

The interdependence of writing material and scribe's  
posture as reflected in calligraphic shift and  
historical script development in 1st millennium BC  
Northwest Semitic alphabets

Reinhard G. LEHMANN  
Johannes Gutenberg University of Mainz, GERMANY

Dear colleagues & friends,

The first alphabet in the strict sense of the word evolved sometime in the 2<sup>nd</sup> millennium BCE somewhere in the greater area of Syria-Palestine or the Northern Sinai.

No one knows precisely when this happened, where it exactly happened, and who did it. In fact, only little is known about what happened at the dawn of the alphabet. However, for this globally unique invention neither an inventive genius nor a divine epiphany was responsible. Rather it was a presumably long process of trial and error, depending on some basic notions for the writing of foreign names in pre-alphabetic systems like Hieroglyphic Egyptian and Cuneiform Akkadian, which eventually culminated in a first fully functional and true alphabet. But this is another story and not the topic today.

What is an alphabet, and how do we define it? According to David Crystal, an alphabet is “a type of writing system in which a *set of symbols* (letters) represents the important *sounds* (phonemes) of a language.” Albeit there will be objections to that definition and also different and more sophisticated definitions, in my opinion this one works perfectly for our purpose. And I am convinced that it also works perfectly in general.

This is what we definitely have in the Levantine trade port cities of the late second millennium BCE, in Ugarit, in Byblos, and beyond. Also, it was this alphabet, which only later and as an offspring, evolved as the Greek and subsequently other ‘Western writing’ alphabets like Latin and the manifold offsprings thereof.

And indeed, even the Greeks with all their pride and xenophobia did never deny that their alphabet was an import and never claimed that it were a native invention. Rather, the best of their historians, like Herodotus for instance, admitted freely that the Greek alphabet was borrowed from the Phoenicians, calling its early characters φοινικῆια γράμματα or καδμήια γράμματα.<sup>1</sup> Also, by no means it is reasonable to challenge the ancient North Semitic Levantine alphabet as if it were not yet a true, fully functional alphabet because it had no signs for vowels. On the contrary, for structural reasons the ancient Semitic languages were not thus dependent on semantic distinction by vowels. No one ever claimed that an alphabet must represent *all* sounds of a language. It is mostly a matter of how much ambiguity one can tolerate and how much entropy one can stand before the writing becomes incomprehensible — and this depends on the structure of the language itself. Hence, for the first true alphabet, used for languages that were (Northwest) Semitic, a set of first of 27 or 29, later of 22 *consonant* graphemes only was quite enough: a *set of symbols* that “represents the important *sounds* of a language.”

---

<sup>1</sup> HERODOTUS *Hist.* V 58-59, cf also PLINIUS *Nat. hist.* V xiii 67 and *Nat. hist.* 7.57 (56).

## 1. The scribe—*sofer mahhir*, the tachygrapher

This was the state of affairs already in the early or middle second millennium BCE. In the late 2<sup>nd</sup> millennium—at the latest, as far as we know—it came to pass that scribal proficiency at its most high level took also possession of the alphabet.

Scribal proficiency in general, albeit for non-alphabetic writing only, was already well established and widespread in the Ancient Near East as early as in the 3<sup>rd</sup> and 2<sup>nd</sup> millennium BCE. This was for Egyptian Hieroglyphic logo-syllabographic, or for syllabic cuneiform writing on clay tablets, as for instance in Akkadian.

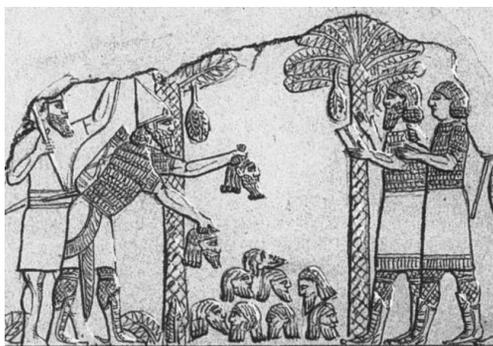
However in addition, in the 2<sup>nd</sup> half of the second millennium there were professionally trained scribes also for cuneiform *alphabetic* writing in



the northern Syrian port city Ugarit. And eventually at the turn of the millennium there is clear epigraphic and iconographic evidence for scribal skill and experience even in *linear* alphabetic writing at least on the western Levantine seashore, in Phoenicia. Hence, already at the dawn of the first millennium BCE we can freely speak about an established calligraphic education even for the youngest script tradition, which eventually made the game in a global horizon: the linear alphabet.

