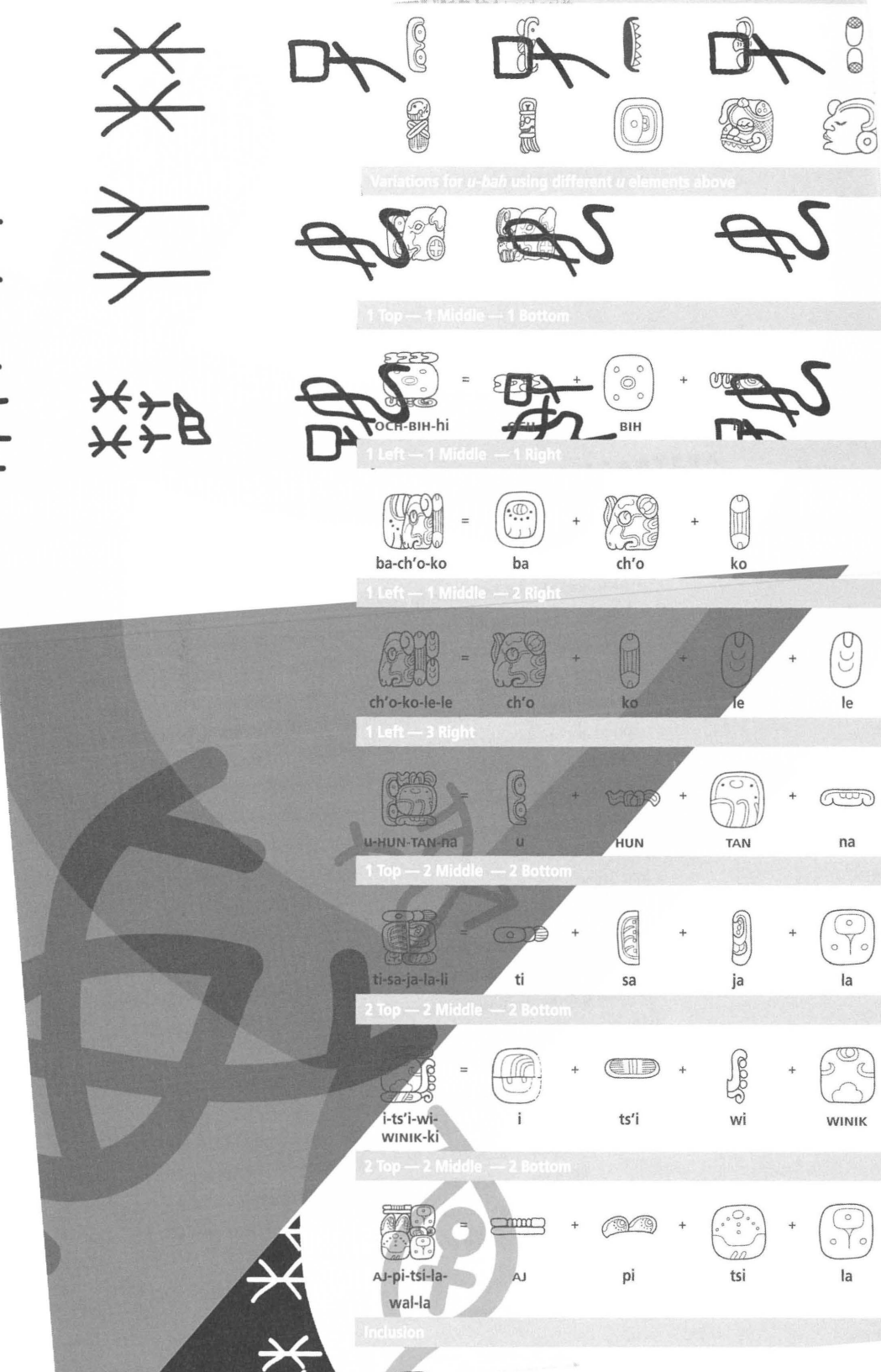
Variations for u-bah using different u elements above
1 Top — 1 Middle — 1 Bottom
OCH-BIH-hi
BIH
1 Left — 1 Middle — 1 Right
ba-ch'o-ko
ba
ch'o
ko
1 Left — 1 Middle — 2 Right
ch'o-ko-le-le
ch'o
ko
le
le
1 Left — 3 Right
u-HUN-TAN-na
u
HUN
TAN
na
1 Top — 2 Middle — 2 Bottom
ti-sa-ja-la-li
ti
sa
ja
la
2 Top — 2 Middle — 2 Bottom
i-ts'i-wi-WINIK-ki
i
ts'i
wi
WINIK
2 Top — 2 Middle — 2 Bottom
AJ-pi-tsi-la-wal-la
AJ
pi
tsi
la
Inclusion

A Comparison
of Maya and Oracle Bone Scripts

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ABSTRACT

Maya script and Oracle Bone script are described and compared in terms of relationship between glyph, sound and meaning, glyph composition and grapheme positioning. They are found to be similar in having graphemes that are pictographic and adaptable to different glyph compositions, having glyphs that are square shaped, belonging to the category of logo-syllabic scripts and having the textual device of double dots/dashes for repetition. They are different in that Oracle Bone script is more abstract and has a much higher number of glyphs, that grapheme shape and the relationship between glyph, sound and meaning is more standardized than in Maya script. Another difference is that there are many more cases in Maya where one glyph includes several words, and that Maya is closer to the syllabic end on the logo-syllabic continuum. It is suggested that these differences may be the result of differences in the conceptions of "self" (as suggested by Houston and Stuart), the languages, the degree of political centralization and the extent of public use of the scripts. It is also suggested that early writing systems may reflect how tightly morphemes are bound in the language, as the agglutinative nature of Maya language may have led to the Maya script's containing more multi-word glyphs. It is surmised that the literacy rate in the two societies may have been similar.

BIOGRAPHICAL NOTE

William Chiang is an assistant professor in the Department of Foreign Languages at National Taichung Institute of Technology, in Taichung, Taiwan, ROC. He did graduate work in the United States and his research is concerned with the relation between writing systems, language and culture.

The Oracle Bone script is a logo-syllabic writing system used in north China (*figure 1*) from middle to late Shang dynasty (approximately 1500 B.C. to 1000 B.C.). Most of the extant writing is carved on tortoise shells and ox scapulae for the purpose of divination. A question is asked in both positive and negative manners, such as "Will there be unlucky events in the next ten day period? Will there not be unlucky events in the next ten day period?" The answer is determined from cracks in the shell/scapulae caused by drilling and heating with further text written to indicate how things turned out. The text is usually written from top to bottom, with the positive question on one side and the negative question on the other (*figure 2*).[1]

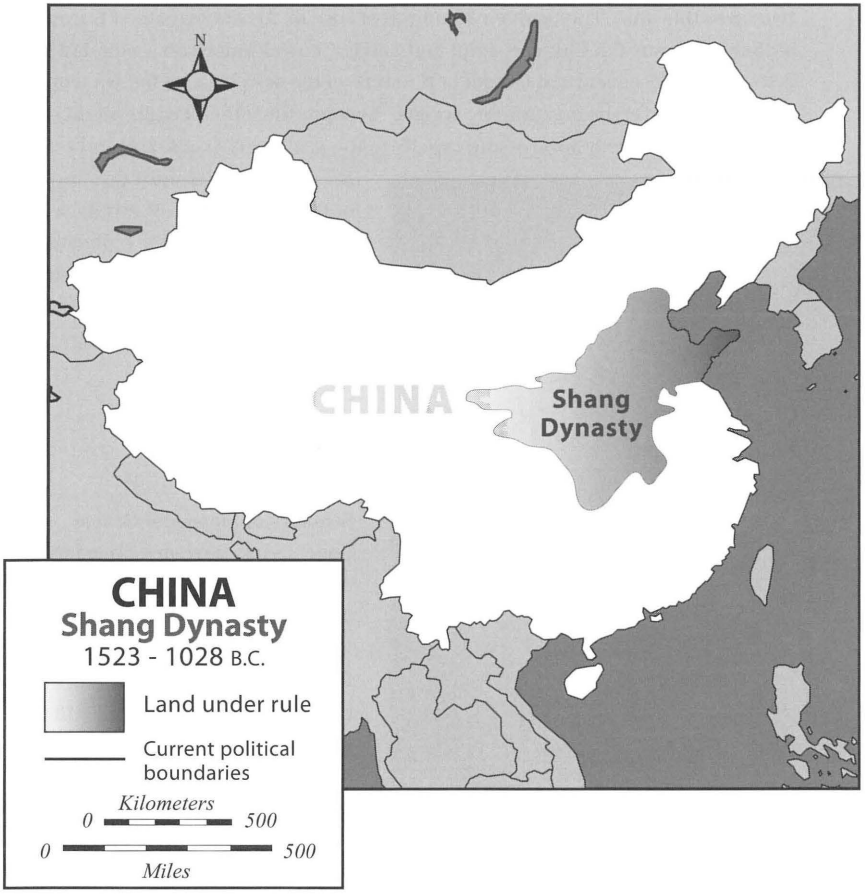


Figure 1 Map of the Shang area.[2]

