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# The 'Ideal Square' of Logographic Scripts and The Structural Similarities of Khitan Script and *Han'gŭl*

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A comparison of the Khitan Small Script and Korean *han'gŭl* shows a striking structural similarity of two essentially phonetic scripts that combine 'letters' into large blocks. These blocks in *han'gŭl* correspond to the syllable, whereas in Khitan they correspond to the word-level. I shall compare these two systems structurally with both the linear alphasyllabic principle of Brahmi-derived scripts and the principle of an 'ideal square' (or 'ideal oblong') that characterizes Chinese, Egyptian or Mayan logographic scripts in order to establish why the Khitan and Korean scripts share a rare structural principle.

## 1. Korean *Han'gŭl*

Korean *han'gŭl* is distinctive as being the first phonographic script to be invented on phonemic featural grounds (Kim 1997: 145-150) and

for which date and purpose of creation are known. It also stands out amongst other phonographic scripts of the world in that the graphemes of the script are written in blocks that occupy a discrete square corresponding to a syllable of the spoken language. Thus the word *han'gŭl* itself is not written in a strictly linear way as:

(1) ㅎㅏㄴㄱㅡㄹ

***h* + *a* + *n* + *g* + *ŭ* + *l***

but in two blocks, each corresponding to one syllable of the word:

(2) 한글

Depending on the number and shape of graphemes in a syllable, their proportions vary in order that each block completely occupies the a square of identical area. The more graphemes in a syllable, the more compressed those graphemes become.

This feature has been described as unique. King, for instance, states that 'This feature more than others, makes Hankul distinctive' (King 1996: 219). It is certainly exceptionally rare amongst phonographic scripts. On the other hand, strict linearity in other phonographic scripts is often violated, and indeed, if we consider diacritics (e.g. *é*, *è*, *ẽ*, *ẹ*) as distinct graphemes, it is arguably rare. For example, Brahmi-derived scripts are structured around consonantal cores, the vowel letters being attached above, below, before or after their onset consonant, while consonant clusters tend to be represented by ligatures. The Brahmi-derived Tibetan *dbu can* script, which as almost all Brahmi-derived scripts is written horizontally (left

to right), is arguably more linear in that it has few true ligatures (essentially only *y* and *r* in C*y,* C*r* and *r*C are formally different from their stand-alone form) compared with its relatives in India, and vowels are represented strictly as diacritics above or below a consonant, abolishing the possibility found in other Brahmi-derived scripts of India or South-East Asia whereby certain phonological sequences CV may be orthographically represented as VC. Despite this simplification of the principles of the script, Tibetan is not entirely linear. As I have mentioned, vowel letters occur as diacritics above (*e*, *i*, *o*) or below (*u*) their onset consonant; moreover, many consonant clusters are realized in stacks, each consonant being written immediately below its predecessor (c.f. Goldstein et al. 1991: 23-27; Denwood 1999: 56, 58-61). Consider the following Tibetan example, *bslebs.pa.* 'arrival':

(3) བསླེབས་པ་

*e*

written: *b* + *s* + *b* + *s* + . + *p(a)*+ .

*l*

Nevertheless, although the stacking of letters points to a lack of strict linearity, the script does not work on the principle of blocks in the same way as *han*'*gŭl*. There is no attempt to compress the *e* + *s* + *l* stack into the same amount of space as is occupied by *b*. Moreover, only certain combinations of consonants are stacked, and the stacks do not correspond to any discrete unit of spoken language, whether it be syllable, morpheme or word.

The aesthetic principle underlying the block structure of *han*'*gŭl*, the ideal square, is, as we shall see, highly characteristic of logographic scripts,

but is almost limited to Korean amongst phonographic scripts. It is, however, not entirely limited to Korean. I shall consider in the next section the similarities displayed by the Khitan Small Script, a script used by a state that bordered the Korean state until two and a half centuries before the creation of *han'gŭl*.

