The Origin of the Alphabet

Abstract
The origin of our writing system, the alphabet, has been debated for centuries. I revisited the issue from a systematic viewpoint and developed a line of enquiry with particular focus on the transformation theory of Sir D'Arcy Wentworth Thompson and contemporary systematics. I offer ten different lines of evidence supporting the theory that the invention of the alphabet was the result of a synthesis of forms of the Aegean Linear scripts with script(s) of the Levant.

Introduction

Although the ancestry of our current writing system can be traced with certainty to the Latin alphabet, the ultimate origins of the latter have been debated for centuries (1, 2). Both mono- and polygenic theories have been proposed, but none has met universal acceptance (1-4). The ancient sources seem unequivocal that the invention of the alphabet was the result of major interaction of different cultures of the Mediterranean, albeit with great differences on the details (5, 6). Contemporary studies have made surprisingly little headway on the issue. With some exceptions, much of the Anglophone literature follows Herodotus in suggesting that the Greek alphabet was an adaptation of a Phoenician script (7, 8). Tree-like diagrams connecting the various scripts are often produced but without any explicit methodology and only rarely is it mentioned that this parentage scheme is in fact conjectural and untested (9). Apart from disagreements on dating of various archaeological findings, theories on the origin of the script are marred by the lack of a solid reference framework for quantitative assessment, a situation strongly reminiscent of the state of biological systematics before the advent of phylogenetic algorithms. In recent decades, however, a powerful toolbox of methodologies and philosophical concepts has been developed for systematics of organisms (10). Although scripts are not organisms in the current sense of the word in English, they are organomena (organized systems) and as such, well within the scope of implementation of systematic methodologies. These are currently being used for the study of relationships of languages (11) and manuscripts (12), and could provide the robustness of phylogenetic and statistic analyses hitherto lacking in the study of other organized systems.

A great number of theories that have been offered in the course of the centuries on the origin and historical development of the alphabet, often driven by religious, ideological or even racial motives (2, 13). Three have enjoyed revival and/or significant support in the 20th century: the Egyptian, the Cretan and the Sinaitic, with a significant party of undecided scholars. The derivation of the alphabet from Egyptian hieroglyphics is nowadays advocated only in relation with the Sinaitic theory, which suggests that Egyptian writing formed the inspirational basis of the inscriptions found in Sinai mines. Consisting of a small number of texts known as the Proto-Sinaitic, they are dated towards the end of the Middle Bronze Age -ca 1500 BC (8). These are supposed to have been the first texts in the Proto-Canaanite which, in turn, gave rise to the Phoenician at ca 1050 BC (14). The Cretan theory, advocated by Sir Arthur Evans proposes that the Cretan scripts, earliest findings of which go back to the late 3rd millennium BC, were taken from

Crete to Palestine by the Philistines and formed the basis of the alphabet (2). Both theories have been criticized for their many difficulties. The Cretan theory, proposed well before the decipherment of Linear B by Michael Ventris (15) was based on superficial similarity and does not appear to have currently any supporters. The Proto-Sinaitic theory still attracts attention not least because of its Biblical connotations; more sober analysis makes it all but impossible to accept (8).

Since most of the theories hitherto proposed have been strongly influenced by non-grammatological constraints, I tried to examine the situation using independent scientific methodology. I reviewed, from a systematic viewpoint, evidence concerning all the scripts involved in these theories, in order to assess possible interconnections and systematic relationships.

Homologies and morphological similarities

The first concern was to establish whether phonetic equivalence of symbols had any correspondence to morphological similarities, in order to assess homologies that would allow a systematic analysis. In essence the first question to ask was: do similar forms represent similar sounds? Comparison of the various systems revealed significant similarities (see SOM {link to file 4}, section 3 for individual symbol forms and D'Arcy Thompson tropes describing potential transformation series) for symbols from the Vinča signary, Linear A, Linear B, Linear C, Levantine Protolinear, Phoenician abjad and Greek alphabet. Egyptian hieroglyphics did not show more than occasional superficial similarity, nor did most Proto-Sinaitic symbols. Although similar Vinča symbols can be easily provided for all letters, they were excluded as there is no generally accepted decipherment or agreement on their relationship with other scripts and hence homology, a primary consideration for systematics, could not be established. Much fewer Proto-Sinaitic symbols showed significant morphological similarity and given that a convincing decipherment is also lacking, no meaningful comparison could be established for the majority of letters apart from superficial similarities. In total, four scripts have direct phonological links to symbol morphology (Linear B, Linear C, Levantine Linear/Phoenician and alphabet), while Linear A is both very close morphologically and broadly accepted as a close relative of Linear B and hence could be included in the analysis.