The Maya script is a logo-syllabic writing system used in the Mayan area, encompassing present day southern Mexico, Honduras, Guatemala and Belize (*figure 3*) from the first century B.C. to the time of the Spanish Conquest in the 16th century. Most of the extant writing appears on ceramic vessels, stone stelae, building surfaces and bark paper codices. Its function seems to be naming the owners/donors of objects involved in ritual practices such as feasting, captive taking, building dedication[4] and in the case of codices, recording calendrical and religious information for divination purposes. Maya texts from the Classical period of 250 A.D. to 900 A.D. usually run in columns of two, with the reading order of upper left, to upper right, to lower left, to lower right (*figure 4*).[5]

There are two reasons for comparing the Maya and the Oracle Bone scripts. First, there has been some mention of the similarity between Chinese and Maya writing systems[8] yet, as far as I know, no detailed comparison of the two up to this date. The Spanish Jesuit priest Jose de Acosta discussed European alphabets versus the Chinese script and native Central American script, but the discussion only concerned the general nature of the script, i.e., what we would term phonetic versus logographic scripts.[9] Second, since the decipherment of Maya script has been progressing rapidly in the past thirty years, and since it is considered the most developed of the Mesoamerican scripts, a possible candidate for independent script invention, such a comparison might throw some light on the development of early writing systems.

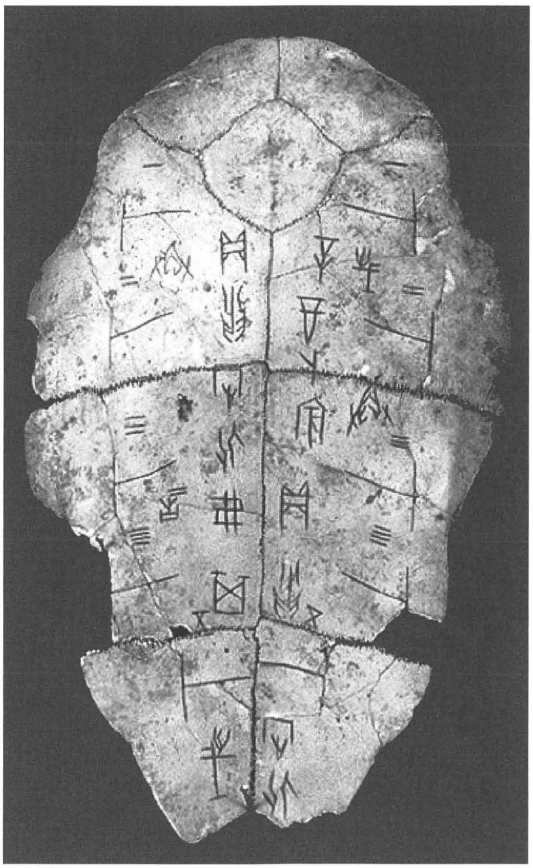


Figure 2 Tortoise shell with Oracle Bone script.[3]

A BRIEF NOTE ON TERMINOLOGY[10]

Scholars of Maya and Oracle Bone scripts have developed their own specialized vocabularies for describing the smaller units out of which whole texts were composed. In order to make comparison of these two scripts clearer, I will be using the following vocabulary to describe the units of both Maya and Oracle Bone texts. A "glyph" will refer to a roughly square-shaped unit of space into

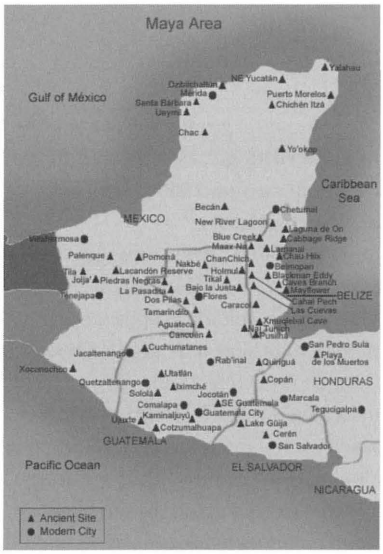


Figure 3 Map of the Mayan area.[6]

which the arrangement of one or more smaller units ("graphemes") is organized. These square glyphs are usually arranged in horizontal and vertical columns. The grid-of-square-glyphs nature of Maya inscriptions can be clearly seen in the inscription illustrated in figure 4. The linear lines of glyph units in Oracle Bone script can be seen in figure 2.

"Glyphs," in turn, are composed of one or more smaller units that I refer to as graphemes, of which there are two types: phonetic graphemes are those that make reference to a sound and assist in indicating how a glyph was pronounced; semantic graphemes are those that make reference to a semantic category and assist in indicating the meaning of the glyph. One glyph may correspond to one word or several words. If one word is represented by only one grapheme and that grapheme represents only one meaning, that grapheme is termed a logograph. If that grapheme can represent homonymous words, it is termed a phonetic grapheme.

As we will see below, Maya glyphs are composed of either a logograph or a single phonetic grapheme, or a logograph combined with one or more phonetic graphemes, or simply a combination of phonetic graphemes. Thus one way to write the Mayan word *balam* 'jaguar' would be to combine the **ba** syllable with the **BALAM** logograph to form the glyph (*see*

Figure 4 Unprovenienced panel of Maya script (possibly from La Corona, Guatemala) (drawing by David Stuart).[7]

Table 1 Maya Script

Table 2 Oracle Bone Script

Table 3 Relationship of glyph, sound, and meaning

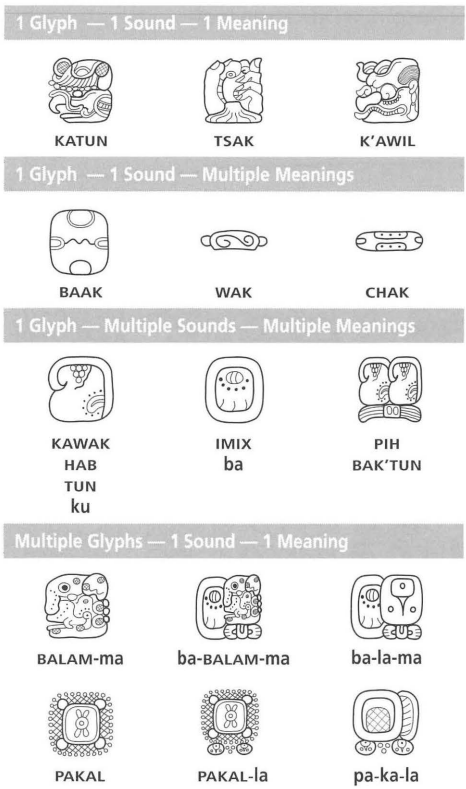


table 1).[11] Semantic graphemes were quite rare in Maya writing. It is estimated that Maya script has around 800 glyphs and around 200 graphemes.[12]

Oracle Bone glyphs were usually composed of either a logograph, or a phonetic and a semantic grapheme, or a combination of semantic graphemes. For example (*see table 2*), the glyph pronounced *gip* and meaning 'reach,' is composed of two semantic graphemes, one meaning 'person' and the other meaning 'hand.' Whereas the glyph pronounced *muar* and meaning 'younger sister,' is composed of the phonetic grapheme pronounced *miur* , and the semantic grapheme meaning 'woman.' It is estimated that Oracle Bone script has over 4,000 glyphs and 348 graphemes.[13]

The remainder of this paper will consider in more detail the relationship between glyph, sound and meaning, and how graphemes were combined into glyphs for Maya and Oracle Bone script respectively.