In the early first millennium BCE, it is intriguing to find pictures of scribe-pairs, which show clearly that the old cuneiform-syllabic and the younger linear-alphabetic belong to separate literacies. At least there were

separate scribal educations and, in consequence thereof, two different calligraphic traditions. But this does not necessarily mean that both were incompatible or competing. Quite the reverse, it seems that for a while both side by side had the same high reputation at the Mesopotamian ruler's courts. For example on a wall painting in the palace of Til Barsip in Northern Syria from the 8<sup>th</sup> century we find two scribes standing close behind one another with their specific writing tools in the hand — which is a lump of clay for cuneiform writing, and a sheet of papyrus for linear alphabetic writing respectively.<sup>2</sup> Their portrayal, moreover, is quite meticulous. Both scribes differ slightly in clothing and hairstyle and only one of them has a beard. Most intriguing, both have the writing tool in their right hand,<sup>3</sup> albeit in remarkably different manual posture, each of which is characteristic for the different writing material and technique.



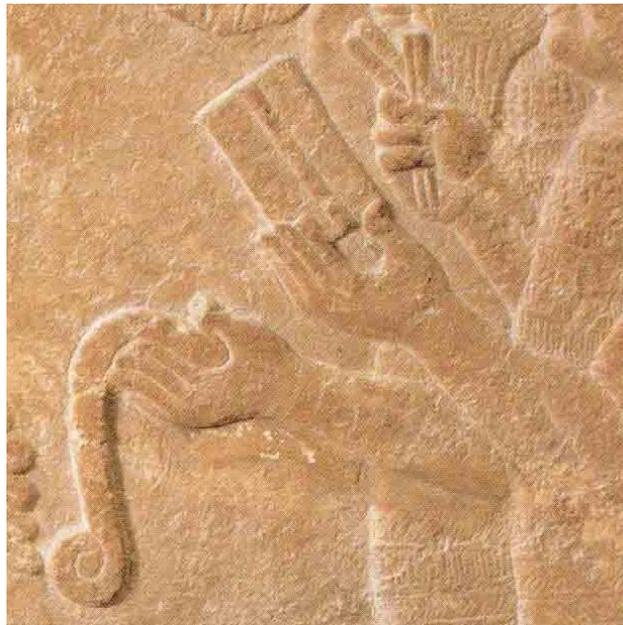
---

<sup>2</sup> Of course, the use of papyrus is not restricted to linear alphabetic writing alone but was used for Egyptian Hieroglyphic, Hieratic, and Demotic writing, too. However, there is no sufficient reason to assume this in northern Mesopotamia – at least for technical reasons papyrus does not fit for cuneiform writing at all.

<sup>3</sup> This, of course, confirms right-handedness as normal also among scribes in antiquity. Scribal left-handedness seems to have been extremely seldom. However, there is reason to assume that at least mediocre or occasional scribes only could have been left-handed, see Lehmann 1998.

## The interdependence of writing material and scribe's

Similar depictions are found several times in the late 8/7<sup>th</sup> century Niniveh palace of cruel-boasting Sennacherib, where couples of scribes make inventory of tribute, booty, and—in abhorrent accounting mentality—of beheaded enemies. Again the scribes have different hairstyle and only one of them is bearded, holding a papyrus sheet<sup>4</sup>, while the other holds a *codex type* wax tablet in his left and two styluses in his right hand.<sup>5</sup> However, it is not clear whether this points to a gradual loss of the predominant cuneiform tradition in favour of alphabetic (Aramaic?) flat writing, or whether it is a depiction of making only preliminary notes.



---

<sup>4</sup> Some scholars believe that this is no papyrus but skin, but the curled bottom end and the whole situation in my opinion clearly depicts an open scroll of rough fresh papyrus as it come from the manufactory.

<sup>5</sup> The right hand is lifted in a gesture that reminds on the speaker's gesture in Roman antiquity. But with regard to the whole scenario it is more probably that this is a counting gesture. The *two* styluses either are different types of *stilus*, the writing implement as such, or a *stilus* and a *spatula* to erase written text.

Anyway, let me intruduce to you another noble character from Southern Anatolia in present-day Turkey. Though we do not know him by name, he is my favorite scribe at all, a true *Sofer Mahhir* רִפְסֵי מַהֲחִיר, as it is called in Ancient Hebrew—a tachygrapher.