Taxon relationships and symbol onomastics

A summary of the comparisons of the outlines of different homologous forms is provided in Figure 1 {link to file 1}. As it immediately becomes apparent there is a striking morphological similarity of symbols of the Linear syllabaries, the early alphabet and the Phoenician abjad. Simple D'Arcy Thompson tropes of morphological transformations, which often occur in writing systems, can lead to successively linked morphologies (SOM {link to file 4}). Further evidence for script interrelationships is provided by symbol names. Previously, these have been often linked to word meanings in order to support theories of origin. It is elementary to find such links in specific languages, let alone language families like Indo-European or Semitic (see also SOM {link to file 4}). It is impossible to independently assess or compare these speculative

connections, and I therefore consider them of little value. The symbol onomastics appear much more straightforward: the letters of the Greek alphabet (and indeed much of the Phoenician, as reconstructed from the Hebrew) mostly share the syllabic value of the related Linear B or Linear C syllabogram either as their name or part thereof (Figure 1 {link to file 1} and supporting material {link to file 4}).

Linear forms persisted in the Aegean while systematic analyses reveal an eastern connection

Further evidence of the interrelationship of the archaic Greek alphabet with the Aegean syllabaries in particular is provided by the fact that forms not found in Phoenician or the Levantine Proto-linear but present in Linear B and Linear C persisted in local alphabets into the classical years. Nine such forms or variants thereof can easily be distinguished (Figure 1 {link to file 1}): B_2, three–line F, I_2, M_1, Ξ_1, horizontal Ξ_2, R_1/R, P_2/P and Y, indicating continuity or overlapping of Linear writing and the alphabet in the Aegean. Additionally, the alphabet encodes vowels like the Aegean scripts but unlike the Phoenician abjad. When the morphological data were submitted to systematic analyses however, both in cladistic (parsimony) and phenetic (distance) terms, the alphabet was found to be more closely related to Linear C and the Phoenician, both in the Eastern Mediterranean rather than the Aegean Linear B. The tree topology was highly supported in both cases (Figure 2 {link to file 2}). This is a crucial result that is in agreement with the ancient reports on the origin of the alphabet in an eastern context as well as its different nature to the syllabaries. The alphabet does not appear to have been just the next step on a gradual development of the Aegean syllabaries. A major transformation in organization has taken place, reducing the 70-90 symbols of the syllabaries to just 23 of the archaic alphabet found in the Doric islands and Crete (16).

The question of symbol order

The question remained about how the order of these 23 symbols was devised. Following Diodorus Siculus' narrative (6), I considered Syrian candidates as probable sources for phoneme order and in particular one of the Ugaritic cuneiform scripts. Ugarit, in present day Ras Shamra in Syria, found opposite the Cape St Andreas of Cyprus on the Syrian coast, was a metropolis of the Bronze Age with well-established relations with both the Aegean and the Asian hinterland (17). Although the cuneiform script is written in a different way, with resulting drastically different morphology, there is a striking similarity in phoneme order that has been previously suggested as an influence for or by the Phoenician and/or its ancestors. Subsequent comparison revealed that the alphabet shares 7 domains (Figure 3 {link to file 3}, domains i-vii) of similarity with the Ugaritic, while the Phoenician and related abjads share 6. Hence rather than the alphabet coming from a single progenitor, these observations would suggest that the emergence of the new semiotic system was a result of plexis or interweaving of different cultural organomena from the Aegean (form) and the Levant (order).