THE MAYA SCRIPT

As we pointed out, the Maya script has around 800 glyphs and 200 graphemes. Of the 90 possible syllables based on Cholan and Yucatecan Maya, glyphs and graphemes representing 71, or about 79%, have been deciphered. About 85% of all extant texts can be read.[14]

RELATIONSHIP OF GLYPH, SOUND, AND MEANING

Some logographs are structured with one glyph, one sound and one meaning; for

example, KATUN, a unit in the Maya calendar; TSAK 'conjure up'; KAWIL, name of a god (*see table 3 for this and following examples*).

One glyph, one sound with multiple meanings is a situation that arises mostly from sound borrowing, in other words, the Rebus principle. For example, BAAK (*baak* can mean both 'bone' and 'prisoner'), WAK (*wak* can mean both 'six' and 'raised'), CHAK (*chak* can mean both 'red' and 'great').

An example of one glyph – multiple sounds – multiple meanings is one glyph representing KAWAK (*Kawak* the name of a day sign in the Maya calendar), or HAB (*hab* 'year'), or TUN (*tun* '360-day cycle'), or **ku**, a phonetic grapheme can all be represented by the same glyph.[15] A second example is one glyph for the day sign IMIX or the phonetic grapheme **ba**. A third example is one glyph representing PIH (*pih* 'bundle') or BAK'TUN (*bak'tun* a unit in the Maya calendar).[16]

In the case of multiple glyphs – one sound – one meaning, Mayan words can be represented by a logograph, or a logograph plus one or more phonetic graphemes, or simply one or more phonetic graphemes. For example, the word *balam* 'jaguar' can be represented by the logograph BALAM representing the head of a jaguar for example or others: **ba**-BALAM, BALAM-**ma**, **ba**-BALAM-**ma**, **ba**-**la**-**ma**. Likewise the word *pakal* 'shield' can be represented by a logograph PAKAL representing a shield, by a logograph PAKAL plus the phonetic grapheme **la**, or simply the phonetic graphemes **pa**, **ka**, and **la**.

Table 4 Variant glyphs resulting from variant forms of a logograph or grapheme

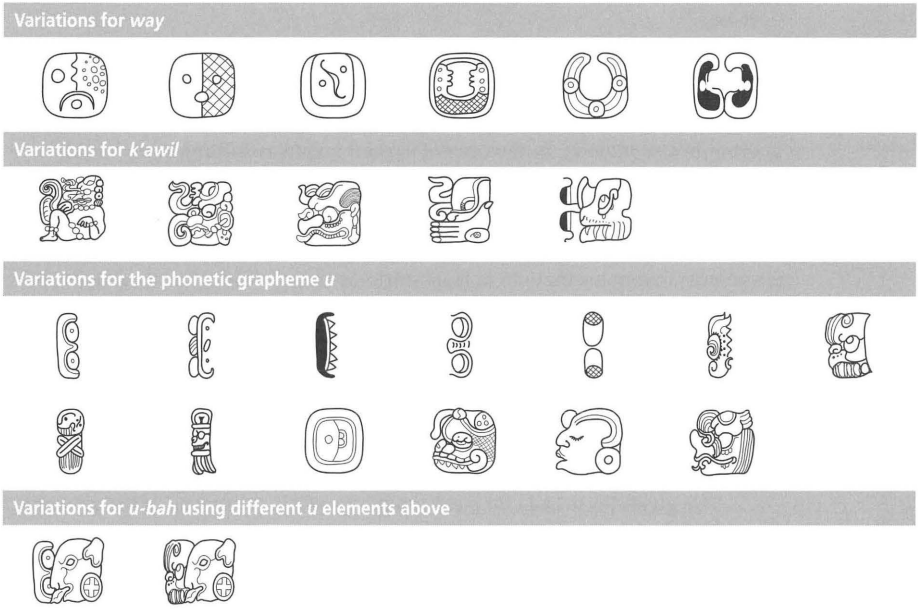


Table 5 Multiple words in one glyph

Another common way variant glyphs come to represent the same word is through variant forms of a logograph, or variant forms of a phonetic grapheme (*see table 4*). In the case of variant glyphs resulting from variant forms of a logograph, examples include at least six variant forms for *way* 'spirit companion,' and five variant forms for *k'awil*, the name of a god.

In the case of variant glyphs resulting from variant forms of a phonetic grapheme, examples include at least thirteen variant forms for the grapheme representing the sound *u*. The phrase *u-bah* 'he/she/it goes' can be represented by a glyph that uses one of two of the variants of *u*.

Multiple words in one glyph are common in Maya script where a phrase or even an entire sentence can be represented in one glyph. For example, **ti-WAK-BEN** (*ti wak Ben* 'on the day six Ben') is composed of **ti** (*ti* 'on'), **WAK** (*wak* 'six'), and **BEN** (*Ben* a day name) (*see table 5 for this and following examples*).

The glyph for **tu-ba-hi** (*tu baah* 'on his head') is composed of the phonetic graphemes **tu** (*tu* 'on his/her/its') and **ba** and **hi**, which together form *baah*, 'head.'

Table 6 One sound with multiple meanings and glyphs

1 Sound — Multiple Meanings — Multiple Glyphs		
KAN		
AK'BAL		
IX		
AHAW		

The glyph **och-bih** (*och bih* 'he/she/it enters the path,' a metaphor for death) is composed of **och** (*och* 'enter') and **bih** (*bih* 'path').

'Holy king of Palenque' (*k'uhul Baakal ahaw*), written as **k'uhul-baak-la-ahaw** is composed of **k'uhul** (*k'uhul* 'holy'), **baak** and **la** (*Baakal* 'Palenque') and **ahaw** (*ahaw* 'king').

The glyph **hok'aj-ti-ahaw-le** (*hok'aj ti ahawlel* 'he is tied into the kingship') is composed of **hok'aj** (*hok'aj* 'he/she/it is tied'), **ti** (*ti* 'into'), **ahaw** (*ahaw* 'king') and **le** (*le/* –ship or –ness).

The glyph **u-ch'am-wa-lo-mu** (*u cha'maw lom* 'he/she/it takes the staff') is composed of **u** (*u* 'he'), **ch'am** (*ch'am* 'take'), **wa** (*-aw* transitive suffix), **lo**, and **mu**, which together form *lom* 'staff.'

Although one sound can represent several different meanings and be represented by several different glyphs, all glyphs are interchangeable for the various meanings (*see table 6*). For example, three glyphs representing **kan** can all mean 'snake' or 'sky' or 'four.' The only homophones that are differentiated by glyphs achieve this by the rare semantic graphemes. For example, the semantic grapheme indicates a day sign in the Mayan calendar; it serves to differentiate meaning in the following instances. The sound **ak'bal** can mean 'darkness' or the name of a day. The sound **ix** can mean 'jaguar' or the name of a day. The sound **ahaw** can mean 'king' or the name of a day.

Yet even here, the glyphs without the day signs can still sometimes represent the day names. Nevertheless, Maya script is considered a logo-syllabic script because of the many glyphs which only represent one sound and one meaning.