## 2. Khitan Script

The Khitan state, just as the Jurchen state that later subsumed it, possessed two scripts, Large Script and Small Script. Khitan Large Script appears to have been predominantly logographic in nature, although it is very poorly understood. The Small Script, on the other hand, is somewhat better understood, thanks to the research carried out in China on the basis of a number of texts for which Chinese language versions also exist (Qinggeertai et al. 1985; Liu & Yu 1990). It is, nevertheless, still only partially deciphered. It is also often overlooked. It fails, for instance, to receive any mention whatsoever in *The Blackwell Encyclopedia of Writing Systems* (Coulmas 1996). Scholars have identified 378 graphemes (although some of these are variants of each other), and values have been identified for 132 of these (see Qinggeertai et al. 1985: 152-153, 677-678). Most of the graphemes appear to be phonographic letters. The structure of the script appears to be predominantly what may be termed 'telescopic' or 'semi-syllabic', in that the symbols tend to represent more than one phoneme, but less than one syllable, so that, for instance, a syllable $C^1$ V $C^2$ may be represented by two graphemes ($C^1$ V + V $C^2$), or three

graphemes ($C^1$ V + V + V $C^2$), a principle that appears also to have characterized Jurchen script (Sofronov 1991: 6-7). It is not an uncommon principle among nascent phonographic scripts in predominantly logographic environments, where the one-phoneme-per-grapheme principle has not been achieved, as a means of reducing the number of phonograms in use. The same principle, for instance, may be observed in Sumerian (c.f. Coulmas 1989: 83). The Khitan Small Script does appear also to possess a number of purely consonantal graphemes, although, considering that our knowledge of the Khitan phonological system or how Chinese loanwords were incorporated into it is still limited, these may yet prove to represent C V sequences.

Khitan Small Script was apparently invented in 925, and it continued in use after the Jurchen conquest of 1125 until the Jurchen prohibited its use in 1191 (Kara 1997: 230). This does not make it the earliest predominantly phonographic script in the region. It does, however, possess a common characteristic with *han'gŭl*, namely the ideal square-based block principle.

Above we observed how the graphemes that make up the Korean word *han'gŭl* are written not linearly:

(4) ㅎㅏㄴㄱㅡㄹ

***h* + *a* + *n* + *g* + *ŭ* + *l***

but in two blocks:

(5) 한글

Similarly the five letters that are used to write the Khitan word *č*$^{h}$*istpen* ('filial piety' + case ending)[1] are written not linearly:

(6) 

***č*$^{h}$ + *i* + *is* + *t* + *pen***

but in a single block:

(7) 

Although the blocks themselves are often oblong rather than square, there is a clearly identifiable break between them in manuscripts, making the end of one block and the beginning of the next unmistakable. Moreover, whether square or oblong, the component graphemes within a block occupy the entire block, with the result that the fifth component in (7) is expanded. Kara (1997: 230) states that an odd-numbered final component is centered, although consideration of manuscripts shows that it is clearly expanded to twice the width of the other components.

Although the Khitan script had been prohibited by the occupying Jurchen two and a half centuries before the creation of *han'gŭl*, it is interesting that the same distinctive phenomenon arose in the Khitan state and in Korea. This is particularly intriguing since the Khitan state and Koryŏ were neighbors. There is clearly no formal link between the Khitan

1) The word is the fourth word in at the start of the Chinese-Khitan bilingual *Daozong Aice*. c.f. Qinggeertai et al. 1985: plates 4 and 5 for the manuscript and pages 515-528 for its analysis.

graphemes and those of *han'gŭl*, but the question arises whether the ideal square principle in the two had a common origin. I argue that the principle indeed does have a common origin. There is a possibility that King Sejong and his scholars may have been aware of the earlier existence of Khitan Small Script, considering that the Khitan script existed for two centuries while the two states shared a border, but with almost 250 years between the prohibition and demise of Khitan Small Script and the creation of *han'gŭl* this is a difficult case to argue. Rather, I argue that it is more likely that the common origin lies in the nature of *logographic* scripts themselves and the way in which they may be adapted.

# 3. The Ideal Square

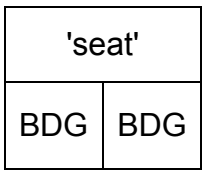
I shall define a logograph for my purposes as the smallest *complete* unit of logographic scripts that corresponds to a word or morpheme in the spoken language.[2] Logographic scripts function on very different principles to phonographic scripts. A single logograph tends to consist of more than one component. These components function as phonetic components, semantic components, or even functionless components (known in Chinese linguistics as *jihaofu*, Chen 1999: 134) - functionless in that they contribute neither phonetic nor semantic information, but just serve to make the

2) Such a definition allows one at least to define logography between different scripts in common terms. It is normal practice in Egyptology to define the components of what I call logographs as 'graphemes', whereas in East Asia it is the whole logograph that constitutes a 'grapheme'. This results in comparisons between different logographic scripts being conducted on unequal grounds.

logograph unique.

