-Ø* ‘he was offering it’ (<*ak* ‘to give, offer’) is transitive and imperfective (Figure 4a). It contrasts in tense/aspect with *u-pak-ah-Ø* ‘he planted it’ (<*pak* ‘to plant, sow’), which is perfective (Figure 4b).

The morphology of intransitive verbs is more complicated because the script has a “split-ergative” type of pronominal inflection, which it shares with the Cholan and Yucatecan languages. Imperfective intransitives take the same subject prefixes as transitives (*u-*, *uy-*, and *y-*) and have no suffix. However, the subjects of perfective intransitives are identified with the objects of transitive verbs, which are suffixed, not prefixed, to the verb. Perfective intransitives are marked by *-ah* (the same suffix that occurs with perfective transitives).

Only two root intransitives have been positively identified in the Maya script. One is *bah* ‘to go,’ which is inflected for imperfective tense/aspect as *u-bah* ‘he was going’ (Figure 4e). The other is the verb meaning ‘to be born,’ which I read as *ay*. The stems of this verb are *y-ay* ‘he was being born’ (imperfective) and *ay-ah-Ø* ‘he was born’ (perfective) (Figures 4c and d). Derived intransitives, particularly passives derived from active transitive stems, are much better documented; they are usually perfective, e.g. *muc-ah-Ø* ‘he was buried’ (<*muc* ‘to bury’) (Figure 4f).

The monumental inscriptions contain numerous examples of the positional verb meaning ‘to sit’ (Figures 4g and h). Ringle (80) has deciphered the main sign in such collocations as Cholan *chum* (which is cognate with Yucatecan *cum*), and the positional suffixes with which it is associated were first identified by MacLeod (68). The perfective suffix of positional verbs is *-wan* in several Cholan languages; it is spelled syllabically as **wa-n(e)** in Figure 4g. The Yucatecan counterpart of this suffix is *-lah*, which is spelled syllabically as **la-h(a)** in Figure 4h.

The particle-form class is most clearly represented by the preposition *ta* (Cholan) or *ti* (Yucatecan), which has a number of different meanings: ‘to, at, in, from, for, on.’ It is sometimes prefixed to *tzolkin* dates, where it has the meaning ‘on,’ as in *ti-ho-ix* ‘on 5 Ix’ [Ix is the fourteenth day of the Maya week (Figure 3h)]. It also appears in accession contexts, such as *chum-wan ta-ahaw-lel* ‘he was seated in rulership’ (Figure 5a), as well as in directional collocations, such as *ti-lakin* ‘in the east’ (Figure 3g) and *ti-yax-te* ‘in the ceiba tree’ (Figure 3c), where it must be glossed as ‘in.’ When *ta* or *ti* are prefixed to the third-person pronoun *u-*, the result is the contracted form, *tu-* [as in *tu-la-hun-pop* ‘on the tenth of Pop’ (Figure 3i)], which also occurs in the Cholan and Yucatecan languages. The preposition *ichil* ‘in, within’ is another particle that appears in the Maya script. It is spelled syllabically as **i-chi-l(a)** in Figure 3j.

Numerals are ubiquitous in Maya writing because of the calendrical framework that structures virtually all hieroglyphic texts. Both cardinal and ordinal numbers can be found in the script. The latter are derived from the former by prefixing one of the variants of the third-person pronoun, *u-*, *uy-*, or *y-*, to the

