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## A NEW WRITING SYSTEM DISCOVERED IN 3<sup>RD</sup> MILLENNIUM BCE IRAN: THE KONAR SANDAL ‘GEOMETRIC’ TABLETS

BY

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**Abstract:** Four tablets probably written in the second half of the 3rd millennium BCE were recently found in Konar Sandal, an archaeological site in the Halil Rud valley in southeastern Iran. Three of them are bigraphical, with a Linear Elamite inscription and a second inscription in previously unknown signs that are qualified here as ‘Geometric’. The fourth tablet remains enigmatic. Descriptions of the tablets, a study of their signs and semantic structure, and hypotheses concerning their content are given here.

**Keywords:** Iran, Konar Sandal, Bronze Age, writing system, Linear Elamite, Geometric writing

Four tablets, currently held in the Museum Bagh-e Harandi in Kerman, were recently found in Konar Sandal, a village located in the Halil Rud valley in southeastern Iran (see Pl. 1). Three of them are bigraphical, with Linear Elamite inscriptions (texts B’, C’ and D’<sup>2</sup>) and additional signs, unknown up to now, that are qualified here as ‘Geometric’<sup>3</sup> (texts  $\alpha$ ,  $\beta$  and  $\gamma$ <sup>4</sup>); the

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<sup>2</sup> On the CDLI web site (<http://cdli.ucla.edu/>), the last Linear Elamite text published is referred to as A’.

<sup>3</sup> This label seems to be more cautious than the geographic ones, such as ‘eastern script’ (Steinkeller) which is eastern only from a Mesopotamian point of view. The Kermanite label proposed by Vallat could be better, but nothing assures this writing will be found in the future only in Kerman province (even though the local nature or the geographically limited extension of this writing has to be supposed after more than one century of archaeological excavations in Iran). A label writing derived from signs shape (such as geometric/geometrifform or cuneiform) is a stronger definition since writings are mainly identified by signs shape and not by their geographic or chronological extension.

<sup>4</sup> It was decided here to use a neutral system for designating the Geometric texts, without any geographical or historical reference. As Latin letters were already used for Linear Elamite documents, Greek letters were chosen.

fourth tablet remains enigmatic (see Pl. 2). This last document is considered here as a Linear Elamite text (E'), although this point is far from being resolved since the tablet's few preserved signs do not match fully the known corpus of Linear Elamite signs (texts A to A'; cf. Cuneiform Digital Library Initiative internet site<sup>5</sup>).

Y. Madjidzadeh (Madjidzadeh 2012) proposed to interpret these four documents as a five-stage evolution toward Linear Elamite writing, from 1)  $\alpha$ , through 2)  $\beta$ , 3) E', 4)  $\gamma$  / D' and finally 5) B' and C', which show 'the closest similarity' with Linear Elamite. In contrast, it is argued here that these tablets exhibit two different but contemporary systems without any genetic link: Linear Elamite (B', C' and D') and the new 'Geometric' graphical system ( $\alpha$ ,  $\beta$  and  $\gamma$ ).

The fragment bearing the inscription E' was found in 2005 in the entrance of the architectural complex crowning the southern tepe of Konar Sandal<sup>6</sup> (KSS; geographic coordinates 28°26'58" N, 57°46'43" E). Previously described as a brick fragment, its width (between 3 and 3,5 cm) and the size of its signs (only slightly larger than the other three texts) indicate that it was perhaps the top right-hand or bottom left-hand portion of a large tablet.

After this discovery, a villager gave the tablet (11,5 × 7 × 1,8 cm) bearing the inscriptions  $\gamma$  and D' to the archaeological mission, showing the location in his garden where he found it in 2001. In November/December 2006, trench XV (5 × 5 m; approximate geographic coordinates 28°27'16" N, 57°46'45" E), was opened in this garden, 550 m northward from KSS; tablets  $\alpha$  / B' (18 × 10 × 2,2 cm) and  $\beta$  / C' (13,5 × 8,5 × 2,2 cm) were discovered in this excavation at a depth of 1,10 m, near a rectangular bipartite kiln and a piece of an unbaked anepigraphical tablet<sup>7</sup>.

Because three out of these four documents (E',  $\alpha$  / B' and  $\beta$  / C') come from regular excavations, there can be little doubt of their authenticity (cf. Lawler 2007).

<sup>5</sup> <http://cdli.ucla.edu/search/search.pt>; period name: Linear Elamite. For inscriptions X, Y and Z, see Mahboubian 2004: 50-55; for A', *Phoenix Ancient Art Catalog* 2007 n° 1, item n° 47.

<sup>6</sup> Madjidzadeh and Pittman 2008: 81.

<sup>7</sup> See Madjidzadeh 2012, for the circumstances of this discovery.

## 1) Surface examination

All of the signs on the tablets were impressed while the clay was still soft, except perhaps in B', where some stroke crossings do not show the expected configuration if the clay had been still wet (see Pl. 3). Actually some signs are more likely to have been scratched rather than impressed in this inscription.

A close observation of the signs shows that most of them were written in a sequence of strokes, with earlier lines cut by later ones. Several examples of this feature from inscription  $\beta$  are shown in Pl. 4.

$\alpha$  and  $\gamma / D'$  also exhibit imprints of some sort on their surface (Pl. 5). Whether these were clay smoothing prints from a brush, fingerprints left by the scribe while writing or bandage traces cannot be currently determined.

Finally, all the tablets were baked (a kiln was found near  $\alpha / B'$ ,  $\beta / C'$  and  $\gamma / D'$  in trench XV).

## 2) Signs

The tablets' orientation (how they were held when people wrote and read them) is not as important as the order in which the signs should be written / read. The presentation shown here<sup>8</sup> (Pl. 6) relies on the orientation of several of the Linear Elamite signs (for example, as  $\text{𐎧}$  rather than  $\text{𐎧}$ ) that are inscribed on vertical supports. Examples of similar signs from Linear Elamite inscriptions C (on a statue), Q (on a silver vase) or V (on a seal) demonstrate how these signs were oriented.

In the Geometric inscriptions  $\alpha$  and  $\beta$ , signs are rather regularly distributed between each line ( $\alpha$ : 20, 18, 19, 19 and 18;  $\beta$ : 17, 19, 18, 18, 18 and 7 / incomplete line) while  $\gamma$  presents a different pattern, with more signs inscribed in the upper line (19, 14, 13, 14/13 and 4/5 Geometric signs +  $D'$ : 9 Linear Elamite signs and 2 dividing strokes).

The Geometric writing is represented by 254/256 signs<sup>9</sup> consisting of 19 different signs (see Pl. 7;  $\alpha$ : 94 signs, 9 different;  $\beta$ : 97 signs, 16 different;  $\gamma$ : 63/65 signs, 13 different). The vertical stroke sign (sign H) is not

<sup>8</sup> Basello 2006 presented  $\gamma / D'$  in an inverted way.