GLYPH COMPOSITION: OVERVIEW

In terms of glyph composition, we have already seen how a Maya glyph can consist of a logograph, or a logograph plus one or more phonetic graphemes, or simply some phonetic graphemes. Semantic graphemes that only convey meaning and not sound are rare. We have already seen the day sign indicator. Another is the headband scarf on top which indicates kingly status. In addition, there is a textual device consisting of two dots placed at the upper left corner of a phonetic grapheme, indicating

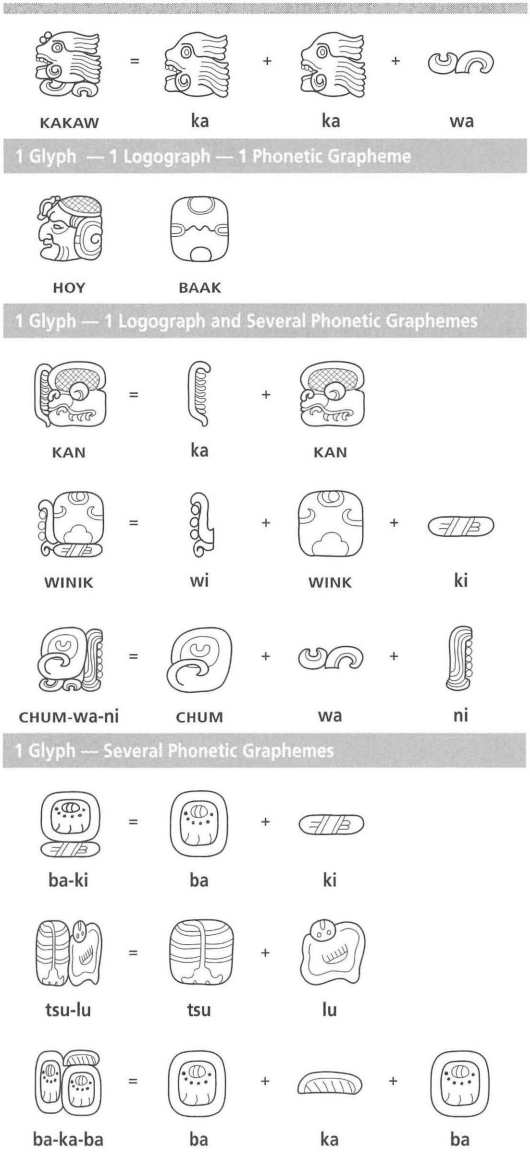
repetition of that grapheme. For example, *kakaw* 'chocolate' is composed of the phonetic grapheme **ka**, repeated by the two dots and the phonetic grapheme **wa** (*see table 7 for this and the following discussion*).[17]

We have already seen examples of the following three categories with the words *balam* and *pakal*. Here we give more illustrations separated according to their structure. One glyph with one logograph or one phonetic grapheme is exemplified by **HOY** 'he/she/it prepared' and **BAAK**.

One glyph with one logograph and several phonetic graphemes is exemplified by three illustrations: 'snake' is constructed with **ka** and the logogram **KAN**. *Winik* 'person' is constructed with **wi** and the logogram **WINIK** and **ki**. **CHUM-wa-ni** (*chumwan* 'he/she/it sits') is constructed with the logogram **CHUM** 'be seated' with **wa** and **ni** (*-wan* positional suffix).

One glyph and several phonetic graphemes is exemplified by three illustrations also: **ba-ki** (*baak* 'prisoner') is constructed with **ba** and **ki**. Likewise **tsu-lu** (*tsul* 'dog') is constructed with **tsu** and **lu**, while **ba-ka-ba** (*bakab* an aristocratic title) is formed with **ba**, **ka** and **ba** again.

Table 7 Glyph composition



GLYPH COMPOSITION: GRAPHEME POSITIONING

In terms of grapheme position, one Mayan glyph may contain as little as one, or as many as twelve graphemes, all combined according to the principles of conflation, where graphemes overlap one another, or inclusion, where a grapheme occurs inside another. If a logograph exists, the phonetic graphemes may occur as affixes to its left, right, top and bottom. The grapheme reading order is generally from left to right, top to bottom.[18] Table 8 contains examples of conflation and inclusion based on structure.

For one left – one right, there are three examples: tsu-lu (*tsul* 'dog') composed with tsu and lu. KAN (*kan* 'snake') composed with ka and KAN. u-ba (*u bah* 'his/her/its image') composed with u and ba.

For one left – two right, there are also three examples: ba-ka-ba (*bakab* an aristocratic title), formed with ba and ka and ba. wi-WINIK-ki (*winik* 'person') is composed with wi, WINIK and ki. tu-ba-hi (*tu baah* 'on his head') is composed with tu and ba and hi.

Two left – one right, has three examples: CHUM-wa-ni (*chumwan* 'he/she/it sits') composed with CHUM and wa and ni. tu-pa-ja (*tu pah* 'it is an earspool') composed with tu and pa and ja. chu-ka-ja (*chukaj* 'he/she/it is captured') composed with chu, ka, and ja.

One top – one bottom has three examples: ba-ki (*baak* 'prisoner') is composed with ba and ki; OCH-BIH (*och bih* 'he/she/it enters the path,' a metaphor for death), is composed with OCH and BIH; and PAKAL-la (*pakal* 'shield') is composed with PAKAL and la.

One top – two bottom is exemplified with the following example: ti-WAK-BEN (*ti wak Ben* 'on the day six Ben') is composed with ti and WAK and BEN.

One top – two bottom has three examples: pa-ka-la (*pakal* 'shield') is composed with pa and ka and la. K'AL-SAK-HUN (*k'al sak hun* 'he ties the white headband') is composed with K'AL, SAK, and HUN.

Quadripartite structure is known with sa-ja-la-la (*sajalal*, underlordship) is composed with sa, ja, la, and la.

One top – one middle – one bottom is shown with OCH-BIH-hi (*och bih* 'he/she/it enters the path,' a metaphor for death) is composed with OCH, BIH, and hi.

One left – one middle – one right is exemplified with the following: ba-ch'o-ko (*bach'ok* 'first sprout') composed with ba, ch'o, and ko.

One left – one middle – two right is shown with ch'o-ko-le-le (*ch'oklel* 'sprouthood') constructed with ch'o, ko, le, and le.

One left – three right is shown with the following example: u-HUN-TAN-na (*u huntan* 'her beloved one') composed with u, HUN, TAN, and na.

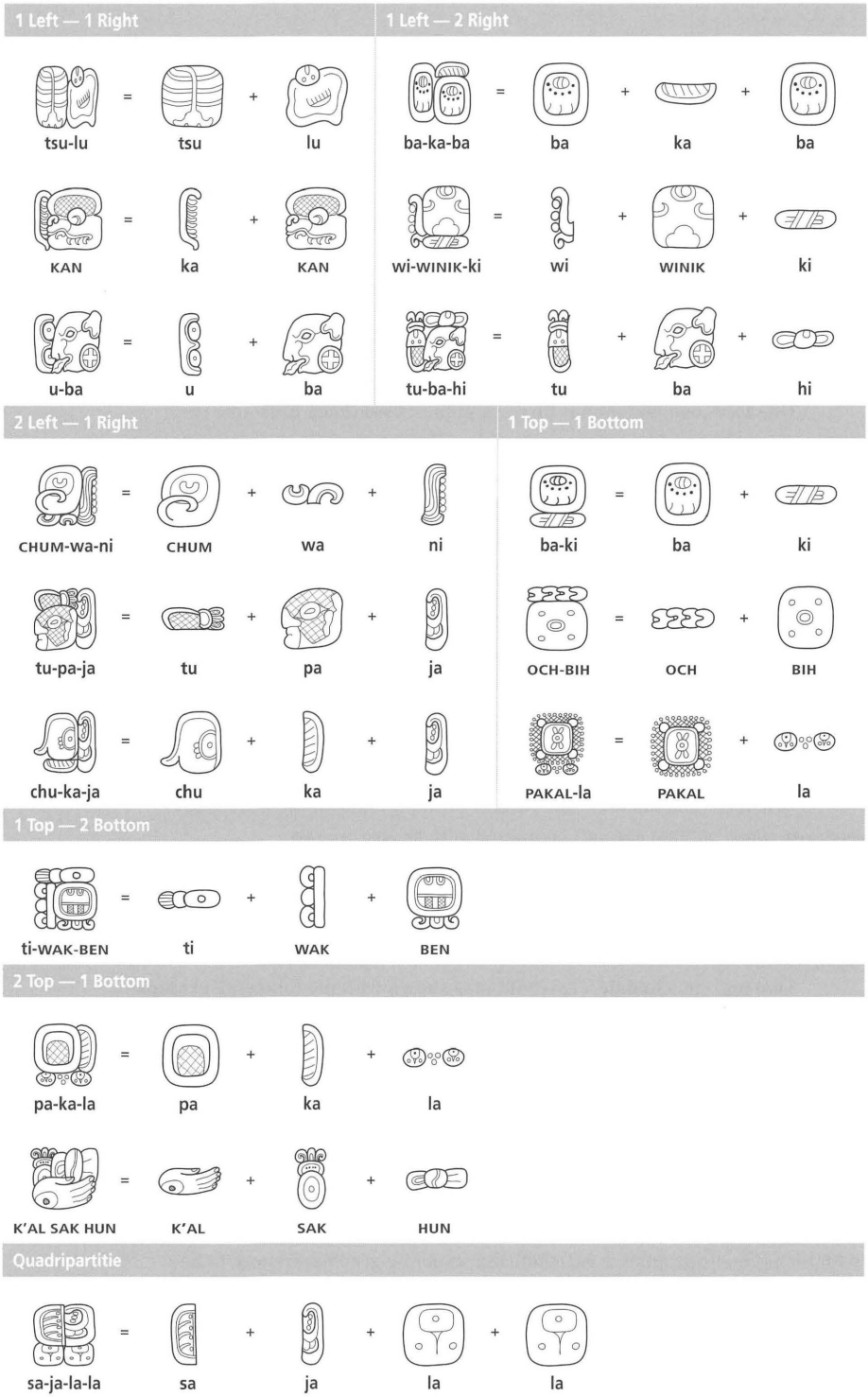
One top – two middle – two bottom is shown with the following example: ti-sa-ja-la-li (*ti sajalal* 'in the underlordship') is composed with ti, sa, ja, la, and li.

