Directionality and Alignment in the Cuneiform and Chinese Scripts
(draft)

Benjamin Studevent-Hickman
The Oriental Institute of the University of Chicago

Comparing writing systems is always a risky business. Any given writing systems will appear "different or similar, depending on which aspects are examined" (Taylor and Olson 1995: 15), in the latter case even yielding such oxymoronic phrases as "diverse oneness" to describe them as a whole (DeFrancis 1989). The slope is particularly slippery where directionality and alignment are concerned,[1] for there is no universal when it comes to these qualities. East Asian writing systems and other logosyllabic--or, perhaps better, morphosyllabic--systems (e.g., Sumerian) were traditionally written vertically but could be written horizontally as need be; by contrast, more phonetic systems (e.g., alphabets) were generally written horizontally but may, analogously, appear vertical at times. Nevertheless, depending on the relative number of these exceptions, one can still speak of a script being in a specific direction and with a specific alignment.

The question of why the characters of an ancient script were aligned vertically or horizontally and read in a specific direction is very difficult to answer. With no native writers of ancient systems to consult, modern scholars are bound by witnesses, which may be confined to particular time periods and geographical areas and, thus, represent a partial record of the overall writing system. Despite this handicap, reasonable deductions are possible when the writing system is viewed in the larger context in which it was created, used, and developed. This brief discussion examines the development of two early scripts, Sumero-Akkadian cuneiform and Chinese, with particular attention to their directionality and alignment. One of the primary goals here is to examine the factors that led to these changes and, ultimately, why these two writing systems in particular lent themselves to both vertical and horizontal alignment. To address these issues, this discussion relies on integrational semiology, which, simply put, examines the larger context of reading and writing within a given system. As argued here, it was ultimately the morphosyllabic nature of the Sumero-Akkadian and Chinese writing systems that made them so conducive to these changes--changes that were ultimately based on foreign influence and/or political reforms.

Integrational Semiology, Directionality, and Alignment

One of the most constructive disciplines that can be used to address the issue of directionality and alignment in writing systems is integrational semiology. This discipline, developed most vigorously by Roy Harris (1994; 1995), has its basis in Saussurean semiology but, as the name suggests, is much more "integrational" (i.e., contextually based) in its approach. As outlined by Harris,

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[1] By "alignment" I mean the relative position of the graphs with respect to each other. The letters in this sentence are *aligned* horizontally, but they could be read in either *direction*, theoretically.

> [i]ntegrational theory recognizes three sets of factors which typically contribute to the making of any sign: (i) *biomechanical* factors, relating to the capacities of the human organism that determine the parameters within which communication can take place; (ii) *macrosocial* factors, relating to cultural practices and institutions established in particular communities; (iii) *circumstantial* factors, relating to the particular context of communication and the activities integrated (Harris 1995: 22).

In this regard, integrational semiology treats reading and writing as integrated and "linked" by "reciprocal presupposition." In other words, "[i]ntegrational phenomena are structured in such a way that the possibility of a later operation depends on the execution of an earlier operation, which in turn derives its significance from the anticipation of that possibility" (1995: 6).

Fundamental to integrational semiology in this context is the concept of "graphic space," the area where text is positioned and, accordingly, read. Above all, graphic space functions to identify and exercise the external and internal syntagmatics of a text--namely, the relationship of the written characters to the "items or event to which they are significantly connected in the space outside," and the "disposition of written forms relative to one another and to other forms within the same graphic space," respectively (1995: 121). It is the interaction of these two elements that determines the way a text is written, read, and interpreted.

The use of both direction and alignment are absolutely critical to the use of graphic space and the way a text is ultimately processed. In beginning to write, a person can, theoretically, place the first graph anywhere, but this placement must anticipate subsequent graphs; and, if they are semiologically related, these graphs will invariably occur adjacent to one another. Obviously, the center of the graphic space provides the most options vis-à-vis the placement of the second, which is where "the question of direction first arises." The question, then, is where to place the first one. According to Harris, "[t]here is an obvious (biomechanical) advantage, both for the writer and for the reader, in adopting a solution which, so far as possible, minimizes the difficulty of identifying which the 'next' square is"; "[i]n other words, the optimum principle will be one which eliminates as many as possible of the many alternatives and ambiguities which would otherwise arise in plotting a consecutive path " (Harris 1995: 129-130). One of the key ways of doing this--and this is practiced in virtually every system throughout history--has been (a) to place the first graph in one of the corners and (b) to imagine the entire graphic space as a grid (no writing system places the first graph in the center, as a rule, nor do any place the second graph diagonally to the first).