<sup>9</sup> 60 Geometric signs are clearly visible in  $\gamma$ , but their real number should be between 63 and 65 without the break that damages the two lowest lines.

understood here as a word dividing sign. If the composite dotted signs are supposed to be variants of the dotless ones, there are a total of 13 different signs on the three Geometric text documents<sup>10</sup>. Five of these are frequent (square, circle, triangle, grid, and vertical stroke; totalling 198 signs out of 254/256, or approximately 78%), two are uncommon (6 ovals/sign F and 11 inverted U/sign E), two appear only on  $\beta$  and  $\gamma$  (15 lozenges and 5 crosses), two only on  $\beta$  (2 signs K and 3 signs L) and two only on  $\alpha$  (6 signs J and 2 signs M/crescents).

The sign distribution among the three documents reveals that seven signs appear on all three tablets (square, circle, triangle, grid, vertical stroke, oval, and inverted U). The dotted signs, the lozenges and the crosses appear only in  $\beta$  and  $\gamma$ , distinguishing clearly these two texts from  $\alpha$ . Finally, four signs appear in only one text (signs J and M in  $\alpha$  and signs K and L in  $\beta$ ). These uncommon signs most likely had a precise and limited value, with the result that they were not needed in every document (see Pl. 8).

The Konar Sandal documents also include Linear Elamite inscriptions B' (6 signs), C' (7 signs and 1 dividing stroke) and D' (9 signs and 2 dividing strokes). The three inscriptions utilize 19 different signs, of which two are unique to this corpus (signs 118 and 208; see Pl. 9). The few preserved signs in E' are similar to Linear Elamite signs (lozenge-shaped sign, dotted stroke) but do not match completely (above all the two top right-hand signs built around a cross). Three hypotheses might be proposed to explain these features:

- E' could be an older or more recent form of Linear Elamite writing;
- perhaps only hapaxes appear in this fragment, while the rest of the tablet had 'good' Linear Elamite signs;
- or E' might be a new and distinct form of writing.

<sup>10</sup> Although only 3 documents ( $\alpha$ ,  $\beta$  and  $\gamma$ ) with Geometric signs are known at present, the limited sign inventory-19 (or 13 if dotted signs are variants) out of 254/256-has to be considered. If Geometric signs constitute a visual system for writing a language, we might hypothesize that each sign could carry a phonetic (syllabic) value.

This characteristic may parallel the phonetic way that the Elamite language, in its earliest known stages, was written with cuneiform. Indeed, when they borrowed cuneiform writing, 'Elamite' scribes seem to have rejected Mesopotamian logograms (Stève 1992: 4-11). Out of 85 different signs present in the Naram-Sin treaty (the most ancient cuneiform Elamite text known), only 6 were logograms (7%), used to name gods Inšušinak, Aba and Sin. This phonetic aspect of the Elamite language writing is later reversed, and the proportion of logograms reaches 68% during the Achaemenid period.

### 3) Semantic structure

The layout of Geometric signs in  $\alpha$  and  $\beta$  seems to follow a sign sequences doubling pattern (see Pls. 10 and 11) in which the signs were inscribed according to boustrophedon<sup>11</sup> (the direction of writing or reading changes line after line, from left to right then right to left) and stoichedon (equal sign distribution between each line)<sup>12</sup>. Semantic units/words might consequently stretch over two lines.

Because of these sequence repetitions, the use of the boustrophedon principle and the incomplete lowest line in  $\beta$  (probably the end of the text, written from the left to the right), the starting points of both  $\alpha$  and  $\beta$  seem to be in the top right-hand corner.

Given the hypothesized writing/reading direction and starting point, repeated sign sequences appear in  $\alpha$  and  $\beta$ —two large ones in  $\alpha$  (groups A1/A2 and B1/B2; Pl. 10) and six smaller ones in  $\beta$  (groups A1/A2, B1/B2, C1/C2, D1/D2, E1/E2 and F1/F2; Pl. 11). These make up the general semantic structure in each text.

Text  $\alpha$  (see Pl. 10) begins with a small group (1) of two or four signs<sup>13</sup>, then group A (24 signs) repeated twice (A1 and A2), then group B1 (21 signs according to the first dividing hypothesis, 19 signs according to the second), then the small group 1, and finally group B2. The semantic structure of  $\alpha$  may be summarized as: group 1 / A1 / A2 / B1 / group 1 / B2.

Text  $\beta$  shows a similar pattern (see Pl. 11). According to the first dividing hypothesis, it is organized as: group 1 / A1 / A2 / B1 / O (sign B in signs list) / B2 / C1 / C2 / group 2 / D1 / E1 / group 3 / E2 / D2 / F1 / W (or sign L) / F2. Following the second dividing hypothesis, the semantic sequence would be: group 1 / A1 / O (sign B) / A2 / B1 / B2 / C1 / C2 / group 2 / D1 / E1 / group 3 / E2 / D2 / F1 / W (sign L) / F2.

<sup>11</sup> Also used in some Greek, Etruscan, ancient Latin (cf. *Lapis niger*), hieroglyphic Luwian, south Arabian alphabetic and Eastern Island rongo-rongo (inverted boustrophedon) inscriptions. Closer to Konar Sandal in time and space, some Indus inscriptions may present such an organisation (Possehl 2003: 134 and Vidale 2007: 345). Moqaddam (2009: 54) also noticed the boustrophedon system used in Konar Sandal Geometric texts.

<sup>12</sup> Sign numbers per line are approximately similar: 20, 18, 19, 19 and 18 in  $\alpha$ ; 17, 19, 18, 18, 18 (and 7) in  $\beta$ . Before starting to write, Konar Sandal scribes probably counted the number of signs they had to write and, depending on the number of lines they wanted to draw, determined how many signs should be written in each line.

<sup>13</sup> Two group subdivisions may be seen in  $\alpha$  and  $\beta$ . Both of them are considered here.

Once this general semantic structure (consisting mainly of double repetitions of sign sequences) is determined in each text, another repetition level emerges inside some sign sequences. This is particularly clear in  $\alpha$  (Pl. 12) and perhaps evident in  $\beta$  (Pl. 13). If the  $\alpha$  first dividing hypothesis is considered (semantic structure: group 1 / A1 / A2 / B1 / group 1 / B2), sign sequence A is perhaps built around 6 sign subgroups (group 1, a, b, c, d and e) organized as follows: a – b – c – group 1 – a – b – d – a – e. As for sign sequence B, it may be divided into 5 sign subgroups (f, g, h, i and j) organized as follows: f – g – h – f – i – g – j. The  $\alpha$  semantic structure could be consequently reformulated as: group 1 / a – b – c – group 1 – a – b – d – a – e (A1) / a – b – c – group 1 – a – b – d – a – e (A2) / f – g – h – f – i – g – j (B1) / group 1 / f – g – h – f – i – g – j (B2).