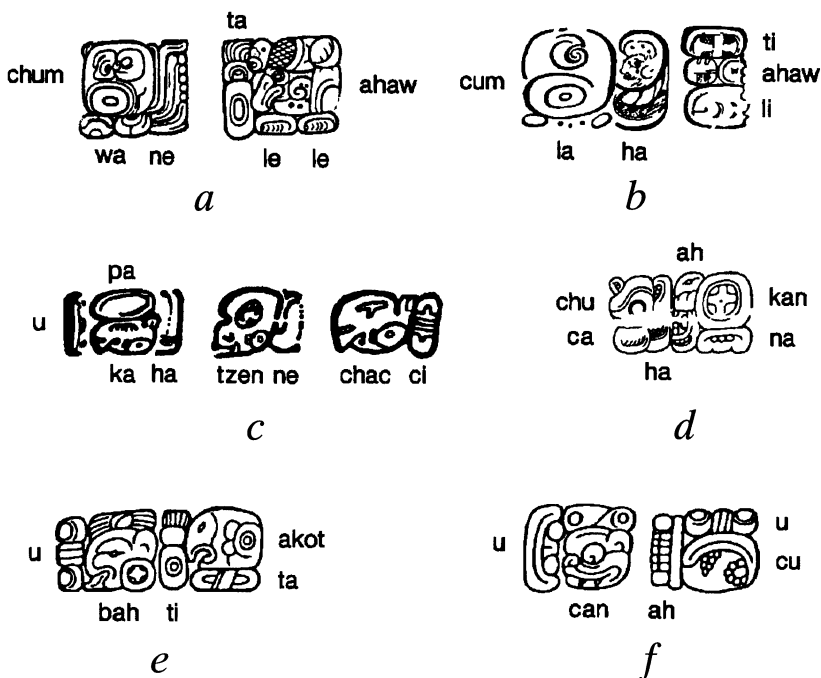


Figure 5 Syntactic constructions. (a) *chumwan ta ahaulil* ‘he was seated in office’ [Dos Pilas, Stela 8, F14-G14 (drawing by Ian Graham)]; (b) *cumlah ti ahaulil* ‘he was seated in office’ [Palenque, Tablet of 96 Glyphs, D5-C6a (Figure 264 in Reference 85)]; (c) *u-pakah tzen chac* ‘the rain god planted food’ [Dresden Codex, p. 15b (after 97:40)]; (d) *chucah ah-kan* ‘Mr. Kan was captured’ [Yaxchilan, Lintel 46, F3-G3 (32:101)]; (e) *u-bah ti akot* ‘he was going to dance’ [Yaxchilan, Lintel 2, F-G (34:15)]; (f) *u-can ah-uc* ‘the captor of Mr. Uc’ [Yaxchilan, Lintel 2, O1-O2 (34:15)].

number. For example, *ho-tun* is a cardinal expression that refers to five periods of 360 days (Figure 3e), whereas *u-ho-tun* is the ordinal form of this expression, signaling the fifth period of 360 days (Figure 3f). Other examples of cardinal and ordinal numbers appear in Figures 3d, i, and j.

The basic word order of Maya writing is verb-object-subject in transitive clauses and verb-subject in intransitive and positional clauses. The transitive clause in Figure 5c begins with the perfective verb *u-pak-ah-0* ‘he planted it,’ followed by the nominal direct object *tzen* ‘food,’ which is followed in turn by the nominal subject *chac*, the name of the Maya rain god. It can be translated as ‘the rain god planted food.’ Intransitive clauses are illustrated by Figure 5d, where the verb is *chuc-ah-0* ‘he was captured,’ and the nominal subject refers to a man (*ah-kan* ‘Mr. Kan’) who was captured in a raid. There are also a few examples of complement constructions with *u-bah* ‘he was going’ as the main

verb, followed by a preposition (*ta* or *ti*) and an uninflected verbal complement (45). In Figure 5e the complement is *akot* ‘to dance’ (37).

In possessive constructions, the noun referring to the possessor follows the noun representing the object possessed; the former takes one of the allomorphs of the third-person pronominal prefix [e.g. *u-can ah-uc* ‘the captor of Mr. Uc’ (Figure 5f)]. The same is true of possessive constructions in the Cholan and Yucatecan languages.

Finally, some progress has been made in identifying discourse features in the script, including aspectual sequencing (6:174–78) and foregrounding and backgrounding (44). There is also some evidence of the use of syntactic couplets in Maya writing (10).

### *The Content of Maya Writing*

Berlin (1) and Proskouriakoff (75) established the foundations for our present understanding of the content of monumental inscriptions at sites all over the Maya lowlands (see also 17, 19, 20, 23, 24, 42, 52, 61–63, 66, 70, 71, 76–79, 86, 87, 93). The inscriptions are concerned primarily with dynastic history, referring to significant events in the lives of rulers and members of their families (e.g. when they were born, when they married, when they took office, when they went to war, and anniversaries of their accessions to office).