Internal evidence indicates that the alphabet was an invention

Attention is drawn to the fact that the tree-building methodology used here reveals systematic relations rather than ancestry. The reconstruction of the emergence of the

alphabet needs to be based on further considerations and evidence. The first issue to be addressed and one that has been the subject of much debate is whether the alphabet was an invention or the result of a gradual process. The distribution of symbols within the archaic alphabet is not random but follows a unique arithmetic pattern that is not found in the Ugaritic script. The five vowels are distributed in intervals of 3, 4, 5 and 6 consonants indicating that the proto-alphabet was a conscious invention in a single place, at a single time. The arithmetic significance of this series aside, two further lines of evidence show that the event most likely happened in the East and was indeed an invention. First, only the five vowels of the Eastern Greek syllabic scripts (at least as we know them from Linear C) are used as opposed to the seven or more symbols for vowel phonemes present in local Linear B variants of the Aegean. Secondly these 5 vowels are arranged in a meaningful sequence (Figure 3 {link to file 3}) that could have served as a simple mnemonic device in the early days of the adoption of the alphabet by scribes used to syllabic Linear writing, if it did not have a more profound meaning to the developers of the script (in preparation). Not only can the sequence AEIOY be easily shown to be meaningful, but the same time forming a nested harmonic of vowels (29), a sequence that is obviously lacking in the Ugaritic cuneiform.

Under this light, a hypothesis that a polyglot inventor(s) recognized the simplicity and power of the Ugaritic cuneiform and adopted it with Aegean forms and simple mnemonic devices in order to help it spread in the lands of the Linear syllabaries, is emerging as a likely scenario.

Summarizing, the invention of the alphabet as a synthesis of forms, principles and organization deriving from Aegean syllabaries with a Levantine script in an Eastern context is supported by at least ten lines of evidence: (i) ancient literature testimonies, (ii) symbol morphological similarity, (iii) phonetic homology, (iv) letter onomastics, (v) letter variants in Greek alphabets that have counterparts in Linear B homologues but not in Eastern scripts, (vi) encoding of vowels, (vii) the internal organization of the alphabet resembling the Ugaritic but according to an arithmetic distribution, (viii) the use of the five vowel phonemes present in Eastern Greek syllabic system (as it has survived in Linear C), (ix) meaningful sequence of vowels, and (x) the systematic position of the scripts on the tree of Figure 2 {link to file 2}. Even if some of this evidence proves not to apply for a particular symbol, it is all but impossible that it all comes from a random process. This leaves little doubt for the case of conscious invention in a specific cultural and geographical area and against a gradual accumulation of small changes.

Epilogue: a marriage of Kadmus and Harmony

The lines of evidence presented here and the results of their analysis indicate that our script is the result of plexis of different ancestral systems, a result of synthesis and symbiosis of forms and organizing principles originating in different cultures. It also indicates that all past efforts to give credit for the invention of the alphabet to just one group, based on ethnic, linguistic or religious lines as we understand them in the 20th and 21st century, are at best, misplaced. All the more so when we are talking about an event that took place at a time when such concepts, as we understand them now, did not exist.

And yet, what existed and never ceased to exist is myth. Can the long forgotten original messages hidden in the allegory of myth be reconstructed? Taking the Theban myths and the interesting coincidences a step further, perhaps unsurprisingly for mythical circle dominated by the descendants of Kadmos, the Labdacids, we find their own signature letter, labda, at the very center (position 12) in the proto-alphabet. Remarkably, should the results described herein prove to be of value, they would give a new, hitherto unseen or forgotten meaning to the old myth of the marriage of Kadmos and his wife Harmony. They could show that the "Kadmeian letters" of the alphabet were indeed organized around the concept of a harmonic sequence of numbers.

Materials and methods

Symbol sources and relations

I considered the symbols and organization of the scripts involved in the main theories on the origin of the alphabet: hieroglyphics from Egypt, Proto-Sinaitic (8, 14), archaic Phoenician (from ca 1050 BC) and earlier inscriptions from the Levant(14), as well as Linear A (18), Linear B (19-21) and Cypriotic or Linear C (22) and archaic Greek alphabet symbols from the Aegean and beyond (16).I have also included symbols of the Vinča semiotic system that has been proposed as the ancestor of Linear A (23). Dates of the various findings vary widely. The earliest Vinča symbols are dated at the mid-6th millennium BC, earliest Egyptian in the late 4th and first Cretan writing at the end of the 3rd (for further treatment of the dating debates and sources of digital characters, see supporting on-line material –SOM {link to file 4}, sections 1.1 and 2.2). The relationships of the three Linear syllabaries are well established. Comparative analysis with the other scripts was based on correspondence of morphology with phonetic values. In order to establish homology (literally, "saying the same thing"), a fundamental prerequisite for systematic analysis, these had to be identical or similar, given the different principles of encoding in syllabaries, abjads and alphabetic writing.