It is indeed intriguing to find a telling alteration of this pictorial tradition at the same time in Anatolia. Here the influence of the innovative Levantine Phoenician linear alphabet flat-writing tradition was much stronger than in Mesopotamia. In Zindjirli, the old Sam'al-Ja'udi city state, on the so-called writer's othostat of king Barrakib only *one* scribe is left. But he still holds *two* tools. However, now these belong to *one and the same* writing technique: there is again the *codex type* wax tablet under the scribe's left armpit, and a scribe's toolbox (palette)—the writing implement as such—is in his left hand. This clearly belongs to the flat writing technique with ink on papyrus, and preferrably for alphabetic writing only, which clearly indicates that any cuneiform writing is ruled out now.



We do not know what the name of that scribe was. We definitely know nothing else about him, but he's the man we are looking for. *His* writing skill and expertise changed the alphabet. *He* is one of those men who turned clumsy letters into calligraphy, and one of those who smoothed the way from proto-Phoenician script to Syriac, Hebrew, and Arabic calligraphy and beyond.

How could this happen?

### The 'Phoenician typewriter' standard

I will leave aside all those sophisticated scholarly debates on early (Semitic) alphabet history and about how, why, and when a simplification of pictographic symbols took place that eventually, in the course of the 2<sup>nd</sup> millennium BCE, evolved into linear alphabet characters<sup>6</sup>. I only would like to outline a few 1<sup>st</sup> millennium main parameters that are crucial for the palaeographic turn(s) of Northwest Semitic alphabetic script history.

It is well-known and almost incontrovertible proof that the early 1<sup>st</sup> millennium BCE alphabetic standard in the Levant was *Phoenician*. This, however, implies no claim whatsoever as if 'the Phoenicians' were the inventors of the alphabet. Rather, the most ancient standardized graphemic type of the so-called 22-letter 'Abgad' was first and foremost found in texts, which are predominantly Phoenician in language, though not exclusively. Inscribed specimen from adjacent Levantine languages or dialects, like the Moabite Mesha stone or the Gezer calendar (language open to dispute) prove that in terms of script typology, 'Phoenician' is only an *umbrella term*, but neither a language nor a national script tied to a certain 'national' language.

Anyway, as an *umbrella term* it is widely accepted that by the turn of the second to the first millennium BCE we have something like a *Standard Phoenician* script, which, to say it again, is not necessarily a script of the Phoenicians and for Phoenician language alone, but a certain alphabet-glyph type. This was the outcome of long centuries of trial & error, of diverging and competing centers and schools, and of both, progressive and retarded areas<sup>7</sup> of scribalism. At the end of this process, which seems to

---

<sup>6</sup> A specimen of what kind of systemic simplification process might have happened here I have given in Lehmann 2012.

<sup>7</sup> This can be best seen by the so-called Rap'a palimpsest arrowhead (Lehmann, forthcoming).

have been dramaticized by a certain bottleneck-effect by means of mercantile requirements of the Levantine sea trade in the 12/11<sup>th</sup> centuries, the so-called *Phoenician Standard* turned out as a supra-regional, Levantine & Eastern Mediterranean *scriptio franca*.<sup>8</sup> This means—in contrast to any ideas of a *lingua franca*—a script that was apt to many or most of all languages or dialects, which were relevant for the mercantile *quasi*-globalization in the Eastern Mediterranean of the outgoing 2<sup>nd</sup> millennium.

The basic parameters to describe the shift from the first fledgling alphabets of the mid-second millennium to the so-called *Phoenico-Standard* at the turn of the millennium can be in short described as follows (Naveh):

Order:

to fix the letter-sequence of the respective abecedary as Abgad ('-b-g-d...') only, which formerly in the 2<sup>nd</sup> millennium had serious variants and also an alternative system, the Halahama-order.

Reduction

Cutback of formerly rich-inventory alphabet(s) of 29, 30, or 27 consonantal graphemes in the mid-second millennium to a grapheme inventory of 22 letters.

Linearization:

i.e. to abandon the older pictographic shapes in favour of abstract linear graphs

Stabilization:

to fix writing direction from arbitrary to dextrosinistral (right-to-left):  
Stabilization of writing direction to dextrosinistral (right-to-left), which formerly in the 2<sup>nd</sup> millennium could have been both, right-to-left, left-to-right, and boustrophedon (also occasionally vertical or circular)

We do not precisely and incontrovertibly know when, and in which succession these crucial process in historical alphabet development was finished, though we can say for sure that it could not have been earlier

---

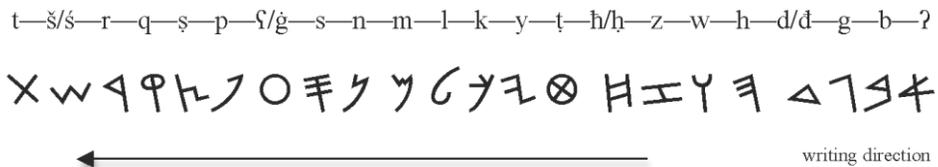
<sup>8</sup> See Lehmann 2012: 45-46.