Two top – two bottom left – one bottom right is shown with the following: i-ts'i-wi-WINIK-ki (*its'i winik* 'younger brother') is composed with i, ts'i, wi, WINIK and ki.

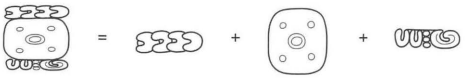
Two top – two middle – two bottom is shown with the following: AJ-pi-tsi-la-wa-la (*aj pitslawal* 'he of the ballgame') is composed with AJ, pi, tsi, la, wa, and la.

Inclusion has three examples: CHUM-mu (*chum* 'to be seated') is composed with the phonetic grapheme mu inside the semantic grapheme CHUM 'to be seated.' sa-ja-la (*sajal* an aristocratic title) is composed with the phonetic graphemes ja and la inside sa. mo-lo (*Mol* a month name) is composed with the phonetic grapheme lo inside the phonetic grapheme mo.

Table 8 Glyph composition: Grapheme positioning



1 Top — 1 Middle — 1 Bottom

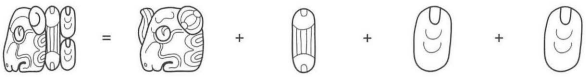


OCH-BIH-hi | OCH | BIH | hi

1 Left — 1 Middle — 1 Right

ba-ch'o-ko | ba | ch'o | ko

1 Left — 1 Middle — 2 Right



ch'o-ko-le-le | ch'o | ko | le | le

1 Left — 3 Right

u-HUN-TAN-na | u | HUN | TAN | na

1 Top — 2 Middle — 2 Bottom

ti-sa-ja-la-li | ti | sa | ja | la | li

2 Top — 2 Middle — 2 Bottom

i-ts'i-wi-WINIK-ki | i | ts'i | wi | WINIK | ki

2 Top — 2 Middle — 2 Bottom

AJ-pi-tsi-la-wal-la | AJ | pi | tsi | la | wal | la

Inclusion

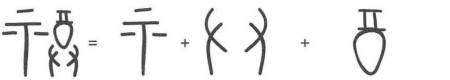
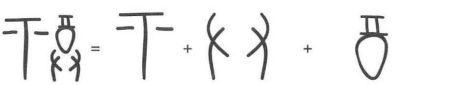
CHUM-mu | mu | CHUM | mo-lo | lo | mo

sa-ja-la | ja | la | sa

Table 9 Oracle Bone glyph, sound, and meaning

1 Glyph — 1 Sound — 1 Meaning			1 Glyph — 1 Sound — Multiple Meanings		
wood	rain	ear	name of a ritual	aristocratic title	to attack first month

1 Glyph — Multiple Sounds — Multiple Meanings		
armor seven	mountain fire	moon night

Multiple Glyphs — 1 Sound — 1 Meaning								
blessing				blessing	=	hands	+	phonetic grapheme
blessing	=	hands	+	phonetic grapheme	blessing	=	religious	+	phonetic grapheme
blessing	=	religious	+	phonetic grapheme	blessing	=	religious	+	phonetic grapheme
blessing	=	religious	+	phonetic grapheme	blessing	=	religious	+	phonetic grapheme
blessing	=	religious	+	phonetic grapheme	blessing	=	religious	+	phonetic grapheme
									
blessing	=	religious	+	phonetic grapheme	blessing	=	religious	+	hands	+	phonetic grapheme
				blessing	=	religious	+	hands	+	phonetic grapheme
									
				blessing	=	religious	+	hands	+	phonetic grapheme
				blessing	=	religious	+	hands	+	phonetic grapheme
				blessing	=	religious	+	roof	+	phonetic grapheme

THE ORACLE BONE SCRIPT

There are currently about 150,000 pieces of Oracle Bones, containing over 4,000 glyphs. Of these glyphs, about 1,500 have been deciphered.[20]

RELATIONSHIP OF GLYPH, SOUND AND MEANING

In terms of the relationship between glyph, sound and meaning, there are several categories (*see table 9 in regard to the following discussion*).

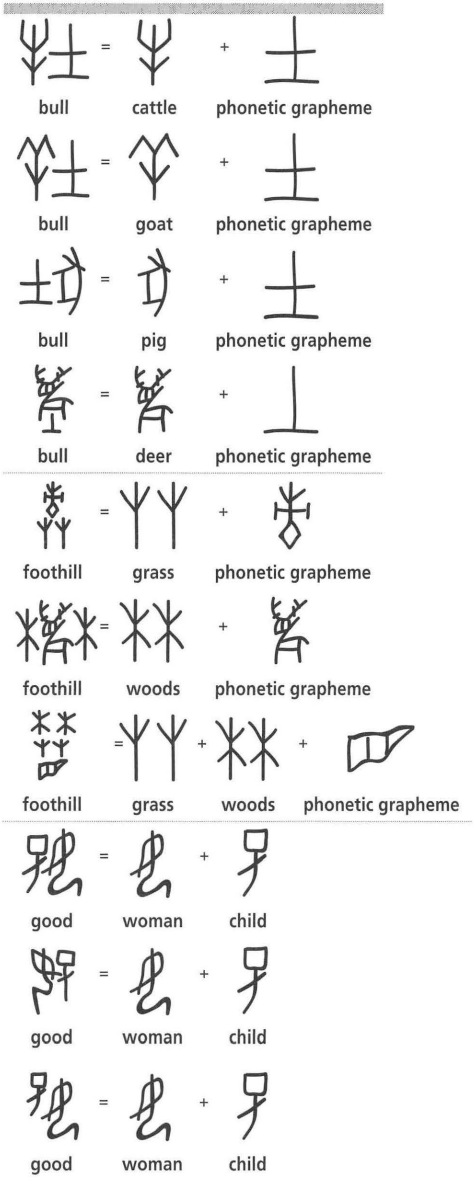
In the one glyph – one sound – one meaning category, for example, the glyph pronounced meuk and means 'wood'; the glyph pronounced ɣ*iu*aɣ means 'rain'; the glyph pronounced *ni*əɣ and means 'ear.'[21]

The one glyph – one sound – multiple meanings situation arises mostly from sound borrowing, in other words, the Rebus principle. For example, the glyph ɣxiuəɣ means 'also' 又 as well as the name of a ritual 祐;[22] the glyph *pak* means 'white' 白 as well as an aristocratic title 伯;[23] the glyph *tie*ŋ means 'to attack' 征 as well as 'first month'.[24]

One estimate puts the percentage of this type of glyph at 46.8%[25] but many of the borrowed glyphs have lost their original meaning, which is one reason often cited to explain why Oracle Bones glyphs are difficult to decipher. Permanent borrowings and the differentiation of homophones through different glyphs also partly explain why Oracle Bone script is considered logo-syllabic, in spite of extensive sound borrowings.

Regarding the category one glyph – multiple sounds – multiple meanings, the glyph 十 could represent 甲 *kra p* 'armor' or 七 *ts*h *iet* 'seven'; the glyph 山 could represent 山 *srian* 'mountain' or 火 *xu*əɣ 'fire'; the glyph 月 could represent 月 ŋ*iuat* 'moon' or 夕 *riak* 'night.'[26]

Table 10 Multiple Glyphs – 1 Sound – 1 Meaning cont.