The question of direction grows more complicated still, for the writer also has to determine the direction of the resulting rows or columns relative to each other. And to complicate matters further, "the combination of the two [determinations] produces a third….the direction obtained by drawing a straight line between the initial square on the grid and the final square….No major traditional writing system goes from bottom right to top left, or from bottom left to top right. The reason for this is again in all probability biomechanical: any bottom-up system will have the disadvantage of forcing the writer's hand to conceal part of what has been written previously" (Harris 1995: 131).

Perhaps the most interesting aspect of this process is the concept of the new line of text (i.e., "where to go at the end of graphic space/line"). According to Harris, "[w]hat is called a 'line' of text is based on a convention whereby when writing reaches the edge of the graphic space, *instead of continuing the path according to the principle of immediate proximity*, a break is made....This break is not syntagmatically determined. It is purely and simply a question of the organization of graphic space. What this does is sacrifice strict continuity, but allow the writer to keep all the characters 'facing the same way'" (Harris 1995: 131-32).[2]

This conceptual framework is particularly conducive to studying the Sumero-Akkadian and Chinese writing systems.

Directionality and Alignment in Sumero-Akkadian Cuneiform

The origins of cuneiform and its use in the Sumero-Akkadian writing system are well known and largely uncontroversial, but where direction and alignment are concerned, its development remains highly disputed.[3] This much is certain: The original, Protocuneiform script was largely pictographic, and its graphemes were formed using essentially the same principles found in early Chinese writing (see Yushu Gong's contribution in this volume). These individual graphs stood upright; that is, their orientation reflected the natural, standing position of the objects they depicted. When placed together and semiologically relevant to each other, the initial alignment of the graphs is not easy to determine on close inspection: Groups of characters were placed together in text fields (i.e., graphic spaces), but the order of characters within those fields (i.e., the orthography of compound characters) could vary, as could their relative positions within the space. Nonetheless, the alignment can safely be assumed to have been vertical, for not only are the text fields elongated along the vertical axis of the characters, but the rows of text fields themselves progressed from top to bottom, as did the characters within them. Later, in the late third millennium, these text fields extended the length of the entire graphic space, thus forming rows or lines; at the end of a given side of text, the principle of immediate proximity could or could not be followed.

At some point--and this is the part that remains disputed--the strings of characters, be they in smaller text fields or columns, were rotated ninety degrees counterclockwise and the alignment of the text became, as a general rule, horizontal. The earliest evidence for this comes from the middle of the third millennium, when the characters were rotated about the graph for the numeral *1*.[4] At this time, there was no independent confirmation of the rotation based on other criteria; this is to say, on objects whose standing position could be established clearly, or which depicted some clear directional relationship to other internal syntagmatics (e.g., other iconographic material alongside the script that provided the orientation of the object as a whole), the script still remained vertical, with a few exceptions. If one excepts that the rotation about the graph for *1* reflects the rotation

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[2] Harris calls this phenomenon "face," defining it as "the relationship between horizontal orientation and alignment."

[3] This recapitulation follows the author's earlier study of the subject (Studevent-Hickman 2007).

[4] The alternate view sees the graph for *1* rotated, not those graphs that appeared alongside it.

of the script as a whole, however, it was implemented to a much greater extent in the Sargonic period, especially under the kings Naram-Sin and Shar-kali-sharri, when several other writing reforms were also introduced.

The first large-scale implementation of the rotation across all media did not take place until some seven hundred years later, when the Kassites became the dominant power in Babylonia. Here, too, foreign influence (i.e., political motivations) were the driving force behind the change. Political motivations would also dictate similar reforms in the history of the Chinese writing system.

Directionality and Alignment in Chinese

According to the present state of our evidence, writing appeared fully formed in Anyang, China, under the Shang dynasty in the thirteenth century B.C.E. And while there is some evidence suggesting the possibility of transmission from the Near east (e.g., the presence of jade in third millennium Mesopotamian tombs, the Anau seal from Turkmenistan--roughly half-way between the two areas), there is as yet nothing to substantiate this to any serious degree.