The glyphs for birth, death, accession, betrothal, and marriage have been identified and in some cases deciphered phonetically. Of the two accession verbs that have been recognized (3, 75), one has known counterparts in two of the Maya languages that were spoken in the region at the time of the Spanish Conquest (16, 80). The verb is *chum* in Classical Chontal and *cum* in Classical Yucatec, which means ‘to sit.’ Examples of accession expressions based on this verb appear in Figure 5. *chum-wan-0 ta ahawlel* (Figure 5a) meant ‘he was seated in rulership’ in Classical Chontal, whereas *cum-lah-0 ti ahawlel* (Figure 5b) had the same meaning in Classical Yucatec. The verbs for “betrothal” and “marriage” have been deciphered as *mac* (Figure 4i) and *naw* (Figure 4j), respectively (6:156–158). They are both inflected with the perfective suffix *-ah* and can be translated as ‘he/she was betrothed’ (*mac-ah-0*) and ‘he/she was married’ (*naw-ah-0*). There is less agreement about how the glyph for birth (Figures 4c and d) should be read. The alternatives that have been proposed are *ay* (6:150–51) and *sih* (22:266; 47). Neither of the two expressions for death that have been recognized in the inscriptions (Figures 4k and l) has been deciphered phonetically.

There is now very good evidence that warfare loomed large in the minds of Maya rulers and their chroniclers. A possible glyph for war has been identified, which consists of the glyph for Venus above glyphs representing a shell, the earth, or the name of a site (77; see Figure 6a–c). The glyphs for capture, captive, and captor were identified by Proskouriakoff in 1960 (75). They were

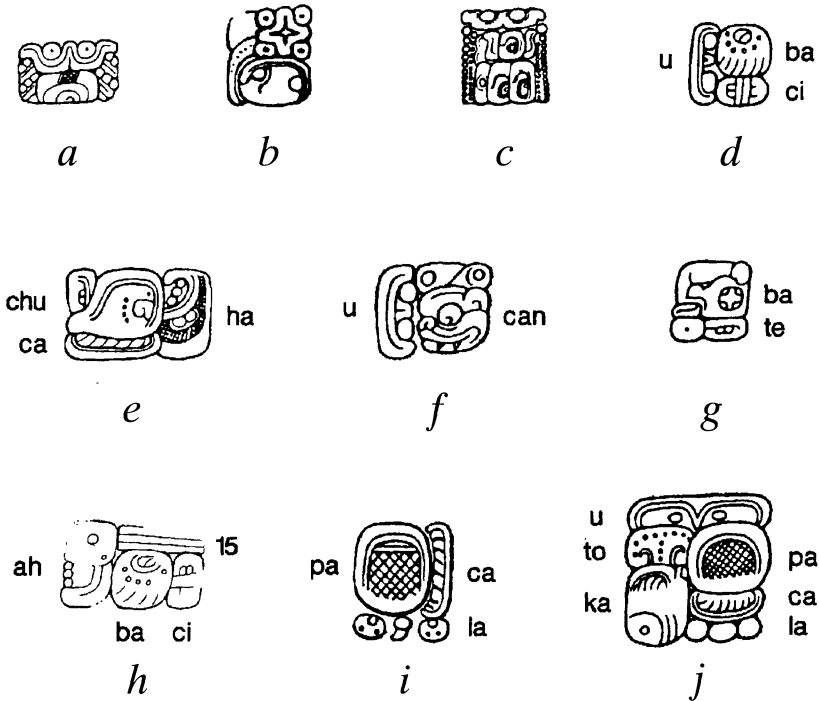


Figure 6 Glyphs related to warfare. (a) “Venus over shell” [Yaxchilan, Lintel 41, A2 (32:91)]; (b) “Venus over earth” [Piedras Negras, Stela 12, D1 (drawing by John Montgomery)]; (c) “Venus over Seibal” [Dos Pilas, Stela 16, C1 (Figure 7 in Reference 29)]; (d) *u-bac* ‘his captive’ [Yaxchilan, Lintel 41, C3 (32:91)]; (e) *chuc-cah-0* ‘he was captured’ [Yaxchilan, Structure 44, southeast doorway, upper step, C1b (33:166)]; (f) *u-can* ‘his captor’ [Yaxchilan, Lintel 2, O1 (34:15)]; (g) *bate* ‘warrior’ [Yaxchilan, Hieroglyphic Stairway 2, step VIII, G3 (33:162)]; (h) *ah-15-bac* ‘he of 15 captives’ [Yaxchilan, Hieroglyphic Stairway 5, 85 (33:179)]; (i) *pacal* ‘shield’ [Palenque, House C, eaves (72)]; (j) *u-tok-pacal* ‘his flint shield’ [Yaxchilan, Lintel 46, F8 (32:101)].