The interdependence of writing material and scribe's

than the 13<sup>th</sup> and not later than the 11<sup>th</sup> century BCE. However, there is good reason to assume that Linearization and Stabilization were an interdependent process, and maybe also the latest.

This Phoenician *scriptio franca*-type became the breeding-ground for every diversification that eventually evolved into those typographically divergent 'national' scripts of the 1<sup>st</sup> millennium and further on. Its first and most prominent offsprout further west was non-Semitic—the Aegaeen, Greek and Latin alphabets that finally evolved in a whole bunch of diverse 'western' writings.

Hence in terms of script typology, 'Phoenician' is the 'typewriter' standard, or the 'Phoenician' *courier* type, which looks like that:



To be sure: the truth is that there is no thing like that. This type is computer-generated. Nevertheless, it nicely illustrates what I mean.

Because there was no wise ruler like the Korean king Sejong to order “the correct sounds for the instruction of the people”, and because there was also no such thing like a centralized language-and-script academy of Syria-Palestine in the first millennium BCE that would have defined the actual standards of typology and writing technique by cyclic circulars, it goes without saying that there was also no fixed standardized script. Rather, there was a well-known and almost standardized-looking convention of 'Phoenician-type' writing, which of course had its variations even in the earliest known inscriptions from the 11<sup>th</sup> to the 9<sup>th</sup> centuries BCE, such as in the scripts of different inscribed arrowheads, or the Tekke bowl, or the early Byblos inscriptions like the Azorbaal spatula and the Ahirom

sarcophagus and shaft inscriptions, or in the most recently discovered Kfar Veradim bowl inscription. But all these variations rather are mere *calligraphic* or *typographic deviations* than typological differences. Moreover, they bear no typological improvement. They still retain their well-identifiable common skeleton forms for each glyph (which for this reason I would call the Phoenician ‘typewriter’ or *courier* type), to which *all variations* basically can be tracked down by only few simple observations on scribal practice.



## 2. The calligraphic turn(s)

At the turn of the 2<sup>nd</sup> to the 1<sup>st</sup> millennium BCE we witness a fast and accelerating development of scribal skill also in non-cuneiform flat surface writing, which apparently was the realm of a supra-regionally acting class or guild of professional scribes. As early as then, this *sofer mahhir* (tachygrapher), as he was called later in Hebrew, had a remarkably high calligraphic expertise. This can be proven by certain features of lettering, which are found in the most ancient Phoenician royal or public-display inscriptions, such as tracking and weight standards, spacing, and dovetailing resp. pair kerning of letters.<sup>9</sup>

Anyway, what the works could happen when the *sofer mahhir*, the tachygrapher, encountered the ‘Phoenician-typewriter’ standard? First of

---

<sup>9</sup> See, *inter alia*, Lehmann 2005, 2009.

The interdependence of writing material and scribe's

all, the influence of regional schools and top-dog schoolmasters should not be underestimated.

*A 'thick-thumb five-inch-finger' schoolmaster?*

The reasons for the abovementioned *typographic variations* within the 'Phoenician Typewriter' standard are beyond speculation. For sure there is no need, nor reason to psychologize at all. Also, it seems not plausible to interpret them as 'archaizing' or 'eccentric' idiosyncrasies, as Benjamin Sass (Sass 2005) had suggested. Rather, there were different scribal centres, or schools, which had a strong impact on the scribal behaviour of their respective areas, and which for hardly traceable reasons coined some idiosyncratically looking graphs.

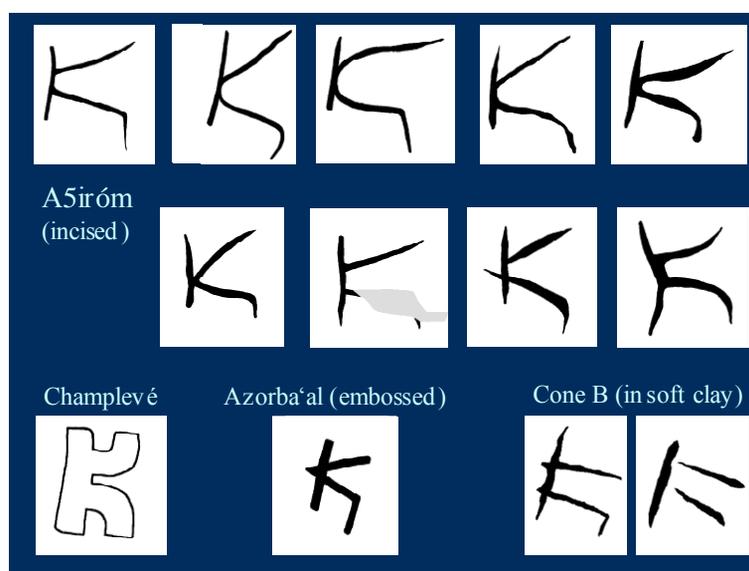
For a trained eye, these seeming idiosyncrasies are by no means typological or graphemic. Moreover, they are areal only and not beyond the bounds that is described by means of geography and topology. Nevertheless some of them maybe could gain a certain lasting effect but, what is most important and marks their confinement: there is no *inherent systemic* reason to take an overall effect at all, but by chance only.