Among these sign subgroups, a, a-b, f and g probably corresponded to coherent semantic units (such as words?).

$\gamma$ , as previously mentioned, does not have the same pattern of repetitions, so it cannot be currently determined if it was written in boustrophedon. From the lowest line where the last Geometric signs were probably inscribed from right to left (before the three small Linear Elamite sequences composing D'), if the boustrophedon principle was used, the Geometric text should, as in  $\alpha$  and  $\beta$ , start in the tablet's top right-hand corner.

Several  $\gamma$  sign sequences were also found in  $\alpha$  and  $\beta$ , such as OΔIOXO (in the second line of  $\gamma$  and in the first line of  $\beta$ ), I□OIA□I (written in  $\gamma$  and  $\alpha$  first lines) and a few other less important examples. Some short sign sequences (no more than 3 signs) repeated twice also appear in  $\gamma$  (IΔI: first and fourth lines; ◇□III or □III◇: third line); these are probably not significant as they do not correspond to any coherent semantic unit.

Between Geometric inscriptions  $\alpha$ ,  $\beta$  and  $\gamma$ ,  $\beta$  and  $\gamma$  differ from  $\alpha$  due to the tablets' shape and size and the signs that are present (dotted signs, crosses and lozenges). The formal similarities between  $\beta$  and  $\gamma$  may be interpreted as indicating a common writing epoch or even production by the same scribe. In semantic structure (and perhaps the meaning),  $\alpha$  and  $\beta$  differ from  $\gamma$  through the sign sequences doubling pattern.

Two points are worth noting when comparing the Konar Sandal Linear Elamite inscriptions B', C' and D' with the 27 other Linear Elamite inscriptions currently known:

- the Konar Sandal inscriptions are relatively short (6 signs in B', 4 + 3 = 7 signs in C' and 4 + 3 + 2 = 9 signs in D'); among other Linear Elamite inscriptions only texts S (5/6 signs) and V (3 signs) are so small<sup>14</sup>;
- for such brief inscriptions, dividing strokes are quite frequent (1 in C'; 2 in D'), defining 2 sequences in C' (3 and 4 signs) and 3 in D' (2, 3 and 4 signs respectively). These very short sign sequences may be compared with texts S and V as previously mentioned, but also with Linear Elamite documents D (where the vertical stroke is used 7 times) and Q (vertical stroke used 8 times) in which several sign sequences (signs between two dividing strokes) were made up of only 2 or 3 signs<sup>15</sup>.

#### 4) Reflections about the content

The Geometric and Linear Elamite inscriptions  $\alpha/B'$ ,  $\beta/C'$  and  $\gamma/D'$  were found together in trench XV and consequently belong to a unique and possibly private archive. They probably did not record any accounting/economic information since they seemingly did not contain any numeral notation rendered by an additive numeration system as no sign is repeated twice in succession<sup>16</sup>.

Some insight into the Linear Elamite writing system may be gained by considering text V, an 'Indus' related seal<sup>17</sup> with three signs. As the main information a seal has to carry is the owner's identity, his/her name was probably rendered on seal V with only three signs. Numerous small sign sequences in Linear Elamite texts (as in S, B', C' and D') could actually be anthroponymical notations. According to this hypothesis, three names would be recorded in D', two in C' and maybe only one in B'. In any case, B', C' and D' are too short to be translations of  $\alpha$ ,  $\beta$  and  $\gamma$ .

<sup>14</sup> Texts P (7 signs) and T (4 signs) cannot be considered here since these are fragmentary documents.

<sup>15</sup> The Konar Sandal Linear Elamite inscriptions (B', C', D' and E') are discussed in more detail, among others, in Desset 2012: 93-127.

<sup>16</sup> For example, in a decimal additive numeration system, 53 would be expressed by 5 signs meaning 10 and 3 signs meaning 1. Basello (2006: 3) suggested interpreting some of the Geometric signs according to a positional numeration system working with the number of strokes present in each sign (cross=2; triangle=3; square/lozenge=4; grid=6). This hypothesis seems to me very unlikely in the case of  $\alpha$ ,  $\beta$  and  $\gamma$ .

<sup>17</sup> Winkelmann 1999.



The types of texts usually kept in Mesopotamian private archives are contracts (records of sales, marriages, etc.), in which the names of witnesses to the transaction frequently appear. If the three tablets found in trench XV were part of a private archive, as supposed above, the Linear Elamite inscriptions B', C' and D' might record the names of persons involved in a contract or the names of witnesses to the agreement inscribed in a different writing system, representing a kind of signature used as a substitute for a sealing.

As for the Geometric inscriptions, their nature remains uncertain. If they represent a coherent writing system, the limited number of signs currently known (19 out of 254/256 attested signs) probably implies phonetic notation and consequently a link with one (or several) language(s)<sup>18</sup>. If Kerman province was included in the ancient geographic or political entity known in the cuneiform texts as Marhaši/Parahšum<sup>19</sup>, then Marhašean onomastics would be a possible starting point to determine the language(s) spoken during the 3<sup>rd</sup> millennium BCE in the current Kerman province and to decipher the Konar Sandal Geometric and Linear Elamite texts. Unfortunately, as far as we know, Marhašean onomastics seem to be multilingual since the anthroponyms of people said to come from Marhaši in Suso-Mesopotamian cuneiform texts were interpreted as 'Elamite', Akkadian, Sumerian and Hurroid<sup>20</sup>. Several languages have to be hypothesized behind the Konar Sandal inscriptions, a very general and vague basis for decipherment. From our experience with Proto-Elamite and Linear Elamite writings, which have been known since the beginning of the 20<sup>th</sup> century but are still currently undeciphered, it is difficult to see how this new graphic system can be translated as long as only three Geometric inscriptions ( $\alpha$ ,  $\beta$  and  $\gamma$ ) are available.

## 5) Dating and connection with Susian Linear Elamite texts

No thermoluminescence dating has been performed on the baked clay tablets. Tablet E' comes from the upper layers of Konar Sandal South (phase 2), which is a unique architectural complex dated to the third quarter

<sup>18</sup> Links between writing and language are not necessary, above all if the semantic field dealt with by writing is limited (Damerow 2006: 1-5).

<sup>19</sup> As firstly proposed by Steinkeller 1982; contra Francfort and Tremblay 2010.