Like those from Protocuneiform, the earliest Chinese graphs are pictographic and oriented largely based on the standing position of the objects they represent. Unlike Protocuneiform, however, there is nothing to suggest that either the direction or the alignment of these characters was fixed in these inscriptions: characters could run left to right, right to left, or top to bottom. Moreover, there was considerable variation not only in individual graphemes but also in the orthography of larger phrases (Bagley 2004: 201-202).[5] In short, the Anyang inscriptions show considerable variation, which, for some, is indicative of the fact that the writing system is still in its infancy (Bottéro 2004: 257).

Where the formation of the graphs is concerned, the first large scale reform of the Chinese script came at the end of the Zhou dynasty (ca. 1045–221 BCE).[6] The reasons for the reform are clear: This period saw a proliferation of writing on several kinds of media, which led to considerable variation in the form of the graphs; also, politically the period was characterized by the existence of several independent states, which further contributed to the diversity of the characters. It was at the end of the Zhou dynasty, specifically with the subsequent Qin dynasty (221–206 BCE), that the first attempt to unify not only all of China but the entire script took place. The new script, developed by the emporer's Grand Counselor, Li Si, and called the "Small Script" (or, simply, "Qin Script"), offer a much more regularized script, but orthographic peculiarities were still common (Boltz 1996b: 195-196). It was only in the subsequent Han dynasty (206 B.C.E. to 220 C.E.) that these variations were largely removed, when Xu Shen set out his explanation of the unit and compound characters en masse. Without question, Xu Shen's work provided the real cohesion the script had needed for so long. In short, in setting out his description of the Chinese script and its formation, "he [was] able to identify nonstandard forms of characters, implicitly curbing their use" (Boltz 1996b: 196); moreover, the script he developed would form the basis of all subsequent versions of the Chinese script. Perhaps the most important and lasting contribution of the Han dynasty

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[5] It is important to note that these variants do not occur in the same text (Bagley 2004: 240 n. 22).

[6] For a general discussion of the reforms of the Chinese script, see Mair 1989.

reforms for direction and alignment was (a) the standardization of the size of each character, which made it such that every character, whether unit or compound, had to fit in imaginary squares of identical size; and (b) the general solidification of the direction and alignment of the script, in columns from top to bottom running from right to left (Mair 1996: 201).

The last series of reforms of the Chinese script occurred over 1,500 years later, and, while they do not reflect changes to the Chinese script per se, they do play an important role in the present direction and alignment of Chinese. Most of these reforms involve some type of Romanization, the two best-known being Bopomofo, which was invented in 1913 and is still used in Taiwan; and pinyin, whose "first schemes" go back to the sixteenth century with the arrival of the Jesuits in China (Mair 1996: 204). The latter would become fully developed some 500 years later, when it was developed in the Soviet Union for Chinese residents there in 1931. It was adopted by China in 1958 and remains by far the most common method of Romanizing Chinese today. Most importantly for the present discussion, the Romanization of Chinese placed a horizontally aligned script (i.e., the Latin script) alongside a vertical script. This, as well as the additional, global influence of the Latin script, have made it such that Chinese can now appear either vertical, from top to bottom, or horizontal, from left to right, in any given context.

Observations on Reform, Directionality, and Alignment in Sumero-Akkadian Cuneiform and Chinese: The Morphosyllabic Effect

According to the evidence outlined here, there is something in the Sumero-Akkadian and Chinese writing systems that rendered their scripts more susceptible to changes of alignment. By far the most immediate and reasonable explanation is their pictographic nature. As pictographs, the individual characters in these systems could be more easily shifted with respect to each other, and examples such as Egyptians hieroglyphs, which can be realigned quite easily themselves, support this. But two arguments speak against this as the *primary* reason. First, over the millennia, the characters have become increasingly abstract, in many cases all but losing any semblance to the objects they originally depicted, yet it is during after losing this quality that such changes in realignment were introduced, at least as reforms. Second, there is a fundamental difference between the changes in alignment between the two scripts discussed. In the case of Chinese, regardless of whether the alignment is vertical or horizontal, the individual graphs always maintained their original, upright position or stance. When a sentence in Chinese is changed from vertical to horizontal, every graph must move--while remaining vertical--to the right of the graph that formerly preceded (i.e., fell above) it. This is not the case with cuneiform: there, when the alignment shifts from vertical to horizontal, the entire string of characters, as a unit, rotates about a single point with respect to the other graphs. As a result, the graphs themselves are rotated ninety degrees counterclockwise, losing their pictographic nature in the process. There must be another explanation.