later deciphered as *chuc-ah-0* ‘he was captured,’ *u-bac* ‘his captive,’ and *u-can* ‘his captor’ by Fox & Justeson (27) and Houston (41) (Figures 6d–f). More recently, Closs (18) has identified and deciphered the glyph for warrior [*bate* (Figure 6g)], and Stuart (87) has shown that rulers often recorded the number of important captives they had taken in their appellative phrases [e.g. *ah-hola-hun bac* ‘he of 15 captives’ (Figure 6h)]. Other terms related to warfare include *pacal* ‘shield’ (53) and *tok pacal* ‘flint shield’ (40) (Figures 6i and j).

The script contains other titles that are not related explicitly to warfare, including *ahaw* ‘lord, ruler’ (Figure 1), which has already been discussed at length above, *cahal* [or, perhaps, *sahal* (38)] ‘ruler of a minor settlement’

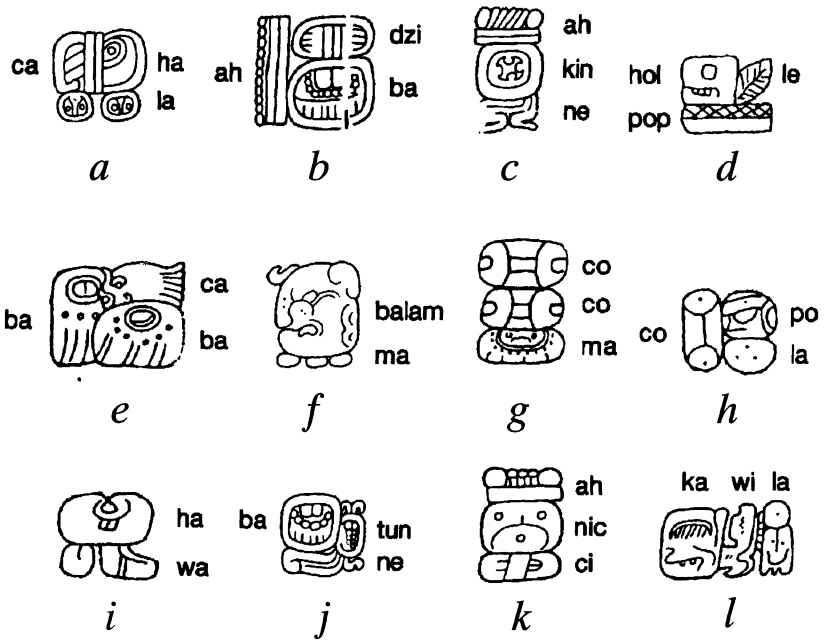


Figure 7 Titles and lineage names. (a) *cahal* 'subordinate ruler' [Xcalumkin, Miscellaneous 5, J (35:197)]; (b) *ah-dzib* 'scribe' [Xcalumkin, Miscellaneous 5, X (35:197)]; (c) *ah-kin* 'priest' [Xcalumkin, Panel 4, A1 (35:182)]; (d) *hol-pop* 'lineage head' [Chichen Itza, House of 3 Lintels, Lintel 1, I2 (Figure 3 in Reference 60)]; (e) *bacab* 'skybearer' [Yaxchilan, Lintel 2, Q (34:15)]; (f) *balam* 'jaguar' [Yaxchilan, Lintel 30, G2 (32:69)]; (g) *Cocom* [Chichen Itza, Akab Dzib Lintel, front, E2 (Figure 12a in Reference 39)]; (h) *Copol* [Chichen Itza, House of 4 Lintels, Lintel 2, F7a (Figure 5 in Reference 60)]; (i) *Haw* [Chichen Itza, House of 4 Lintels, Lintel 4, G8b (Figure 7 in Reference 60)]; (j) *Batun* [Xcalumkin, Miscellaneous 5, F (35:197)]; (k) *ah-nic* 'Mr. Nic' [Yaxchilan, Lintel 27, H1b (34:59)]; (l) *Kawil* [Chichen Itza, Monjas, Lintel 2A, B2 (30:269)].