<sup>20</sup> Steinkeller 1982: 262, Zadok 1984: 52 and 63, 1987: 15 and 1991: 229 and Francfort and Tremblay 2010: 172-184. Interestingly, Glassner (2005: 12 and 14) has suggested that some Marhašean anthroponyms might be linked to 'une langue inconnue'.

of the 3<sup>rd</sup> millennium BCE<sup>21</sup>.  $\alpha/B'$ ,  $\beta/C'$  and  $\gamma/D'$  tablets were excavated in trench XV, at a depth of 1,10 m under the current surface, and were associated with both Konar Sandal South red buff on red ware ( $\approx$  middle of the 3<sup>rd</sup> millennium BCE) and Konar Sandal North plain buff on buff ware ( $\approx$  end of the 3<sup>rd</sup> millennium BCE)<sup>22</sup>. Consequently, the second half of the 3<sup>rd</sup> millennium BCE appears the most suitable dating for the four Konar Sandal documents<sup>23</sup>.

Given this dating, the Konar Sandal Linear Elamite texts (B', C', D' and E') are probably older than the Puzur-Inšušinak Linear Elamite inscriptions from Susa (A, B, C, E, F, G, H, I, P, U and perhaps D), which were most likely written circa 2100-2000 BCE<sup>24</sup>. The Susian Linear Elamite texts not attributable to Puzur-Inšušinak (J, K, L, M, N, R and T) cannot be precisely dated at this time. Conservatively, the era of Linear Elamite writing use should probably be dated between the middle of the 3<sup>rd</sup> millennium BCE and the beginning of the second millennium and not only to the epoch of Puzur-Inšušinak.

## 6) Conclusion

After the disappearance of Proto-Elamite writing sometime in the first few centuries of the 3<sup>rd</sup> millennium BCE, the practice of writing was seemingly lost on the Iranian plateau. In the second half of the 3<sup>rd</sup> millennium

<sup>21</sup> Five <sup>14</sup>C dates are available for Konar Sandal South layers (BETA 207293 and BETA 207294 from trench III and BETA 207285, BETA 207286 and BETA 207287 from the stratigraphic step trench), ranging mainly from the 25<sup>th</sup> to the 23<sup>rd</sup> century BCE (Madjidzadeh and Pittman 2008: 77 and 88).

<sup>22</sup> Madjidzadeh 2012. Following the discovery of the three tablets in the farmer's yard, Madjidzadeh asked Massimo Vidale to look at the pottery unearthed in the same layers. Vidale spent a few minutes examining part of the pottery collected with the tablets, washed and laid to dry near the edge of the trench. His preliminary impression was that the ceramics from the site showed many distinguishing features from the second half of the 3<sup>rd</sup> millennium BCE: painted decoration seemed very limited or absent, and there was an extensive use of potter's wheel, evident in the frequency of a type of thin-walled, elongated beaker. In general, Vidale's impression was that the pottery associated with the tablets was chronologically bracketed between the material spread on the surface of Konar Sandal South and that visible on the surface of Konar Sandal North.

<sup>23</sup> Madjidzadeh (2012), in contrast, prefers to attribute these tablets to the first half of the 3<sup>rd</sup> millennium BCE.

<sup>24</sup> Puzur-Inšušinak was probably Ur-Nammu's contemporary (Wilcke 1987: 109-111), living around 2100 BCE in the middle chronology (Potts 1999: 122) or 2000 BCE according to the ultra-low one (Stève, Vallat and Gasche 2002: col. 428-430).

BCE, Linear Elamite writing (currently attested at Susa, in the Marv Dasht plain, and at Shahdad and Konar Sandal) and the Geometric graphic system appeared in southern Iran. These writing systems appear to be completely independent from cuneiform writing, which diffused into southwestern Iran from Mesopotamia with the akkadian annexation of Susa in the last quarter of the 3<sup>rd</sup> millennium BCE (Pls. 14 and 15). Finally, Indus seals and sealings bearing Harappan signs have occasionally been excavated between Pakistan and Mesopotamia (Pl. 14). Contrary to the Indus and cuneiform writings, which diffused throughout much of the Near East, Linear Elamite and Geometric writings show a more restricted distribution.

In Iran, the second half of the 3<sup>rd</sup> millennium BCE is characterized by creative development in writing systems, with two graphic systems (and corresponding grammatical conventions) being locally invented without any apparent genetic connection with any system currently known. This differentiation stage ended with the introduction of cuneiform writing, first in Susiana and then in Fars. This newly introduced system soon established itself as the only means of graphic notation until the adoption, much later, of other systems developed out of the Iranian plateau, the Aramaic and Arabic alphabets (Pl. 16).

On the Iranian plateau, the 3<sup>rd</sup> millennium BCE represents the culmination of the first great urbanization cycle that started in this part of the world with the neolithisation process in the 8<sup>th</sup> and 7<sup>th</sup> millennia BCE. While presumably rich in thoughts and immaterial realizations, this epoch remain enigmatic. Understanding the locally invented writing systems, Linear Elamite and Geometric writing, would offer significant insights into aspects of ancient society generally invisible to archaeology, such as language, laws, social relations and ideologies. With continued study and the discovery of additional texts, such decipherment may well be possible some day.