The situation of multiple glyphs – one sound – one meaning arises mostly from variant forms of the same glyph (*see table 9 for the following examples*). For example, the word 福 piuək meaning 'blessing' has 127 variant glyphs. The 14 shown here are created by the addition or deletion of graphemes or grapheme elements.[27] The word 牡 *muu* meaning 'bull' has 15 variant glyphs. The four shown here are created by changing the semantic grapheme (*see table 10 for this and following examples*).[28] The word 麓 *leuk* meaning 'foothill' has 12 variant glyphs.[29] The three shown here are created by changing the phonetic grapheme. The word 好 *xəu* meaning 'good' has 11 variant glyphs. The three shown here are created by changing the position of the two semantic graphemes meaning 'woman' and 'child.'[30]

Table 11 Multiple words in one glyph

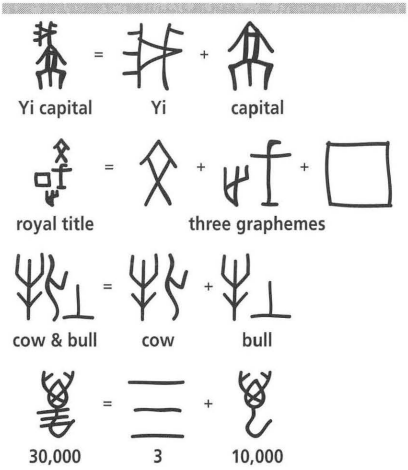
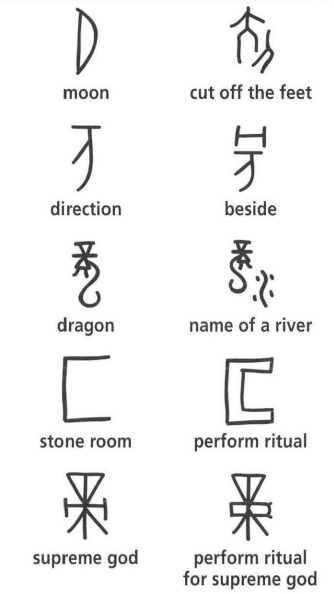


Table 12 One Sound – Multiple Meanings – Multiple Glyphs



In the multiple words in one glyph situation (*see table 11*), four examples are provided, the glyph ŋia *kiaŋ* 'Yi capital' is a combination of two graphemes —ŋia 'Yi' and *kiaŋ* 'capital.' The glyph *mluən miuaɣ teŋ* (a proper royal title) is a combination of three graphemes *mluən*, *miuaɣ* and *teŋ*. The glyph *bien muəu* 'cow and bull' is a combination of the graphemes *bien* 'cow' and *muəu* 'bull.' The glyph *səm mluan* 'thirty thousand' is a combination of the graphemes *səm* 'three' and *mluan* 'ten thousand.'[31]

The condition of one sound – multiple meanings – multiple glyphs contains homonyms differentiated by different glyphs (*see table 12*). For example, the sound ŋiuat can mean 'moon' or 'to cut off the feet.' The sound *buaŋ* can mean 'direction' or 'beside.'[32] The sound *lieuŋ* can mean 'dragon' or the name of a river.[33]

A subcategory of this case is related words differentiated by related glyphs. For example, *pəu* 'stone room for ancestral tablet' is represented by a glyph similar in form to the verb *pəu* 'perform a ritual to locate the ancestral spirit.'[34] Another possible candidate is *teɣ* 'supreme god', represented by a glyph similar to another glyph pronounced *teɣ* and meaning 'to perform the ritual for the supreme god.'[35]

GLYPH COMPOSITION: OVERVIEW

In terms of glyph composition, there are a total of 348 graphemes in the Oracle Bone script, as mentioned above. A grapheme is either phonetic or semantic, depending on its function within the glyph. Oracle Bone also has a device for indicating duplication of a glyph/syllable – two horizontal dashes placed at the lower left of the glyph, as in the third glyph down in the following example:[36]

This phrase is usually read as 王受有祐, 'the king has the protection of the gods.'[37] The glyph ɣ*iu*əɣ "right" is borrowed to represent its near homonyms 有 and 祐.

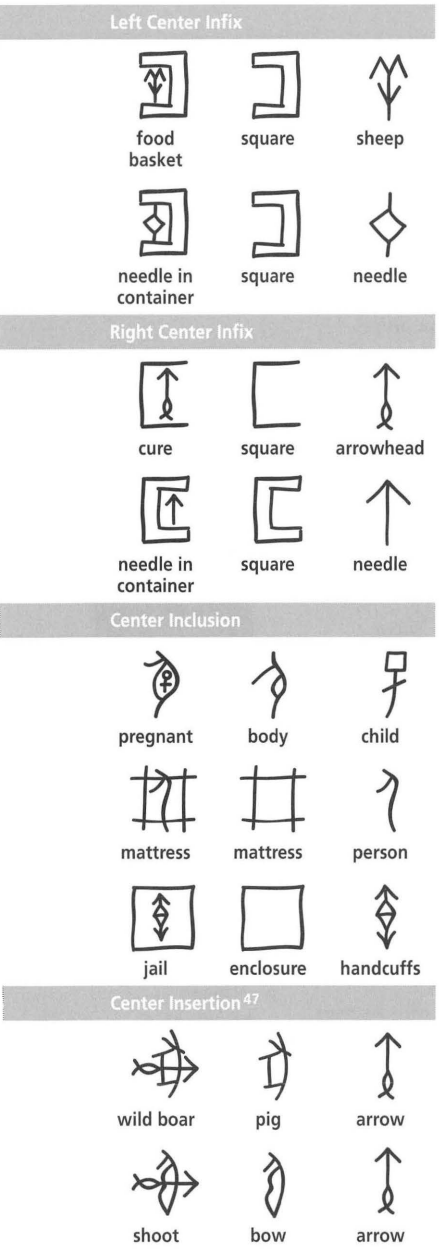
Based on an analysis of 1,341 glyphs from Jiaguwen Heji[38] there are two types of glyphs by glyph composition (*see table 13*): 226, or 16.8%, belong to the category one glyph – one grapheme, for example, ɣiuəɣ 'right hand,' *gua* 'grain stalk' and *nien* 'human being.'

One glyph – multiple graphemes, based on grapheme function, can be further divided into two types: one glyph – multiple graphemes (753 or 56.1% are in this category) or one glyph – multiple semantic and phonetic graphemes (119 or 8.9% are in this category).[40]

Table 13 Types of glyph composition

1 Glyph — 1 Grapheme		
right hand	grain stalk	human being
1 Glyph — Multiple Semantic Graphemes		
=	+	
reach	person	hand
=	+	
pregnant	child	body
=	+	
cut off the feet	big person	sword
1 Glyph — Multiple Semantic and Phonetic Graphemes[39]		
=	+	
younger sister	phonetic grapheme	woman
=	+	
to go	step	phonetic grapheme
=	+	
room	roof	phonetic grapheme

Table 14 Grapheme positioning



In most cases, the phonetic grapheme is on the left and the semantic grapheme on the right.[41] Based on an analysis of 257 semantic phonetic glyphs, 81 semantic graphemes and 175 phonetic graphemes were identified. Among the semantic graphemes, 'kneeling woman' appeared most often, with about 100 glyphs containing it, perhaps indicating the continued importance of matrilineal lineages in Shang times.[42]

Of the 175 sound graphemes, 37% had the same sound and tone as the entire glyph, 36.6% had only a different initial consonant cluster, 8% had only the same rhyme, 7.59% had only a different tone, 2.7% had only the same tone, 2.23% had only the same initial consonant cluster, and 1.3% had only a different rhyme. These figures indicate that in choosing a phonetic grapheme, the most important factor is rhyme. Tone comes second and initial consonant cluster is the least important.[43] The other 18.2% could not be clearly categorized.[44]

GLYPH COMPOSITION: GRAPHEME POSITIONING

In terms of grapheme position, multiple grapheme glyphs can be divided into fourteen types (*see table 14*):

one left – one right accounts for 46.2% of glyphs composed of two graphemes[45] whereas one top – one bottom accounts for 28.5% of glyphs composed of two graphemes.[46]

COMPARISON AND DISCUSSION

SIMILARITIES

The most outstanding similarity between Maya and Oracle Bone script is that the graphemes of both are pictographic in nature. Secondly, the shape of individual graphemes in both is flexible and can be adapted to fit in a particular glyph composition. Thirdly, the glyphs are generally in a square shape.