Taxon delineation

The relationships of the Aegean syllabaries present few difficulties (19, 24, 25); the Levantine scripts presented a more complex problem. The Phoenician abjad is usually arbitrarily separated from older Levantine inscriptions of which it is a later local development, based on historical criteria (14). In reality, if one excludes the Proto-Sinaitic and a few Palestinian pictographs both of uncertain interpretation, the first inscriptions with significant similarity to alphabetic symbols, encoding any perceivable meaning come from the 13th century Levant at the earliest. These are inscriptions of both non-Semitic (Izbet Sartah ostracon) and Semitic languages (Lachish ewer) (14). The term Proto-Canaanite is anyway problematic and I will follow Kaufman (26) in naming the inscriptions belonging to this period Proto-linear and to separate it from the other linear taxa, Levantine Protolinear. As far as consistent morphological differences are concerned however very little separates the two Levantine forms. Although slight style differences may be useful in paleographic terms, they are of little use for systematic analyses and these forms were considered together as a single taxon (see also below).

Character coding and systematic analysis.

Each symbol was treated as an individual organomenon and was analyzed to simple traits (characters) that is, the simple marks or scratches a scribe would employ to create a semaphore. When in doubt, all lines needing one separate movement of hand were scored separately (see attached matrix). I present the forms as found in the archaeological (stratigraphic) record as well as their outlines. Minor morphological differences are sometimes considered paleographically important. Apart from the methodological objections on paleographic typology, particularly on the lack of correspondences with securely dated strata and its being logically cyclical (see also (26)) did not find these minor differences to be of any diagnostic value.

To avoid controversy, characters were scored as presence-absence rather than given different weights (10). The matrix generated (SOM {link to file 4}, section 6) was used to calculate systematic relationships with PAUP* (27) using exhaustive search with parsimony and the distance algorithms. Robustness of relationships was assessed using bootstrap support for 10000 replications and Bremer (28) support (parsimony only). Bootstrap values above 50 and Bremer 1 or more are considered to show support for any given clade.

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Figure legends

Figure 1 {link to file 1}**.** A summary of homophone symbol morphology in Linear A (LA), Linear B (LB), Linear C (LC), archaic alphabet, Phoenician abjad and modern Greek and Latin letters. Outlines of selected symbol variants are presented here; there sometimes was considerable variation (more on SOM 3 {link to file 4}) in form or orientation. Forms are drawn here in a left-right convention for symbols used in the Aegean syllabaries and the archaic alphabet and right to left for Phoenician. Both writing orientation and drawing angle varied in original inscriptions. The interrelationship of the syllabic value with later letter name is also shown. The part of the letter name derived from the ancestral phonetic value is underlined and bold, while the related syllabic value in Linear B or Linear C is underlined. Where more than one forms or variants can be found in local archaic Greek alphabets for the same symbol/letter these are given on a separate line.

Figure 2 {link to file 2}**.** Total evidence relationships for homophone symbol forms in the five different scripts, Linear A, Linear B, Linear C, Phoenician abjad and archaic Greek alphabet. Both phenetic and cladistic analyses resulted in the same tree topology, with distance bootstrap support (written first below the respective branch) slightly higher than parsimony (written second) in the case of Phoenician/Greek group. Decay index values (Bremer support) are shown in front of each node in bold.

Figure 3 {link to file 3}**.** Relationships of phoneme order in the archaic alphabet, the Ugaritic cuneiform (in the box, left column shows probable phoneme value represented by the symbol on the right column), and other Levantine abjads, the Phoenician (column I), the Samaritan (column II) and modern Hebrew (column III – when two forms are present the left is the form used when the letter is present at the end of a word), presented here in lettersets used in word processing. The order and the position of archaic vowels as reconstructed here is confirmed by the archaeological evidence of the Marsiliana Etruscan abecedary (photograph, far left). Seven domains of homology (i-vii) can be traced between the alphabet and the Ugaritic and six for the Phoenician and relatives. The selection of letters follows a non-random pattern, using the five vowels of the Cypriotic system and spelling “AEIOY” while interspersed with 3, 4, 5 and 6 consonants, further supporting the idea that the alphabet was an invention in an Eastern context. Note that the order is not identical with the Ugaritic but specific letters/sounds have been omitted or transposed to accommodate the harmonic principle