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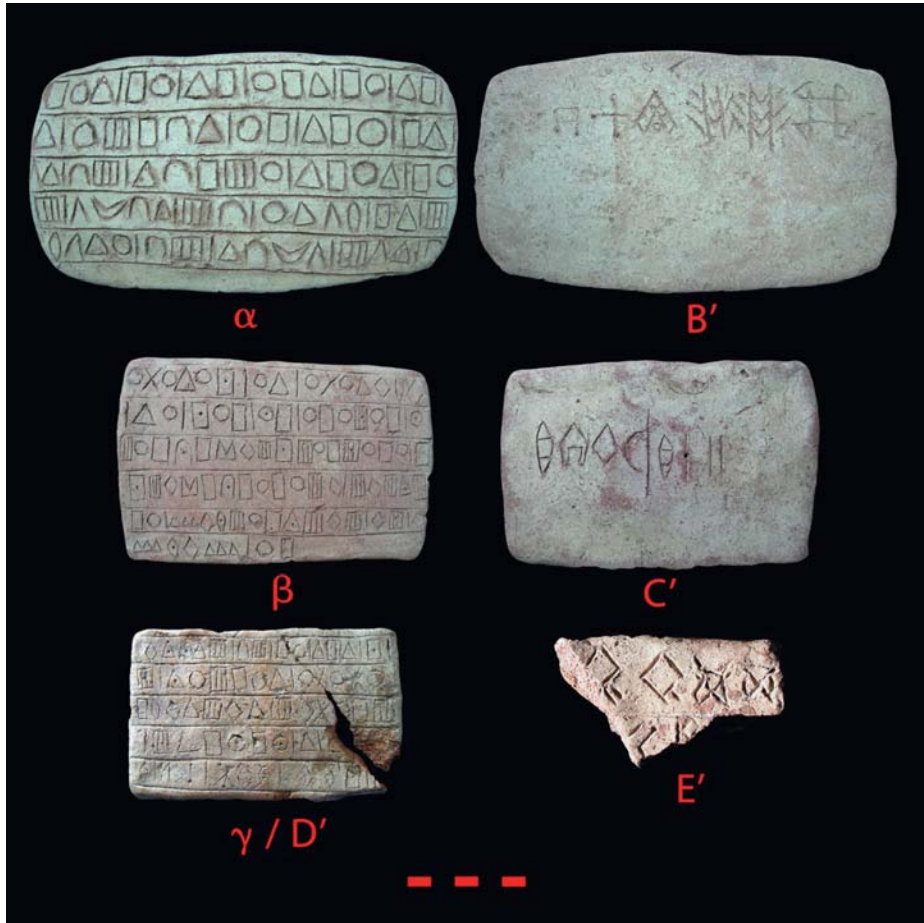
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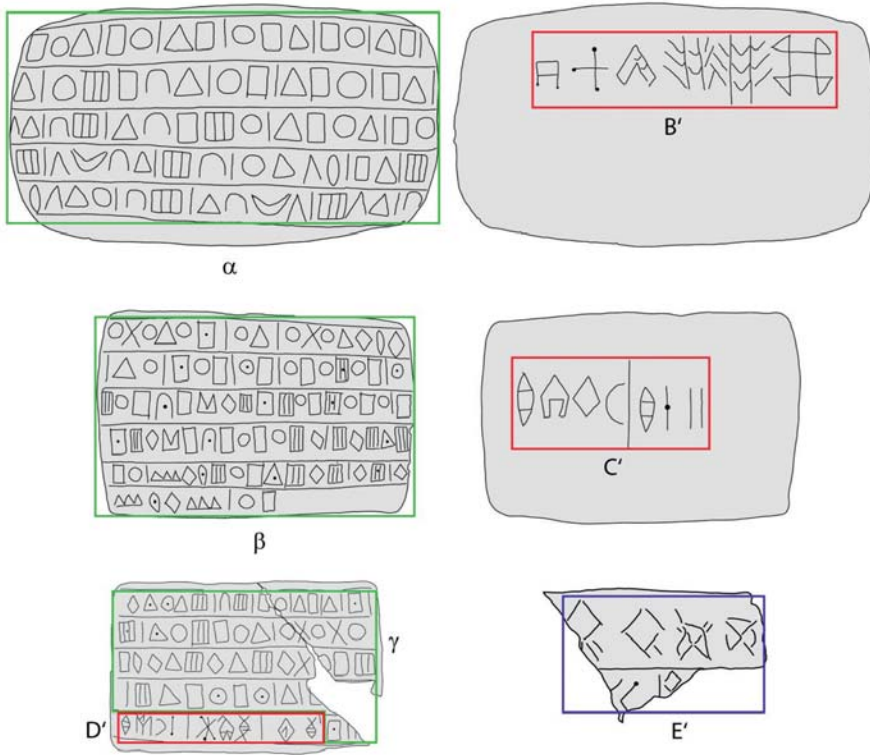
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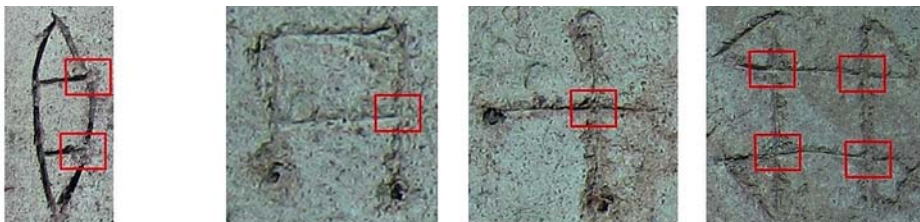




Pl. 1. Konar Sandal tablets.

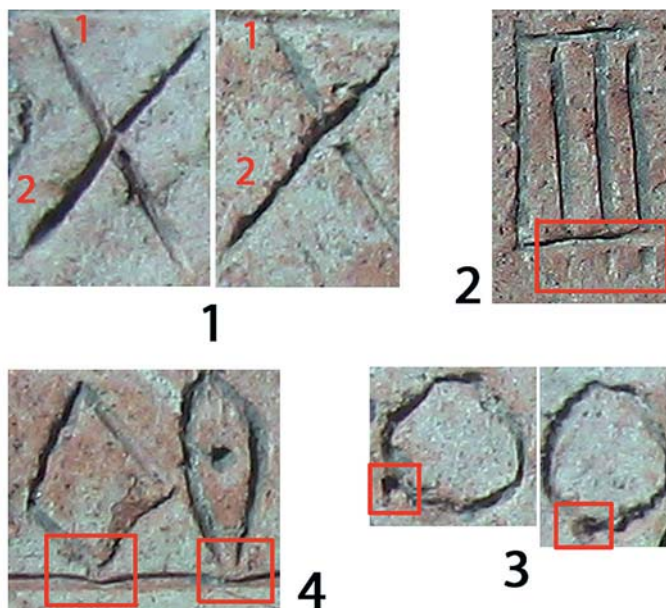


Pl. 2. in green Geometric writing; in red Linear Elamite writing; in blue possible Linear Elamite writing.

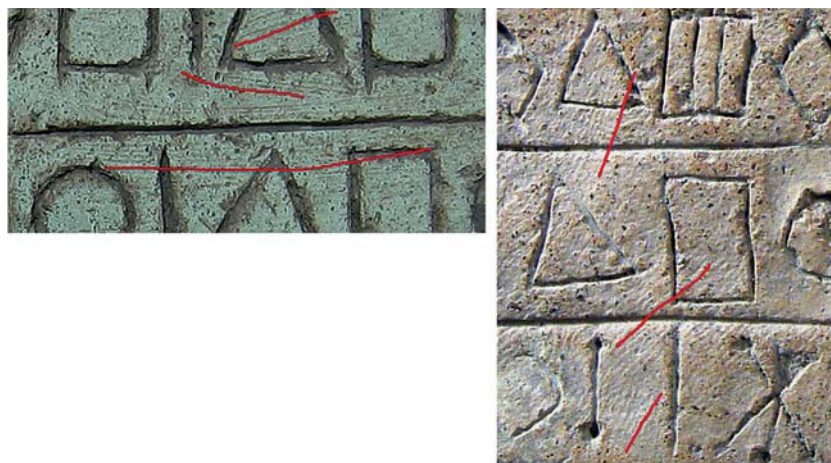


Pl. 3. on the left, Linear Elamite sign impressed in C'; on the right, Linear Elamite signs scratched in B'.