In terms of relationship between sound, glyph and meaning, both belong to the category of logo-syllabic scripts, meaning that in many cases a glyph stands for a word, with some graphemes indicating syllables.

Both scripts have a textual device for repetition — double dashes that appear to the lower left of the glyph in Oracle Bone and double dots at the upper left for Maya. This device appears in Chinese Bronze script of the Chou Dynasty as well, in which case the two dashes appear usually to the lower right and sometimes to the lower left corner of the glyph (*figure 5*).[48]

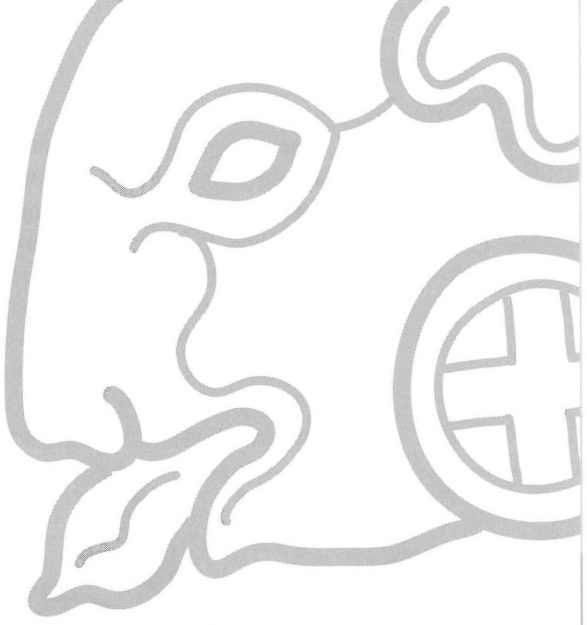
Figure 5 Double dashes for repetition in Bronze Script. The text reads 'son (son) grandson (grandson)' meaning 'for all posterity.'[49]

DIFFERENCES

In terms of pictographic shape, Oracle Bone script is more abstract and shapes are often reduced to lines. Maya graphemes are full-bodied, perhaps contributing to the overlapping and partial blocking of graphemes in multi-grapheme glyphs. Stephen Houston attributed it to "the need to preserve superficial reading ability among a larger group of people" among the Maya.[50] I would disagree with this, arguing that the high degree of variability in Maya script shapes would increase the reading difficulty for the audience. Houston and David Stuart also suggested that the Central American idea of self is more diffused compared to that of the West, and some of this life voice helps animate the Mayan glyphs.[51] Another possible explanation for the full bodied character of Maya script is the fact that Maya script often occurred on public monuments supposedly for public consumption which may have encouraged artistic expression by the scribes.

In terms of glyph number, Oracle Bone script far exceeds Maya script. This may be because Archaic Chinese as a monosyllabic language had many more homophones than Classic Maya, and therefore needed many more glyphs to differentiate them.

In terms of the relationship between glyph, sound and meaning, there is more fluidity in Maya where different glyphs representing the same sound



can stand in freely for one another. Whereas this occurs in Oracle Bone script also, there more glyphs are bound to specific meanings and cannot represent homophonous words, hence the bond between glyph and meaning is stronger. This ties in to the previous point where Oracle Bone script needs to differentiate between homophones. Also, there are many more cases in Maya where one glyph includes several words. In Oracle Bone script this occurs only with proper names, closely knit noun pairs and objects with numbers, whereas in Maya the unit presented could be a phrase or a sentence. This may reflect the agglutinative nature of Classic Maya language, where the bond between morphemes is stronger.

In terms of glyph composition, variations in Maya seem to be due to both variation in the graphemes, for instance, the variant forms of the phonetic grapheme representing *u* and variation in glyph composition, i.e., addition/deletion/substitution of graphemes. On the other hand, graphemes seem to be relatively stable in Oracle Bone and most variations result from glyph composition, for instance, the variant forms of 'blessing,' 'bull' and 'foothill.' This greater degree of grapheme standardization in Oracle Bone may be due to differences in the political situation, as Shang was a more or less centralized polity, whereas the Maya cities were either independent or loosely allied. The difference in grapheme standardization may also be due to the previously mentioned greater artistic freedom in Maya public epigraphy. Although we cannot be certain, the reading of Oracle Bone texts was more likely a private affair among the king and a few officials.

The fact that Maya has few semantic graphemes may be due to the fact that its language is polysyllabic, therefore containing fewer homophones that need to be differentiated by semantic graphemes.

Another difference is that the phonetic graphemes in Oracle Bone script often serve only to remind the reader of the rhyme or tone or initial consonant cluster. In Maya, phonetic graphemes represent entire syllables except when they represent syllable ending consonants. This, together with the greater fluidity between glyph and meaning in the Maya script, places it closer to the syllabic end on the logo-syllabic continuum in comparison with Oracle Bone script.

In terms of grapheme positioning, Maya is much more complicated than Oracle Bone script because most glyphs contain many syllables whereas most Oracle Bone glyphs contain only one.

In short, the differences between Maya and Oracle Bone script probably result from the differences in the languages represented, the different degrees of political centralization, the different extent of public use of the script and the different conceptions of "self" in the two cultures.

What do the two scripts tell us about literacy in Classic Maya and Shang China? I suggest they pose about the same degree of difficulty (or ease) in terms of learning, writing and reading. Maya has fewer glyphs, but the graphemes are

less standardized, the grapheme shapes have more pictographic detail and the grapheme positions are more complicated. Oracle Bone has more glyphs, but the graphemes are more standardized, the graphemes have less pictographic detail and the grapheme positions are less complicated. Similar political economic systems – early kin based states with agricultural economies – would indicate a similar rate of literacy.

Lastly, does the comparison tell us anything new about the development of early scripts? Perhaps that the writing system may reflect how tightly morphemes are bound in the language, as the agglutinative nature of Maya language may have led to the Maya script containing more multi-word glyphs.

ENDNOTES

1 For more general information in English on Oracle Bone script, see Keightley, David N. 1978. *Sources of Shang History: The Oracle-Bone Inscriptions of Bronze Age China.* Berkeley: University of California Press.

2 http://www.artsmia.org/art-of-asia/history/shang-dynasty-map.cfm, accessed 6/12/2006.

3 http://brian.hoffert.faculty.noctrl.edu/REL100/OracleBone, accessed 6/5/2006.

4 Stuart, David. 1995. A Study of Maya Inscriptions. Ph.D. dissertation, Vanderbilt University. Also Stuart, David. 1994. "The Fire Enters His House: Architecture and Ritual in Classic Maya Texts." In Houston, Stephen D., editor. 1997. *Function and Meaning in Classic Maya Architecture.* Washington D.C.: Dumbarton Oaks. Stephen D. Houston. 1997. The Shifting Now: Aspects, Deixis, and Narrative in Classic Maya Texts. *American Anthropologist* 99.2, 291-305.

5 For more general information on Maya script, see Coe, Michael D. and Mark Van Stone. 2001. *Reading the Maya Glyphs.* London: Thames and Hudson.

6 http://www.mesoweb.com/resources/handbook/WH2005.pdf, 35, accessed 6/5/2006.

7 http://www.mesoweb.com/resources/handbook/WH2005.pdf, 6, accessed 6/5/2006.

8 Tolstoy, Paul. 1999. Trans-Pacific Contacts: What, Where and When? *The Review of Archeology* 20.1, 19.

9 De Acosta, Jose. 1986. *Historia Natural y Moral de las Indias.* Madrid: Historia, Book 6, chapters 4, 5, 6, 7. I wish to thank an anonymous reviewer for bringing this and some other articles on Maya script and literacy to my attention, as well as for making numerous helpful suggestions.