(Figure 7a), *hol pop* 'lineage head' (Figure 7d), *ah dzib* 'scribe' (Figure 7b), *ah kin* 'priest' (Figure 7c), and *bacab* 'sky bearer' (Figure 7e) (82, 89). To these decipherments may be added a growing list of lineage names, including several that are still in use today in the Maya area [e.g. Balam, Batun, Cocom, Cupul (spelled as *copol* in Figure 7h), Haw, Kawil, Nic, and Uc (39, 82; cf Figures 2e and 7f–l)].

Several kinship terms have been identified in the script. The distinction between "child of a man" and "child of a woman" that is found in all Maya languages is documented in the inscriptions. There are separate glyphs for these terms, but only the one for "her child" (*y-al*) can be read phonetically (6:106; see Figure 8b). The lowland terms for "older brother" (*sucun*) and

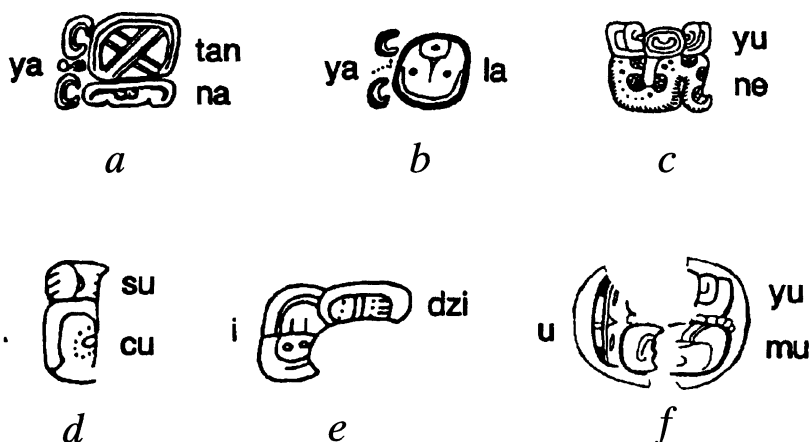


Figure 8 Kinship terms. (a) *y-atan* ‘his wife’ [Piedras Negras, Stela 8, A4 (2)]; (b) *y-al* ‘her child’ [Naranjo, Initial Series pot, B’ (21)]; (c) *y-unen* ‘his or her child’ [Tikal, Stela 31, A3 (Figure 1a in Reference 88)]; (d) *sucun* ‘older brother’ [Palenque, Palace Tablet, L7 (84)]; (e) *idzin* ‘younger brother’ [Collection, QP-D, D2 (drawing by Ian Graham)]; (f) *u-yum* ‘his father’ [Rio Azul pot, L (Figure 2 in Reference 90)].

“younger brother” (*idzin*) show up in abbreviated form as *sucu* and *idzi*, employing the principle of consonant deletion described above (91; see Figures 8d and e). The collocation for “his wife” (*y-atan*) appears in the inscriptions of several sites (6:68; see Figure 8a), as well as in the Dresden Codex, but there is no evidence to date of a collocation for “her husband.” There is also evidence of the term *unen*, which can be used by either a man or a woman in referring to offspring of either sex (88; spelled as *y-une* ‘his or her child’ in Figure 8c). The glyph for “father” (*yum*) has also been identified (91; see Figure 8f). The lowland Maya word for mother is *na*, and several glyphs have this reading but not necessarily with this meaning.