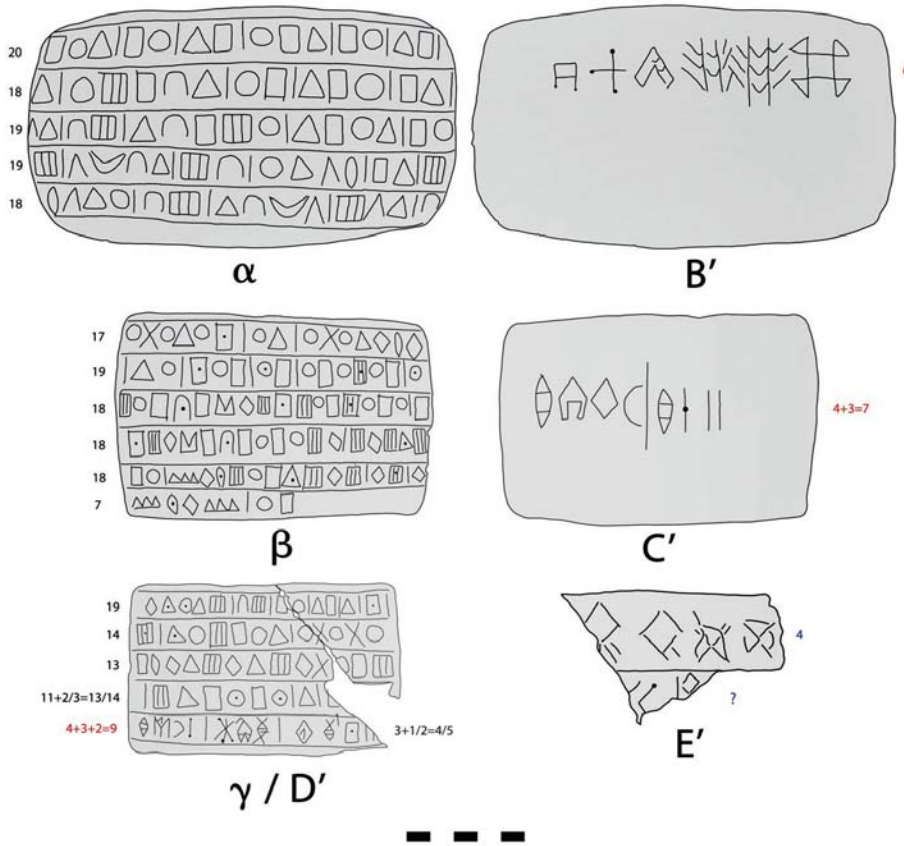























Pl. 4. details in  $\beta$ ; Pl. 4.4: signs were impressed after the separation stroke between the lines was drawn.



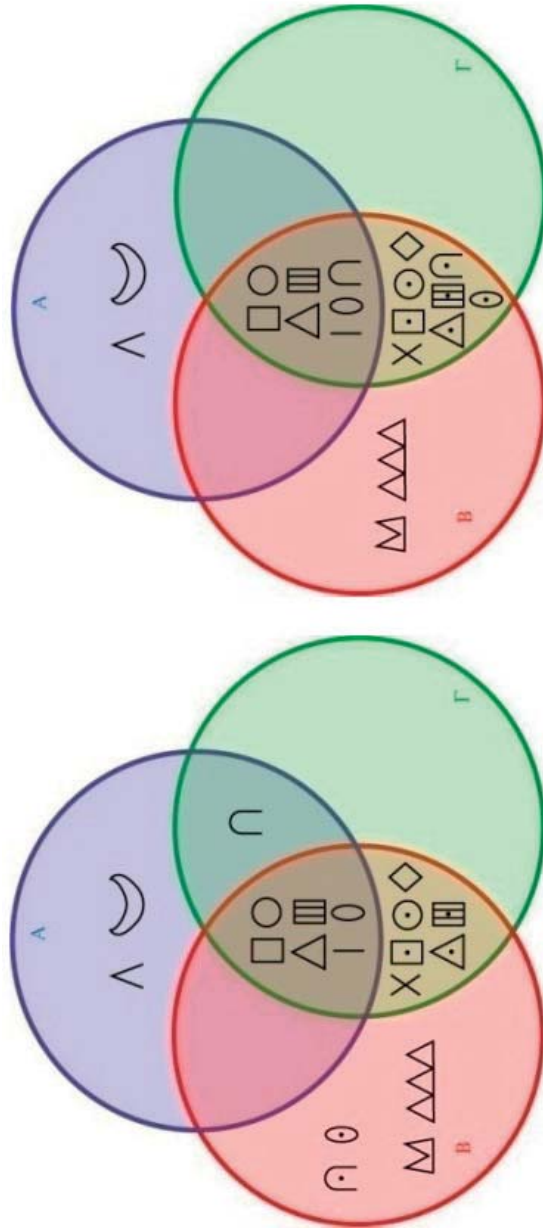
Pl. 5. visible prints in  $\alpha$  and  $\gamma / D'$ .



Pl. 6. Konar Sandal documents, showing number of signs per line.

	alpha	beta	gamma	total
A 	14	15	7	36
A' 	0	4	2	6
B 	12	20	6	38
B' 	0	2	3	5
C 	18	4	8	30
C' 	0	2	2	4
D 	8	11	7	26
D' 	0	3	1	4
E 	8	0	1	9
E' 	0	2	0	2
F 	2	1	1	4
F' 	0	2	0	2
G 	0	2	3	5
H 	24	13	12	49
I 	0	11	4	15
J 	6	0	0	6
K 	0	2	0	2
L 	0	3	0	3
M 	2	0	0	2
?	0	0	3+3/5	6/8
	94	97	63/65	254/256