The result is that, unlike phonographic scripts, there is often no relation between the sequence of the components that make up a logograph and the sequence of phonemes in the spoken language. For instance, an Egyptian logograph of the structure <'seat' + *t* + BUILDING>, where italics represent the phonographic component, inverted commas enclose a precise semantic component, and upper case represent a general semantic component ('determinative'), is used to write the word *st* 'seat'. The fact that BUILDING follows *st* rather than precedes, or that 'seat' precedes both rather than follow either, is a convention that Egyptian scribes arrived at. The sequence of the three components therefore bears no relation to the sequence of units in the spoken language. As there is no logical sequence to the components, then there is no reason why logographic scripts should be bound to a one-directional linear orthography if the shapes of the components are different. Consequently, the components of logographic scripts tend to combine beside or below each other according to their shape in blocks rather than purely linearly. The above Egyptian example, for instance, is realized (for instance in hieratic script in line 77 of the *Shipwrecked Sailor* papyrus, Leningrad 1115,[3] line 77) in the block:

(8)




3) Viewable on-line at http://home.prcn.org/~sfryer/Hieratic/papyrus/index.html.

The second and third components, which are wider than the first, occur beside each other. The result is that in hieroglyphic and hieratic script the components all occupy a rectangular space, ensuring that no parts of this space are unfilled and that no components of the logograph overlap with those of the neighboring logograph.

This principle of Egyptian script is also exactly the same as that of Chinese script and Mayan script. All three scripts make use of the 'ideal square' as a fundamental aesthetic feature of the writing system. Components are expanded, compressed or - in the case of Egyptian - even added just to ensure that the square is filled. The square is of course an abstraction. Its outline is not normally drawn (although the cartouche that surrounds names of people in hieroglyphic script may be considered an exception), but its existence has more than just aesthetic properties. It also functions to define the division between logographs, equivalent to word-division in roman script or modern *han'gŭl*. In the case of Chinese and Mayan, the ideal square truly is square in shape, although in Chinese the resulting logograph corresponds to one syllable = one morpheme, whereas in Mayan it corresponds variously to a word, a phrase or a short clause; in Egyptian, on the other hand, it is rectangular so as to incorporate all the components, but it is nevertheless the same principle.

The link between the ideal square and the logograph and the unit in the spoken language that it represents is important in many logographic scripts. However, the principle of the ideal square may be adapted for various reasons. One example of these is a kind of visual word-play; another is the totally phonographic representation of a word within a logographic script. Both of these display a break of traditional conventions regarding the structure of the logograph; the latter at the same time imposes the

block script and the ideal square principles upon non-logographic writing.

There are various Chinese characters that one encounters displayed in calligraphy or signs – particularly in connection with luck or profit – that may not to be found in a Chinese character dictionary. A very commonly seen one is the 'double happy' character, formed from combining the character 喜 with itself:

(9) 囍

What is significant about this character is the fact that it is strictly a combination of two characters squeezed together into the single-character ideal square that characterizes Chinese script. This character, at least, has been incorporated into Unicode. Other examples have not. For example, the following character is one of a number of luck characters displayed by Chinese businesses that are formed from the fusion of the four characters of a saying:

(10) 

This is a composite of:

(11) 招財進寶

zhāo cái jìn bǎo

'beckon to wealth, receive a fortune'

Again, the four characters of the original saying have been compressed into a single ideal square. In this case, though, we observe a different

form of aesthetics in the way in which the character 財 does not appear as a discrete element in the larger character, its two elements 扌 and 貝 each happening to be similar to elements in other characters. 扌 therefore represents the left-hand side of 招 and the right-hand side of 財, whil 貝 represents the bottom of 寶 and the left-hand side of 財. This is essentially visual word-play. Most importantly, the strict principle of one character = one syllable = one morpheme has been broken. The single ideal square contains two coordinated clauses.

In Japan we encounter a similar effect with phonography. Despite the fact that pre-Modern and Modern Japanese writing is characterized as a mixed script, combining logography with phonography, some of the earliest Japanese had already developed full phonography. All the poetry in the early eighth-century *Kojiki* (711-712) is written phonographically, using *man'yōgana*, Chinese characters used purely for their pronunciation value, and certain volumes of the mid-eighth-century *Man'yōshū* (751-752) were similarly predominantly phonographic (for a brief discussion of early Japanese script see Habein 1984: 7-20). For instance, a common element in men's personal names was the suffix *-maro*. It is of unknown etymology (Martin 1987: 472), and so it has continued through its history to be written with the *man'yōgana*: 麻呂. *Man'yōgana* phonograms followed the Chinese one-character-per-syllable principle, a principle that the Chinese have always adopted in the transcription of polysyllabic foreign names into Chinese. Nevertheless, *-maro* is a single morpheme in Japanese. Eventually a tendency emerged whereby the two characters:

(12) 麻
呂

merged together into a single ideal square:

(13) 麿

In modern Japanese print, the element *-maro* may be represented with either (12) or (13). The latter is treated as a single character.[4] This combination of more than one phonogram into a single ideal square has a number of other parallels in Japan. Another example, for instance, is the way in which *masaki* 'Euonymus japonicus' may be written. Associating the element *masa-* with Classical Japanese *masasi* 正し 'be true' and *-ki* with *ki* 木 'tree', the plant may be written with two characters:[5]

(14) 正
木

There is, however, a *waseiji* (a character invented in Japan to write a native Japanese word) for this plant:

(15) 柾

The latter character is, like 麿, a combination of two characters into a single one. The motivation for this in Japanese is surely the fact that in Classical Chinese there is a strict one character = one syllable = one

4) Later *idu* in Korea also provides examples of phonograms combined into a single, ideal square. A large number of examples--including even a few phonographic character + han'gul combinations--are listed in Sasse (1980).
5) This is a folk etymology. Cf. Martin (1987: 473).

morpheme principle, whereas in Japan most morphemes are polysyllabic. This resulted in a clash between one character = one syllable, and one character = one morpheme. *Man'yōgana* spellings in Old Japanese normally observed the former principle, but the use of characters for meaning value to write native words weakened this, allowing forms like (13) or (15).

In Tranter (2001a) I illustrate a different use of the ideal square on an Old Japanese *mokkan* (wooden slat), which appeared to be a glossary. Each 'headword' character was accompanied by one or two characters that represented a type of *zhiyin* representation of the pronunciation. Where a 'headword' character was accompanied by two characters, these latter were compressed into an ideal square the size of a single character, for example:

(16) 迊
　　𠂇ナ

This is to be interpreted:[6)]

(17) 迊 *tsop* is pronounced like ナ *tsa* + 布 *puH*

A final example is the early modern use of

(18) 𠦂

as a single 'character' in printing. It is commonly found in late Edo

6) I use the Baxter (1992) transcription of Early Middle Chinese.

and very early Meiji period blockprint texts. It represents the word *toki* 'time' (in other texts written 時). However, it is a combination (and a slight fusion) of two phonographic (*katakana*) components:

(19) ト + キ

*to* + *ki*

These Japanese forms illustrate that the combination of phonograms into a single block as defined by the ideal square, albeit observing the one character = one *morpheme* principle, is not entirely unique to Korea or to the Khitan state. Moreover, when we consider other logographic scripts, we encounter parallel examples. An Egyptian parallel to examples (9) and (10) in construction and arguably even in mystical significance is the formula '*nḫw* + *wḏ3w* + *snbw* ('live - prosper - be well') which is often found as a closing formula in texts, such as at the end of the *Shipwrecked Sailor* papyrus. As a set formula, consisting of three coordinated verbs, the three logographs are abbreviated to a single component each ('live', *ḏ3* and *s* respectively) and written side-by-side in a single ideal square. The fully phonographic representation of words in Egyptian similarly adheres to the same ideal square structure. The *Shipwrecked Sailor* manuscript, for instance, begins with *ḏdyn* 'and said' written phonographically. The four letters are written in the same block structure:

(20)

| | |
|---|---|
| *ḏ* | |
| *d* | |
| *n* | *y* |

For a parallel Mayan example, see the three-glyph block <*ca* + *ca* + *u*> used to write *cacau* 'chocolate' in Coe (1992: 231), or the fourteen glyph blocks from Palenque used by Macri (1996: 179) as an illustration of the script: eight of these are entirely phonographic.

In East Asia, even the roman alphabet may be adapted to the ideal square principle. For instance, in Vietnam, which abandoned Chinese character script in the first half of the twentieth century in favour of the roman alphabet (*quoc-ngu*), letters of the roman alphabet may be placed in ideal squares, each corresponding to one syllable = one morpheme, for calligraphic purposes in imitation of Chinese calligraphy. In order to fit neatly, the components, in this case roman letters, may be compressed or expanded appropriately (for an example, see Hannas 1997: 93).