Progress has also been made in deciphering glyphs that refer to gods, rituals, and offerings. Ringle (81) has demonstrated that the glyph shown in Figure 3l was read as *ku* (Yucatecan) or *chu* (Cholan) ‘god.’ Three glyphs for ritual behavior have been recognized in Maya writing: *bah* ‘to perforate’ (as in tongue perforation), *akotah* ‘to dance’ (Figure 5e), and *pitzil* ‘ball game’ (Figure 3k) (6:136–38; 37; 89:24–25). In addition, the glyphs for a number of ritual offerings have been deciphered during the past decade, including the names for two kinds of incense (*ch’ahte* and *pom*); chocolate (*cacaw*); and five kinds of porridge containing a mixture of corn dough and animal parts (*cutz-wah* ‘turkey porridge,’ *mac-wah* ‘turtle porridge,’ *huh-wah* ‘iguana porridge,’

*cay-wah* ‘fish porridge,’ and *ah-ceh-wah* ‘deerslayer porridge’), two of which are still used as offerings in the rituals of the Yucatecan Maya (8, 67, 90).

Apart from individual decipherments, there have been some more general discoveries that are expanding our understanding of the content of Maya inscriptions. Significant progress has been made in deciphering the bands of hieroglyphs that appear on the rims of ceramic vessels, which are now known to contain references to the scribes who painted or carved the texts on the pots, the offerings for which they served as containers (e.g. chocolate), and the term for the vessel (e.g. *lac* ‘plate’) (36, 43, 90). A more recent breakthrough has come in the identification of toponymic glyphs that are both structurally and functionally different from the place signs known as “emblem glyphs.” The former seem to refer to specific geographic locations within the boundaries of ancient Maya cities, whereas the latter apparently are associated with entire polities rather than to places within them (92).

### *Astronomical Records*

It has long been known that the pre-Columbian Maya were accomplished astronomers who produced tables for predicting solar and lunar eclipses and the stations of Venus and Mars (26, 98). These tables appear in a screenfold book known as the Dresden Codex. The eclipse table was recognized because it refers to groups of five and six lunations that correspond to intervals separating successive eclipse seasons. Three of the intervals mentioned in the Venus table (8, 584, and 2920 days) refer to significant periods associated with the movements of that planet: (a) the eight days when Venus is invisible at inferior conjunction, (b) the length of its synodical period (583.92 days), and (c) the period of time necessary for commensurating the Venus calendar with the Maya solar calendar (5 Venus years of 584 days = 8 solar years of 365 days = 2920 days). The Mars table contains three significant numbers also: 78, 352, and 780 days. The first is an approximation of the length of time the planet undergoes retrograde motion (75 days). The second corresponds to the interval between conjunction and stationary (353.12 days). And the third is very close to the length of the synodical period of Mars (779.94).

Although the astronomical structure of these tables was elucidated many years ago, it was much more difficult to demonstrate how they might have functioned in real time. The first breakthrough came in 1982, when Lounsbury (65) demonstrated how calendrical information in the introduction to the Venus table could have been used for calculating an entry date that made sense in terms of the Western calendar. Shortly thereafter, H Bricker (4) discovered the underlying structure of the eclipse table, thus resolving the problem of how it could have been used for predicting solar and lunar eclipses during the second half of the eighth century A.D., and subsequently he and I (12) discovered an effective entry date for the Mars table using a model similar to Lounsbury’s for

the Venus table. All three solutions support the constant for correlating the Maya and Western calendars that is most widely accepted by scholars because it has the closest fit with correlational statements in Maya and Spanish sources dating from the early years of the Colonial period in northern Yucatan. That constant, 584,283, equates the beginning of the current Maya era with August 11, 3114 B.C. (in the Gregorian calendar).

More recent advances in determining the extent of ancient Maya astronomical knowledge and its uses include the analysis of a table of solstices and equinoxes in the Dresden Codex (13), the identification of the constellations in the Maya zodiac (5), and the dating of almanacs containing astronomical references in three of the four surviving Maya codices (14). The pre-Columbian Maya were interested in commensurating different astronomical events, such as eclipse seasons, the stations of Mars and Venus, and solstices and equinoxes, with each other and also with religious festivals, such as the Maya New Year, and important agricultural activities, such as the planting of maize (11, 13).

The planet Venus has also figured in recent research on astronomical records in the monumental inscriptions. Again, Lounsbury (64) led the way by identifying several glyphs that referred to Venus and by demonstrating that the planet was at or near one of its stations on the dates with which the glyphs were associated. Almost simultaneously, Riese (77) discovered that the hieroglyphic collocations in which the glyph for Venus was superfixed to glyphs representing a shell, the earth, or the name of a Maya city co-occurred with dates on which raids or battles had taken place (Figures 6a–c). In the meantime, it has been shown that the ancient Maya preferred to go to war on dates when Venus was visible either as a morning or an evening star (74), thereby justifying the appellation of “star wars” for Maya warfare.