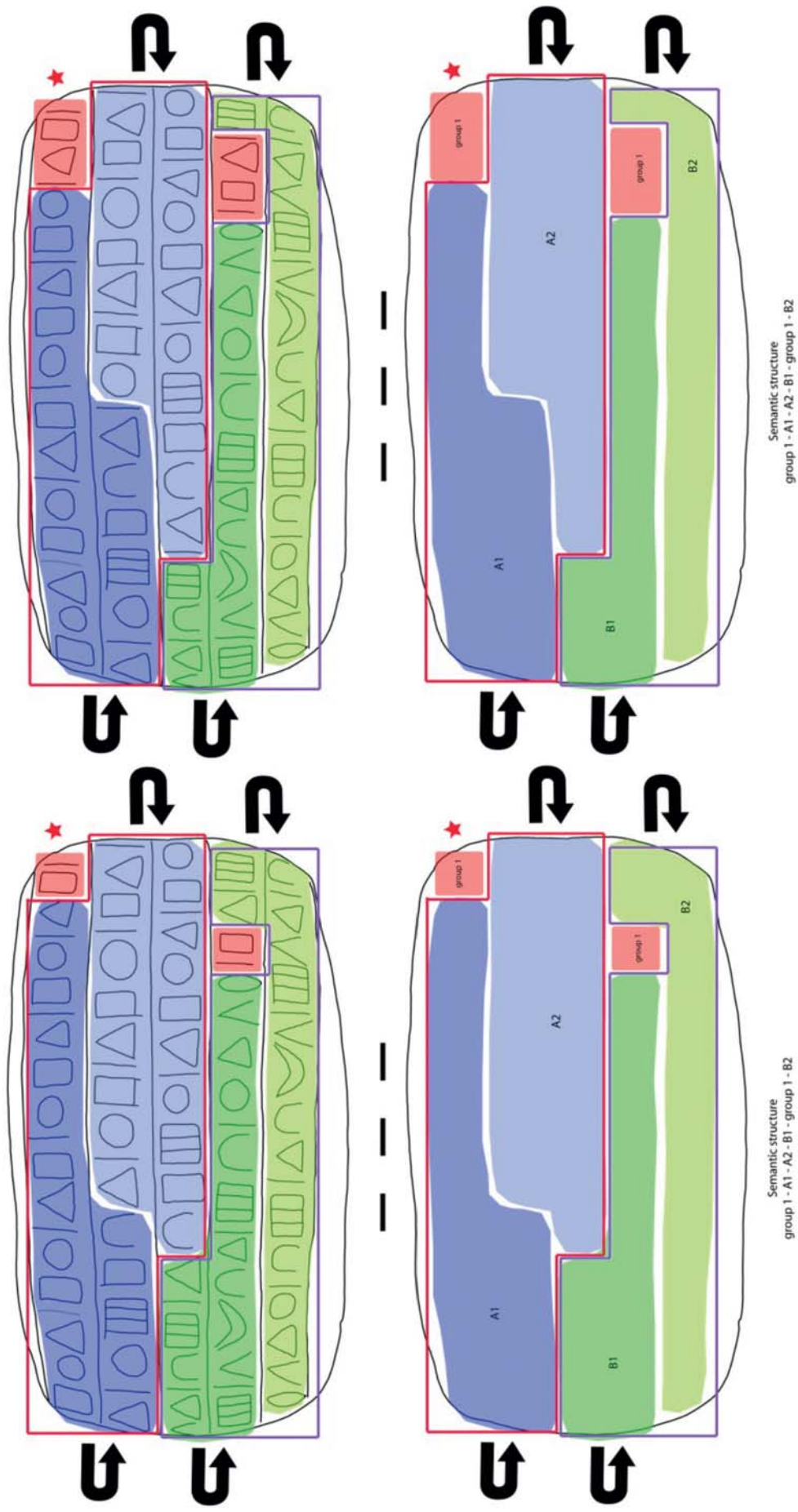
Pl. 7. Geometric signs list.



Pl. 8. on the left, 'real' Geometric sign distribution between  $\alpha$  (blue),  $\beta$  (red) and  $\gamma$  (green); on the right, 'corrected' distribution.

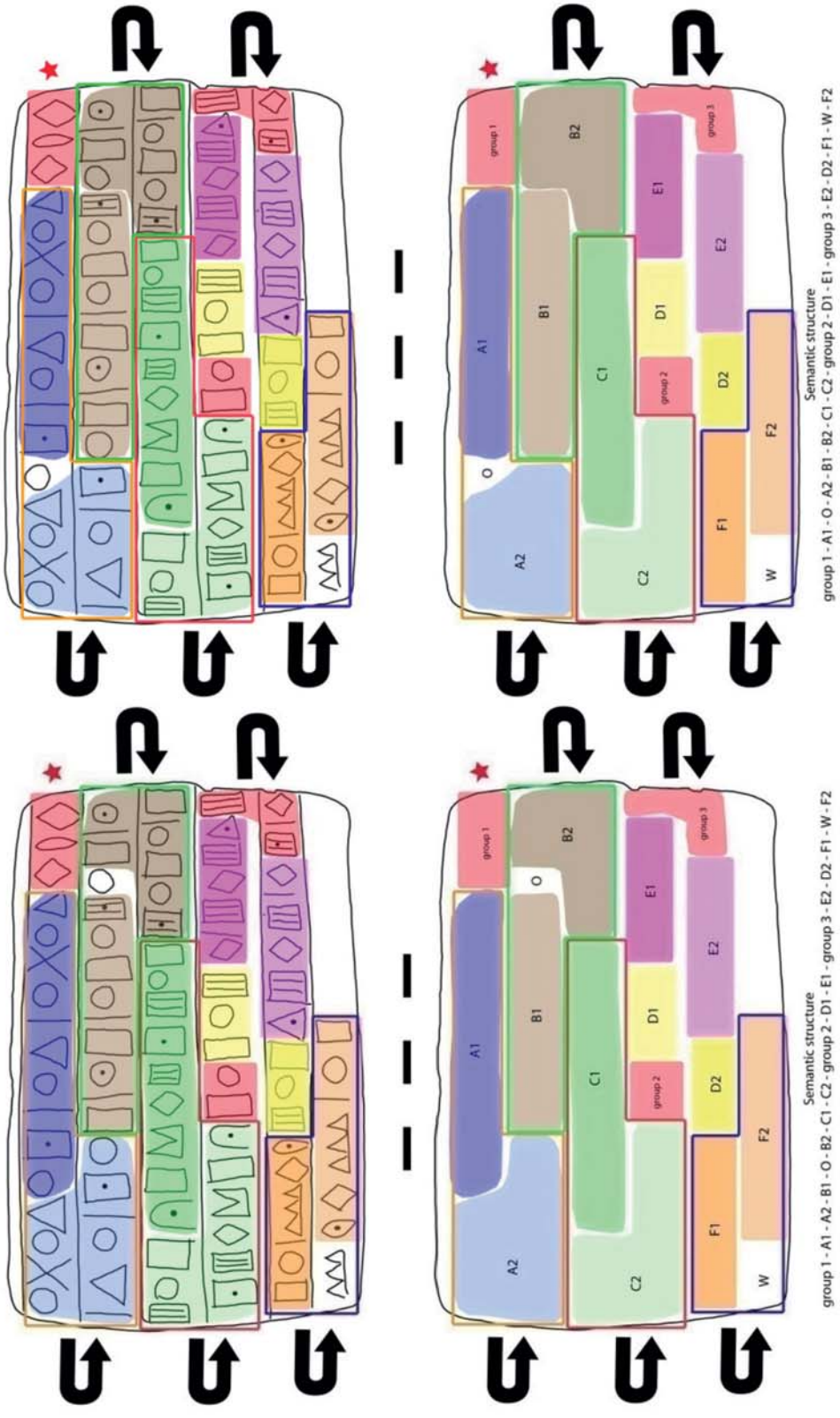
	sign 83 complete matching : A, B, C, D, F, G, H, H2, I, K, P, R, U, V partial matching : W, Y, Z		sign 182 complete matching : A, D, E, K, M (?), P partial matching : none
	sign 178 complete matching : A' partial matching : I, O, T, X, Z		sign 146 complete matching : none partial matching : L (?), W (?)
	sign 117 complete matching : none partial matching : A, B, D, F, G, H, I, L, N, O, Q, W		sign 132 (cf sign 133) complete matching : A, C, F, G, H, I, K partial matching : none
	sign 208 <b>FIRST APPEARANCE</b>		sign 171 complete matching : F, I, M, W, Y, Z, A' partial matching : K
	sign 102 complete matching : F, G, H, H2, X, Y partial matching : none		sign 186 complete matching : none partial matching : A, D, F, G, H, J, Q, U, W, Z, A'
	sign 75 complete matching : S partial matching : A, B, C, D, E, F, G, H, I, J, K, L, N, P, Q, U, V, W, Y, Z		sign 32 complete matching : none partial matching : B, I, O, W, A'
	sign 118 <b>FIRST APPEARANCE</b>		sign 11 complete matching : none partial matching : D, S, V, W, sign 75 (?)
	sign 1 complete matching : A, B, D, E, F, G, H, H2, I, J, K, L, M, N, O, R, T, U, X, A' partial matching : C, O, B, W, Y, Z		sign 21 complete matching : none partial matching : E, G, I, K, W, X, Y, Z
	sign 133 (cf sign 132) complete matching : B, E, G, J, U partial matching : none		sign 56 complete matching : none partial matching : B, D, I, O, V
	sign 170 complete matching : D, F, G, Q partial matching : none		dividing sign complete matching : A, B, C, D, E, F, G, H, H2, I, J, Q, S, U, Y, Z, A' partial matching : none