10 This section is closely based on an example provided by the anonymous reviewer.

11 Most of the Maya glyphs used in this paper come from http://jefferson.village.virginia.edu/med/glyph_catalog.html. This article uses a standard system for transcribing the signs of Maya glyphs into the Roman alphabet. This system is described in Coe and Van Stone, Reading, 19: "A transcription is a more-or-less accurate record in Roman letters of the values of individual signs in a Maya glyph or text, each sound being separated from its neighbors by hyphens. Transcriptions will always be in boldface type, with LOGOGRAMS in upper case, and syllabograms in lower case…A transliteration, always in italics, represents actual Maya language (Classic Mayan) recorded in the glyphic original and/or its transcription…A translation, always in quotes and regular type, is the English-language version of a Classic Maya transcription."

12 Coe and Van Stone, *Reading the Maya Glyphs*, 19. Kettunen. Harri and Christophe Helmke. Date? Introduction to Maya Hieroglyphs. Location: Publisher? http://www.mesoweb.com/resources/handbook/index.html, accessed 6/13/2006, 6. Harris, John F. and Stephen K. Stearns. 1997. *Understanding Maya Inscriptions*. Philadelphia: University of Pennsylvania. Museum of Archeology and Anthropology, 3.

13 胡厚宣. 1984. "八十五年來甲骨文材料之再統計." 史學月刊 1984:2 (Hu, Hou-xuen. 1984. "Bashiwunianlai Jiguwen Cailiao Zhi Zai Tongji (A Recounting of Oracle Bone Data for the Past 85 Years)." *Shixue Yuekan* (Historical Studies Monthly) 1984:2). 李圃. 1995. 甲骨文文字學. 上海: 學林, 24, 173 (Li, Pu. 1995. *Jiaguwen Wenzixue* (Oracle Bone Scriptology). Shanghai: Xuelin, 24, 173). 鄒曉麗, 李彤, 馮麗萍. 1999. 甲骨文字學述要. 長沙: 岳麓, 12 (Zou, Xiao-li, Li Tong, and Feng Li-ping, 1999. *Jiagu Wenzixue Shuyao* (Summary of Oracle Bone Scriptology). Changsha: Yuelu, 12).

14 Coe. Michael D. 1992. *Breaking the Maya Code*. New York: Thames and Hudson, 262.

15 Coe, *Breaking the Maya Code*, 235.

16 Coe and Van Stone, *Reading the Maya Glyphs*, 46.

17 Harris and Stearns, *Understanding Maya Inscriptions,* 34-35.

18 Coe and Van Stone, *Reading the Maya Glyphs*, 18. Harris and Stearns. *Understanding Maya Inscriptions*, 3.

19 Harris and Stearns, *Understanding Maya Inscriptions*, 50.

20 Hu, "Bashiwunianlai Jiguwen Cailiao Zhi Zai Tongji." Li, *Jiaguwen Wenzixue*, 24, 173. Zou, Li and Feng, *Jiagu Wenzixue Shuyao*, 12.

21 周法高. 1974. 漢字古今音彙. 香港: 中文大學 (Chou, Fa-kao. 1974. *Hanzi Gujin Yinhui* (A Pronouncing Dictionary of Chinese Characters in Archaic and Ancient Chinese, Mandarin and Cantonese). Hong Kong: Chinese University. I take my data from Chou's interpretation. Some of the notation is changed to conform to IPA.

22 王宇信, 楊升南, 聶玉海. 1996. 甲骨文精萃選讀. 北京: 語文, 15, 31 (Wang, Yu-xin, Yang Sheng-nan, and Nie Yu-hai. 1996. *Jiaguwen Jingcui Xuandu* (Best Selections of Oracle Bone Readings). Beijing: Yuwen, 15, 31).

23 Wang, Yang and Nie, *Jiaguwen Jingcui Xuandu*, 59, 75.

24 Wang, Yang and Nie, *Jiaguwen Jingcui Xuandu*, 469.

25 Zou, Li and Feng, *Jiagu Wenzixue Shuyao*, 65.

26 Zou, Li and Feng, *Jiagu Wenzixue Shuyao*, 39-40.

27 Examples for "blessing" are from Zou, Li, and Feng. *Jiagu Wenzixue Shuyao*, 34-36, and 李孝定. 甲骨文字集釋. 中央研究院歷史語言研究所專刊之五十, 57 (Li, Xiao-ding. *Jiagu Wenzi Jishi*. (Combined Explanations for Oracle Bone Scripts). Institute of History and Philology, Academia Sinica, Special Publications, No. 50).

28 Examples for "bull" are from Li. *Jiagu Wenzi Jishi*, 291.

29 Examples for "foothill" are from Li. *Jiagu Wenzi Jishi*, 2043.

30 Examples for "good" are from Li, *Jiagu Wenzi Jishi*, 3647.

31 Zou, Li and Feng, *Jiagu Wenzixue Shuyao*, 11, 260.

32 Wang, Yang and Nie, *Jiaguwen Jingcui Xuandu*, 345, 351.

33 Wang, Yang and Nie, *Jiaguwen Jingcui Xuandu*, 79, 151.

34 白川靜. 1977. 甲骨文的世界. 台北: 巨流, 66 (Shirakawa, Shizuka. Koukotubun no Sekkai (The World of Oracle Bone Script). Taipei: Juliu, 66). Wang, Yang and Nie, *Jiaguwen Jingcui Xuandu*, 53, 91, 136, 366, 402, 496, 552, 562, 641.

35 Shirakawa. *Koukotubun no Sekkai*, 53.

36 郭沫若編. 1983. 甲骨文合集. 第十二冊. 北京: 中華, 4505 (Guo, Muo-ruo, editor. 1983. *Jiaguwen Heji* (Collection of Oracle Bone Script), vol. 12. Beijing: Zhonghua, 4505). Other examples of this phrase and the repetition mark can be found on vol. 12, pp. 4509, 4546, and vol. 9, pp. 3330, 3438 and Shirakawa. *Koukotubun no Sekkai*, 48.

37 The first person to interpret it this way is Guo Muo-ruo. See郭沫若. 2000.卜辭通纂. 北京: 北京圖書館, 世系十五 (Guo, Muo-ruo. 2000. *Buci Tongzuan* (Complete Edition of Oracle Bone Scripts), Beijing: Beijing Library, Shixi 15).

38 胡厚宣主編. 1999. 甲骨文合集. 北京: 中國社會科學 (Hu, Hou-xuan, editor. 1999. *Jiaguwen Heji* (Collection of Oracle Bone Script). Beijing: China Social Sciences).

39 Li, *Jiaguwen Wenzixue*, 40-45.

40 This percentage is according to Zou, Li, and Feng. *Jiagu Wenzixue Shuyao*, 6, but later on using a different method of calculation she argues for 20% on p p. 12.

41 Li, *Jiaguwen Wenzixue*, 208.

42 Zou, Li and Feng. *Jiagu Wenzixue Shuyao*, 13, 55.

43 Zou, Li and Feng, *Jiagu Wenzixue Shuyao*, 59-61.

44 Zou, Li and Feng, *Jiagu Wenzixue Shuyao*, 6.

45 朱歧祥. 2002. 甲骨文字學. 台北: 里仁, 103 (Zhu, Qi-xiang. 2002. *Jiagu Wenzixue* (Oracle Bone Scriptology). Taipei: Liren, 103).

46 Zhu, *Jiagu Wenzixue*, 103.

47 Examples from Li. *Jiaguwen Wenzixue*, 104-109.

48 白川靜. 1989. 金文的世界. 台北: 聯經, 79, 84, 201 (Shirakawa, Shizuka. 1989. *Kinbun no Sekkai* (The World of Bronze Script). Taipei: Linking, 79, 84, 201). 何琳儀. 1989. 戰果文字通論. 北京: 中華, 224-225.

49 http://tech2.npm.gov.tw/DM2003/wcbi/c/cintro01.htm, accessed July 5, 2006.

50 Houston, Stephen. 1994. Literacy among the Pre-Columbian Maya: A Comparative Perspective. *Writing Without Words*, Elizabeth Hill Boone and Walter D. Mignolo, editors. Durham, NC: Duke University Press.

51 Houston and David Stuart. 1998. The Ancient Maya Self. Res 33, 88. The fact that the more animated glyphs generally occur in less public settings, as pointed out in the article, may indicate that some private life-force enhancing rituals were held in these settings, provided that Houston and Stuart's theory of the diffused self is correct.

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