A final example of the roman alphabet being adapted to the ideal square is the Chinese artist Xu Bing's banner Art for the People, which consists of four characters, each representing one of the words of the title in the roman alphabet, but in Chinese calligraphic style and compressed or expanded in order to fill their ideal square (the banner was flown outside the Victoria and Albert Museum in London, winter 2000-2001). In conclusion, therefore, the ideal square principle may be adapted for various purposes in scripts, and there are many precedents for phonographic blocks within scripts. Rather than being related to each, the various examples of phonographic blocks are all derived from the fundamental nature of *logographic* scripts.

# 4. Khitan Influence on *Han'gŭl*

It is noteworthy that there is no mention of Khitan in texts relating to the creation of *han'gŭl*. The successor of Khitan, Jurchen, is indeed mentioned in Ch'oe Malli's famous memorial: 'Only types like the Mongolians, Tanguts, Jurchen, Japanese and Tibetans have their own graphs' (translation from Ledyard 1966: 104).

Ledyard (1997: 54) considers that there is little evidence or likelihood that the languages mentioned by Ch'oe Malli had any impact on the creation of the Korean alphabet. He also points out that the foremost of Sejong's scholars, Sin Sukchu, was said to have been able to speak Jurchen, although he observes that 'There is probably not much to the assertion of a knowledge of Jurchen, although Sin did have high military responsibilities on the northeastern frontier in the early 1460s' (ibid.).

The obvious parallel between *han'gŭl* and Khitan script is the fact that they are both phonographic block scripts that adhere to the ideal square principle, adapting the proportions of individual letters so that the result does not violate the aesthetics of the ideal square. There are, however, numerous differences.

Firstly, Khitan script is not alphabetic as such. The structure appears based on the 'semi-syllabic' (or 'telescopic') principles that also are found in Jurchen and Sumerian. Secondly, the organization of the letters within the ideal square is different. All Khitan letters are fundamentally square, in terms of the space that they occupy, and so, regardless of the letters involved, they occur in pairs, each pair occurring below the previous one (Liu & Yu 1990: 247-248). Therefore, any two-letter block will be

represented:

(21)

| A | B |
|---|---|

any four-letter block will be represented:

(22)

| A | B |
|---|---|
| C | D |

and so on. Only when there is an odd number of letters does this vary, with the final letter being stretched to twice its normal width to avoid violating the ideal square principle, e.g.:

(23)

| A | B |
|---|---|
| C | D |
| E | |

*Han'gŭl* consonants may also be considered fundamentally square in terms of the space that they occupy, but the vowels are not (Sampson 1985: 124-125). Apart from the now obsolete ㆍ all vowel letters contain either a horizontal line or a vertical line as their dominant stroke, and the script treats them differently: 그 and 구 vs 기 and 가.

Thirdly, the ideal square in *han'gŭl* is truly a square. In Khitan, on the other hand, it can be characterized as an ideal oblong, in that the blocks consisting of more than four graphemes are taller than they are wide. However, the Khitan script does still work on the ideal square - or rather ideal oblong - principle. The more oblong nature of such blocks is easily attributable to the fact that the blocks represent words rather than syllables, and that the graphemes of the Khitan script are generally more complex than those of *han'gŭl*. Of the 378 graphemes identified by Qinggeertai, the overwhelming majority consist of three or more strokes.

I have presented a range of parallels from Japanese and other logographic scripts that illustrated that the block principle of the ideal square can be adapted, either to enclose more than one logograph or to represent a word phonographically within a single ideal square. There is much evidence that many 'unique' vernacular scripts, such as Khitan, Jurchen, Tangut or Yi, were developed in the region through the precedent of other scripts with which they had contact. This resulted in them developing structural or formal similarities, including in certain cases the development of 'square', 'cursive', 'grass' and 'seal' script styles (Tranter 2001b: 1999). Moreover, such influence may also be observed in the creation myths surrounding them (ibid.: 201-202).

In conclusion, therefore, it is intriguing that the Khitan script shared a fundamental principle with *han'gŭl*, but, though it is impossible to prove that knowledge of the nature of Khitan script did not have some small role in the creation of *han'gŭl*, we should not expect to find any evidence to support this. We do, however, have powerful evidence for a common

ancestor of both scripts in terms of influence, namely the Chinese character script. The latter was structured entirely on the ideal square principle, and I have shown that the phonographic representation of words or morophemes within an entirely logographic system may result in the ideal square principle being adapted to phonography. Moreover, Khitan and *han'gŭl* also share the characteristic that, whereas in Japan the phonographic ideal square was highly sporadic, it was developed into a principle for the entire script.

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