### *The Transition to Alphabetic Literacy*

After the Spaniards conquered the Yucatan peninsula in 1545, the Maya quickly adopted the Latin-based alphabet that had been developed by Spanish priests. The earliest known Maya document in the new script bears a date of August 15, 1557, only twelve years after the conquest had been completed. However, the shift to alphabetic literacy did not mean that the old rules of writing were abandoned completely. Some hieroglyphic principles of writing continued to influence the use of the alphabet by Maya scribes for some time after its adoption.

The simplest examples of the carryover of pre-Columbian conventions of writing in Colonial texts involve a logogram representing the day Ahaw combined with an Arabic numeral. For example, in Figure 11 the glyph for Ahaw has been transformed into a European head with a beard and a crown, indicating, without a doubt, that the word *ahaw* was synonymous with Spanish *rey*



‘king.’ The coefficient “3” appears to the left of the Ahaw logogram, where it has replaced the three dots of the traditional system (compare Figure 1*l* with 1*f*).

Rebuses represent another continuity in the transition from hieroglyphic to alphabetic writing. Two examples of this usage appear on page 15 of the *Book of Chilam Balam of Chumayel* (28). In one example, *ho*, the name for the city of Merida, was represented by the Arabic numeral “5” because *ho* is also the word for this numeral in Maya. In the other example, the word *can*, meaning ‘four,’ was written as *2n* because *ca* is the word for the numeral “2” in Maya, and *ca + n = can* (25).

There is also some evidence of the use of alphabetic letters as syllables in Colonial Maya writing (7). For example, the word *ayikal* ‘rich, wealthy’ is written as *āy.k.l.* on page 2 of the *Book of Chilam Balam of Chan Kan* (15). The tilde (˜) and periods (.) imply that the word is being spelled syllabically as *a-yi-ka-l(V)*, with the consonants *y*, *k*, and *l* representing the syllables *yi*, *ka*, and *l(V)*, respectively. Elsewhere on the same page, *yahalcab* ‘dawn’ is spelled *y.h.l.cab*, with the periods separating the first three consonants indicating the boundaries of the syllables, *ya-ha-l(V)*. This kind of spelling resembles logosyllabic expressions in the pre-Columbian script, where one part of a word is represented as a logogram (*cab*) and the other part by a sequence of syllables (*ya*, *ha*, and *l(V)*) (cf Figure 2*i*).

In syncretizing hieroglyphic with alphabetic principles of writing, the Colonial Maya scribe may have been inspired by the Spanish abbreviation convention involving a principle of vowel deletion, for example, reducing *merced* to *mrd* and the surname *Ramírez* to *Rm̃z*. He may have inferred from this practice that consonantal letters could be used as CV syllables. He may also have been influenced by the names used by Spaniards in referring to the consonantal letters of their alphabet, which have a syllabic structure (e.g. *be* for /b/, *se* for /c/, *e-le* for /l/). However, Spanish scribes did not use tildes and periods to separate the consonantal letters in their abbreviations. Therefore, this type of notation represents a genuine Maya innovation that facilitated the continuation of syllabic principles of writing even after the hieroglyphic script had gone out of use.

### *Conclusion*

The years between 1950 and 1980 can be characterized as the period when two controversial issues, the nature of Maya writing and the subject matter of the monumental inscriptions, were finally resolved. Once a consensus had been reached that the script was logosyllabic in structure and the monumental texts were largely historical in content, progress could be made in phonetic decipherment and the grammar of hieroglyphic texts. By 1992 much of the syllabic grid had been documented (22:280–81), spelling variations had been identified

(7), and the rules for inflecting nouns and verbs in hieroglyphic texts had been worked out (9). At the same time, the lexicon of deciphered words had expanded rapidly in size and in the variety of cultural domains. Thus the years following 1980 represent the beginning of the period of maturity for Maya epigraphy and a time when a substantial number of hieroglyphs were deciphered.

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