Hence, I would like to suggest that there was a kind of path-dependence. Perhaps it was the temper of a master scribe, maybe his age, maybe his long fingers or short legs, a bad eyesight or a typist's cramp, maybe a funny idea or a deep thought, that forced him to move and to behave in a special way when he forms his letters. But these idiosyncrasies of a master scribe led to a *point-of-no-return*, if only the master scribe had enough influence. Then his *signature* eventually will evolve into *typology*! These were the areal top-dogs.

*The Byblos Capitalis alef. An areal top-dog feature.*

An illustrative example for such an areal top-dog feature which is exclusively found in a confined area and in a limited time slot of few

generations only, is the special ‘hooked’ or ‘horned’ *alef*-type of the – as I would name it – ‘*Byblos Capitalis*’ script. While its ‘Phoenician’ standard ‘typewriter’ skeleton form looks like a sharp angle, crossed by a vertical stroke, which is the matrix for *all* later *alefs*, a particular shape of this glottal-stop-letter is found in some inscriptions from early 1<sup>st</sup> millennium Byblos. It is the most outstanding and eye-catching character of the already mentioned A5iróm inscription.



First, its ‘horns’ do not cross the trunk, which is unusual in the majority of early first-millennium Canaanite alphabets. But the more intriguing characteristic is its bottom right ‘horn’, which at the end snaps vertically down. Notwithstanding the old-age of the inscription, this is not an archaic feature alone, because in terms of typology it cannot be historically tracked. However, there are comparable occurrences in a few other old inscriptions, but from Byblos only. It also appears on the bronze Azorbaal-spatula of Byblos from an unclear archaeological context, performed in hallmarking technique. In the third line, the spatula displays an *alef* whose

The interdependence of writing material and scribe's

'trunk' has a tip of 11° and whose bottom 'horn' snaps down with 20° under the line-of-writing.

Further, there is a most clear instance of this artificial 'Capitalis' *alef* on the so-called 'Byblos-champlevé' fragment. Apart from the strange, generally rounded letters, in the first line there is an *alef* whose 'horns' both are at their right end inclined roundly by 90° to the bottom and the top respectively. It seems as if here we had the 'model-shape', or matrix of what I tentatively would like to label the 'Byblian Capitalis Script'.

But by executing this double-bend-horn *alef* in flat writing, the upper 'horn' would require a pushing stroke. This could neither be executed with the broad nib reed pen on papyrus or another flat surface, nor with a stylus in soft clay. As a consequence, the bend or snap of the upper horn was given up in flat writing, as reflected in the so-called 'Byblos Cone B'. This clay votive cone with only a name on it was carved in the still soft clay. Twice it displays an 'open' *alef* with a 'trunk'-tip of ca. 15° and with almost parallel 'horns', but only the second *alef* has a sharp snap-down. Taking into consideration the different writing surface and technique, it is directly comparable to the *alef* of Azorbaal.

Furthermore, this feature and how it is applied to flat and incised writing also clearly demonstrates how both, the Ahirom sarcophagus and the Cone B, depend on the technique of skilled flat writing, which is unfortunately yet unattested by archaeological finds, but must have already been in general use in late second millennium Byblos. It is solely because of a trained flat-writing tradition with an already stabilized typology in its background, that a tradition could afford to tolerate individual scribal habits together with occasional adjustment to uncomfortable writing conditions without affecting the readability and aesthetics of the written document.

There is definitely no other or later form of such a hooked *alef*, nor is there any *alef* in later Northwest Semitic writing that could be traced back

to it. The hooked Byblos Capitalis *alef* seems to be totally extinct again in the mid-1<sup>st</sup> millennium at the latest.