In my view, the morphosyllabic nature of both the Sumero-Akkadian and Chinese writing systems, independent of the contribution their pictographic nature makes to this, offers the best explanation for their susceptibility to realignment. In both systems, each individual grapheme is imbued with a certain independence--an independence not shared

by more phonetically based systems such as alphabets. In the case of Chinese, Mair, perhaps, states this point best:

> [I]t must be admitted that Chinese characters function differently from a purely phonetic script in that they have a powerful ability to carry semantic weight in and of themselves--i.e., without entering into combinations, as is necessary for the elements of phonetic scripts to convey meaning (1996: 201)[7]

This semantic weight, as it were, renders the individual graphemes "stronger," for lack of a better term. And by virtue of their "strength" or "independence," they can be realigned freely without any risk of losing the sense of the compounds of which they form a part, so long as they remain adjacent to those semiologically relevant characters.[8] To be sure, this strength is also reflected in the fact that the Chinese characters have, throughout their history, resisted quite serious threats to their semantic nature. During the Qin reforms, for example, silk manuscripts suggest that Chinese orthography was still not fixed. But the specifics of this development are striking:

> Some of these manuscripts even hint at impending desemanticization of a few graphs, which would have allowed them to function almost as syllabograms. Had this tendency fulfilled itself, it might have added a genuine syllabary to the Chinese writing system. But that did not happen. The tendency toward desemanticization was arrested by a conscientious use of semantic determinatives as an intrinsic part of a character's structure, almost as if the intellectuals of the time were consciously committed to thwarting any movement in the direction of the syllabary and to reaffirming the logographic structure of the script (Boltz 1996b: 196)

Indeed, one striking feature of the Sinitic scripts as a whole is that they have "endured as viable writing systems throughout China and Japan, yielding neither to Indic aksharas nor to European alphabets in spite of extensive cultural contacts with both" (Boltz 1996a: 190).

This view finds additional support in the constrasting, early development of the alphabetic scripts. To be sure, early alphabets, in whatever form they take, could be written from right to left or left to right--or both in the case of boustrophedon writing--but they virtually always maintained their horizontal alignment, the exception being the Proto-Sinaitic/Proto-Canaanite scripts, which could appear vertical (Healey 1990: 24). While there is nothing to preclude alphabets from being written vertically, the fact remains that they, as a rule, have not been, even when foreign influence or cross cultural borrowings were involved. This, in my view, is a function of their much stronger, combinatory structure at the level of the lexeme formation.

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[7] Here I would note that Chinese also lends itself to perpendicular realignment by virtue of the fact that its characters, early in their history, were confined to square of equal size--virtual shipping containers, if you will.

[8] This, in my view, also explains why the orthographies in these writing systems were fixed at such a late date in their development.

This argument also finds support in cognitive experiments with morphosyllabic and alphabetic systems. In general terms, Robinson notes the following:

> Experiments with reflected and rotated letters prove that the mind thinks partly in images. A subject was momentarily shown images of an alphabetic letter on a screen and was asked if the letter was normal or a mirror image of itself. In order to probe the mental process, the letter had been rotated--through angles up to 180 degrees--requiring the subject mentally to rotate it back to its upright position. It was found that the further round the letter had to rotate, the longer the subject took to answer (Robinson 1995: 39)

Closer to the point, several experiments suggest that "meaning extraction" is faster with morphosyllabic systems than with alphabetic ones since the individual characters provide inherent, visual clues (Hoosain 1995; Liu 1995).

The evidence at hand suggests that it is the morphosyllabic nature of the Sumero-Akkadian and Chinese writing systems that rendered their scripts susceptible to realignment. Where those realignments occurred, foreign influence or political reforms are invariable the cause. It seems strange, in the end, that what appears as relative freedom in the organization of graphic space ultimately reflects the confinement inherent to the gridlike structure we, and writers and readers, impose on it. As Harris notes, writing is, effectively, "a history of successive attempts to escape from being imprisoned within a graphic box. But however desperate the attempts, the box--visible or invisible--remains" (1995: 124).

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