### **3. Speedup & typological innovation: Hail, *ha-sofer mahhir*, the tachygrapher!**

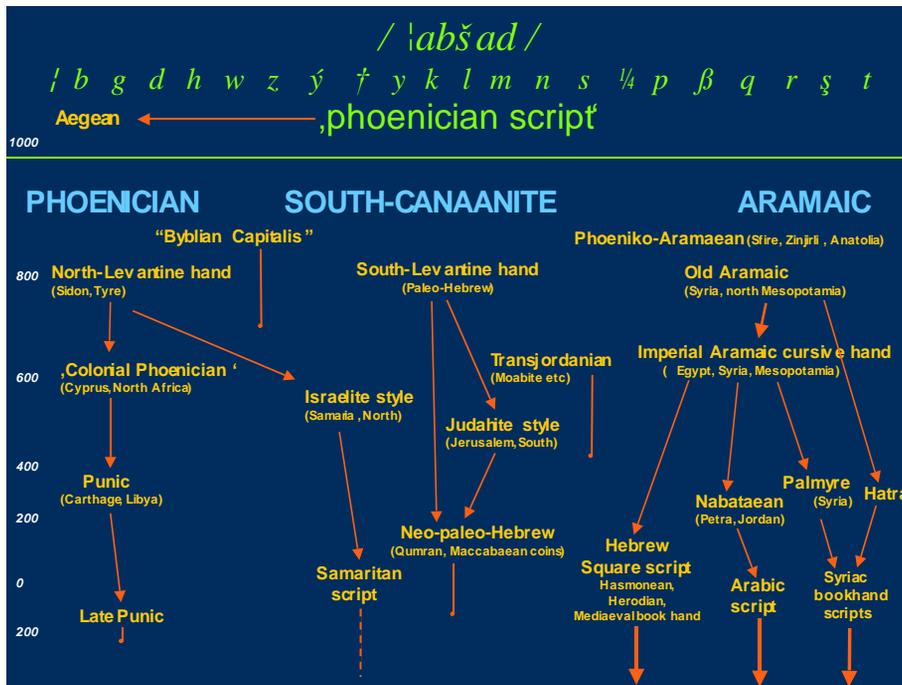
Other scribal idiosyncrasies and deviations from a common late 2<sup>nd</sup> / early 1<sup>st</sup> millennium Levantine standard survived their masters and/or schools. They fell into a breeding ground that gave birth to another powerful scribal development with accretive and, what is most important, *irreversible* impact: the distortion (and smoothing) of glyphs by speedup in *skilled flat hand*.<sup>10</sup> Here it will show up that these turns are no longer idiosyncratic alone, but rather basically *calligraphic*.

At almost this period of time—or even slightly later, in the 9<sup>th</sup>/8<sup>th</sup> centuries at the latest—also a rapid diversification of the Phoenician-type alphabet in general took root. The ‘Phoenician typewriter’ split up into the Southern Levantine, the Aramaic, and the Phoenician-Punic main script branches. Finally, at the end of the millennium, this diversification process has ended up in a whole bunch of different Semitic alphabets in the Near and Middle East, many of which were almost incompatible and alien to one another, and became prominent as the Palmyrene, the Estrangelo-Syriac and younger Serto, the Hatraean, Sogdic and Mandaean scripts, the Aramaic scripts of India, the Imperial-Aramaic chancellery ‘italic’ type, the Hasmonean & Herodian Judaic and later Jewish square Hebrew scripts, the Samaritan bookhand, the Libyan, the Punic and Late-Punic scripts, also the Nabatean and the Arabic scripts, and more.

---

<sup>10</sup> About what is reminiscent of *skilled flat writing*, I wrote to a great extend in Lehmann 2009.

The interdependence of writing material and scribe's



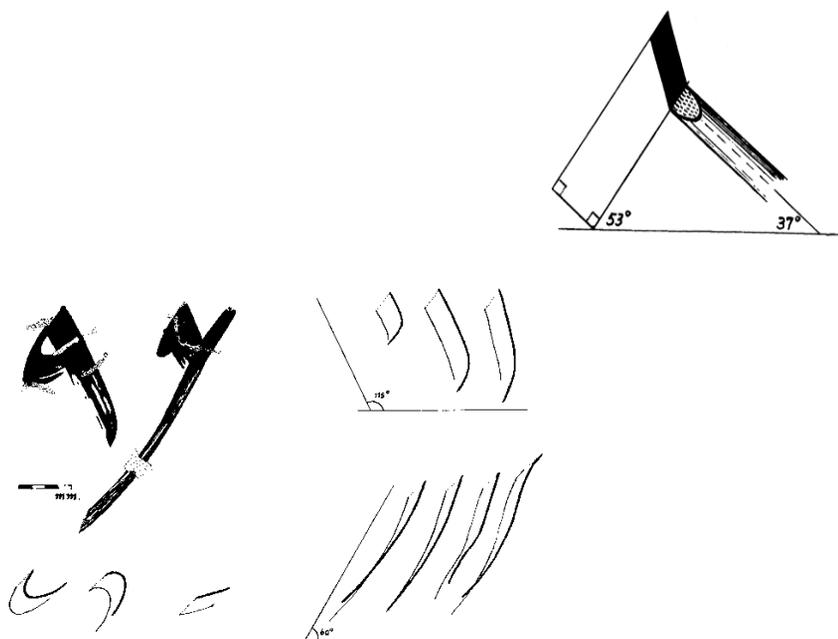
How could this happen, after the standardization of the first fledgling linear alphabets of the mid-second millennium into the so-called *Phoenico-Standard* had taken place by the abovementioned parameters? How does mere signature evolve into typography?

It is perplexing how and why the speedup turn in calligraphy triggered so many changes in the Northwest Semitic alphabet tradition within only a few hundred years. This obviously came along with the invention and introduction of a new writing implement: the so-called *chisel-shaped broad-nib pen* instead of the brush, as it remained in use in Ancient Egypt for instance, and also in Eastern Asia. With the decline of the Egyptian hegemony over the Levant, the brush pen was subsequently given up, and the triumphant rise of the rush broad nib pen began.

Unfortunately, we do not know what our scribe of the Zindjirli orthostat held in his right hand (if ever he did), or what kind of nib the implements in his palette-box had. We only know—by archaeological evidence from

Egyptian parallels—that it were reed pens, which were cut from the overall-growing rush variety *juncus maritimus*. And there is good reason to assume that it was indeed a *chisel-shaped broad-nib* pen that he used.

Writing with this implement gained a lasting effect, because it was based upon the inherent mechanics of writing itself. Moreover, here the irreversible mechanics of path dependence unveiled its full impact. The new implement caused another important parameter, which in interplay with writing surface and scribe's posture triggered far-reaching distortions of letter shapes and, in consequence, the birth of 'new' scripts. Earlier in the late 2<sup>nd</sup> millennium, the crucial decision had been the parting of the ways in writing direction, i.e. dextrograde or sinistrograde – and no-one knows why. However, now in the 1<sup>st</sup> millennium BCE, the parting of the ways, which was quite more manifold and ended up in an almost total divergence of scripts, had a clear and surprisingly simple rationale: *speed and angle of writing*.



## The interdependence of writing material and scribe's

In his 1986 and never-published doctoral dissertation, the Dutch scholar Gerrit van der Kooij identified the parameters for what became crucial when speeding up the writing by professional scribes. A close investigation of the Northwest Semitic script traditions of the first half of the 1<sup>st</sup> millennium BCE has shown that script changes up to seemingly different 'national scripts' depend almost exclusively on changes in the scribe's hand and the scribe's attitude, that is: on regional sweep and influence of dominant scribal schools (van der Kooij 1986:90-93.244-251.253).

The main device, as van der Kooij had proven in painstaking analyses, was the position of the hand when forming a letter, which results in the **angle of writing**, i.e. the angle of inception that starts the main vertical stroke of a letter. What van der Kooij found was an obvious regionalization and, that these regions can generally be distinguished as politically and often culturally defined population groups – all of which now points to underlying spatial and well organized school tradition:

“The main differentiation is based on the difference in size of the angle of inception, and it soon isolated the script traditions for primarily the Hebrew and probably also southern Trans-Jordan from those used for the Phoenician and the Aramaic Language.”

In short: The *small angle of writing* ( $45^\circ$  to *c.*  $10^\circ$ ) was used for *Hebrew texts*. This was the reason why no very considerable changes within the composition of the letters came about, i.e. why there were no considerable deviations from the 'Phoenician typewriter'. On the other hand this script exhibited powerful developments in cursive writing.

A larger *angle of writing* of *c.*  $45^\circ$ - $50^\circ$  was used in the ductus of texts in the Trans-Jordanian region, 'Ammonite', and in Phoenician areas, where the angle later reached  $60^\circ$ . But instead of inherent changes of ductus and form as happened in the Aramaic context, here the enlargement of the angle results in a left-inclination or 'slope' of upto  $45^\circ$  towards the left.

*The most considerable enlargement of the angle of writing* takes place particularly in the *Aramaic* script tradition, probably starting about the end of the 8<sup>th</sup> century BC or somewhat earlier [...]. This angle of writing of 50°-60° and more caused serious changes of graphs.

To sum up, with words by van der Kooij:

“[...] all writing has been spread by way of ink writing ‘schools’. This, then, implies that almost all writing, with all kinds of material-implement combinations including those that presuppose a very specific technical skill, had been accomplished by people trained in ink writing, or put into practise by craftsmen copying ink-written texts.” (van der Kooij 1986: 250)

#### **4. Speedup, mutation & diversification – explanation in pictures**

– (*here a series of detailed examples in pictures will be shown*)

#### **References**

- Bernal, Martin 1990. *Cadmean Letters. The Transmission of the Alphabet to the Aegean and Firther West before 1400 b.c.* Winona Lake: Eisenbrauns 1990.
- Byrne, Ryan 2007. *The Refuge of Scribalism: BASOR 345, 2007, 1-31.*
- Daniels, Peter T. 1990. *Fundamentals of Grammatology. JAOS 110: 727-731*
- Garr, W. Randall 1985. *Dialect Geography of Syria-Palestine, 1000-586 b.c.e.,* Winona Lake: Eisenbrauns 1985.
- Gruendler, Beatrice 1993. *The Development of the Arabic Scripts (Harvard Semitic Series 43).* Atlanta: Scholars Press 1993.
- Lehmann, Reinhard G. 1998. *Typologie und Signatur. Studien zu einem Listenostrakon aus der Sammlung Moussaieff, in: Ugarit-Forschungen 30, 1998, 397-459.*

## The interdependence of writing material and scribe's

- Lehmann, Reinhard G. 2005. Die Inschrift(en) des Aḥīrōm-Sarkophags und die Schachtinschrift des Grabes v in Jbeil (Byblos), Mainz: Zabern 2005 (Forschungen zur phönizisch-punischen und zyprischen Plastik, hg. von Renate Bol, II.1. Dynastensarkophage mit szenischen Reliefs aus Byblos und Zypern Teil I.2)
- Lehmann, Reinhard G. 2005. Space-Syntax and Metre in the Inscription of Yaḥawmilk, King of Byblos, in: Omar Al-Ghul / A. Ziyadeh (ed.), Proceedings of Yarmouk Second Annual Colloquium on Epigraphy and Ancient Writings, Irbid, October 7th – 9th, 2003, Faculty of Archaeology and Anthropology Publications 4, Yarmouk University, Irbid 2005, p. 69-98.
- Lehmann, Reinhard G. 2009. Calligraphy and Craftsmanship in the Ahirom Inscription: Considerations on Skilled Linear Flat Writing in Early 1st Millennium Byblos: *Maarav* 15.2 (2008 [2009]) 119-164 + plates 217-222.
- Lehmann, Reinhard G. 2012. 27-30-22-26. How Many Letters Needs an Alphabet? The Case of Semitic, in: *The idea of writing: Writing across borders* / edited by Alex de Voogt and Joachim Friedrich Quack, Leiden: Brill 2012, p. 11-52.
- Lemaire, André 2008. "The Spread of Alphabetic Scripts (c. 1700-500 BCE)": *Diogenes* 218 (2008) 45-58.
- Naveh, Joseph 1987. *The Early History of the Alphabet*. Jerusalem: Magnes 1987.
- O'Connor, M. 1996b. The Alphabet as Technology. In: Daniels & Bright (eds.), *The World's Writing Systems*, 1996: 787-794.
- Sass, Benjamin 1988. *The Genesis of the Alphabet and its Development in the Second Millennium B.C.*, Wiesbaden 1988 (ÄAT 13).
- Benjamin Sass 2005. The Alphabet at the Turn of the Millennium. The West Semitic Alphabet ca. 1150-850 BCE. The Antiquity of the Arabian, Greek and Phrygian Alphabets, Tel Aviv: Emery and Claire Yass Publications in Archaeology 2005 (Journal of the Institute of Archaeology of Tel Aviv University. Occasional Publications No. 4)
- van der Kooij, Gerrit 1986. *Early North-West Semitic Script Traditions. An Archaeological Study of the Linear Alphabetic Scripts upto c. 500 B.C.*; Diss. Leiden 1986.
- Wiebelt, Alexandra 2004. *Symmetrie bei Schriftsystemen. Ein Lesbarkeitsproblem*, Tübingen: Max Niemeyer Verlag 2004 (Linguistische Arbeiten 488)

Proceedings of the SCRIPTA 2012, Seoul, Oct. 8~10, 2012

Yardeni, Ada 1997. *The Book of Hebrew Script, History, Palaeography, Script Styles, Calligraphy & Design*. Jerusalem: Carta 1997.