Pl. 9. Konar Sandal Linear Elamite signs list and comparisons with other Linear Elamite documents (sign numbers refer to the Linear Elamite signs list published in Desset 2012: fig. 32).

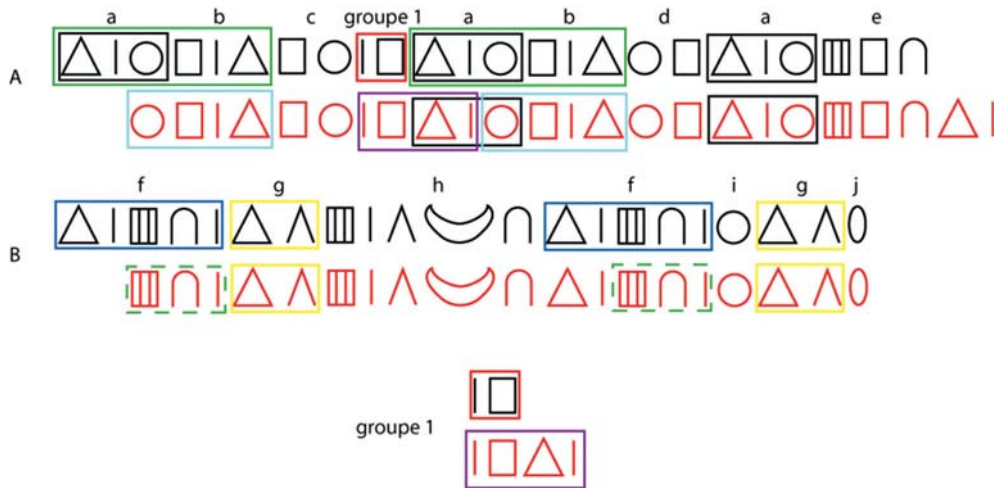


Pl. 10.  $\alpha$  semantic structure with sign groups showing double repetitions. On the left, first dividing hypothesis; on the right, second dividing hypothesis.



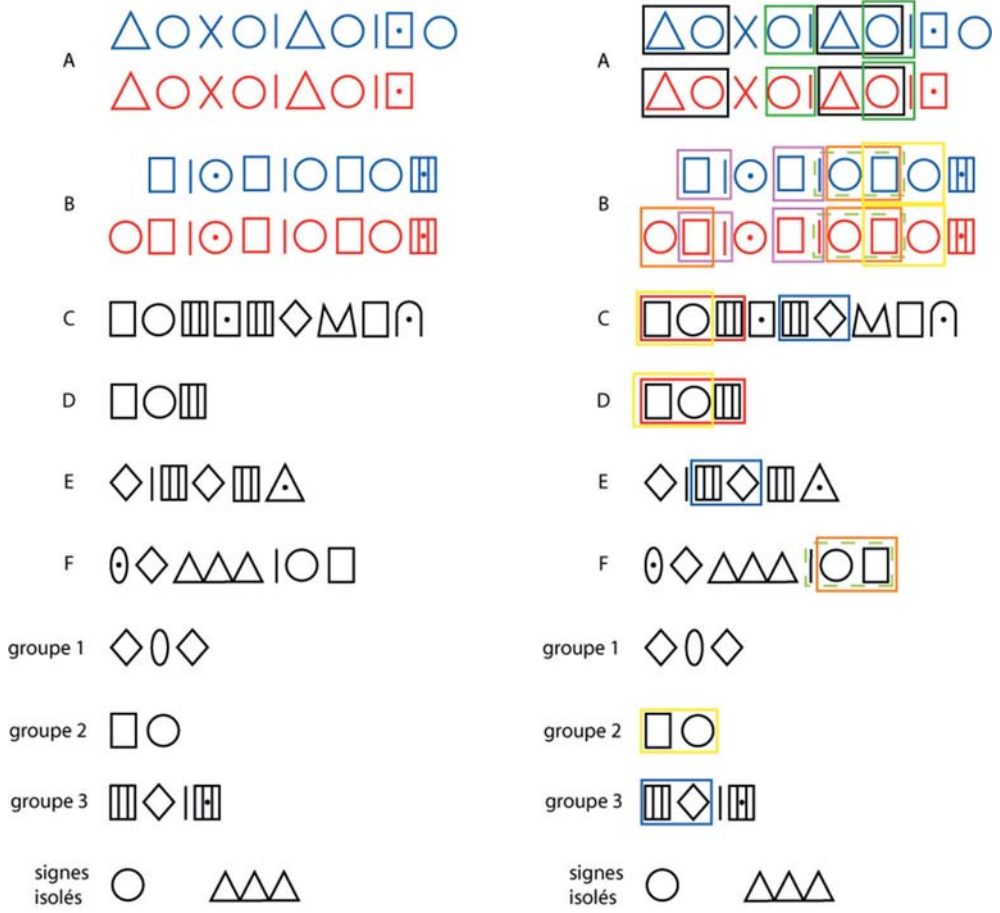


Pl. 11.  $\beta$  semantic structure with sign groups showing double repetitions. On the left, first dividing hypothesis; on the right, second dividing hypothesis.

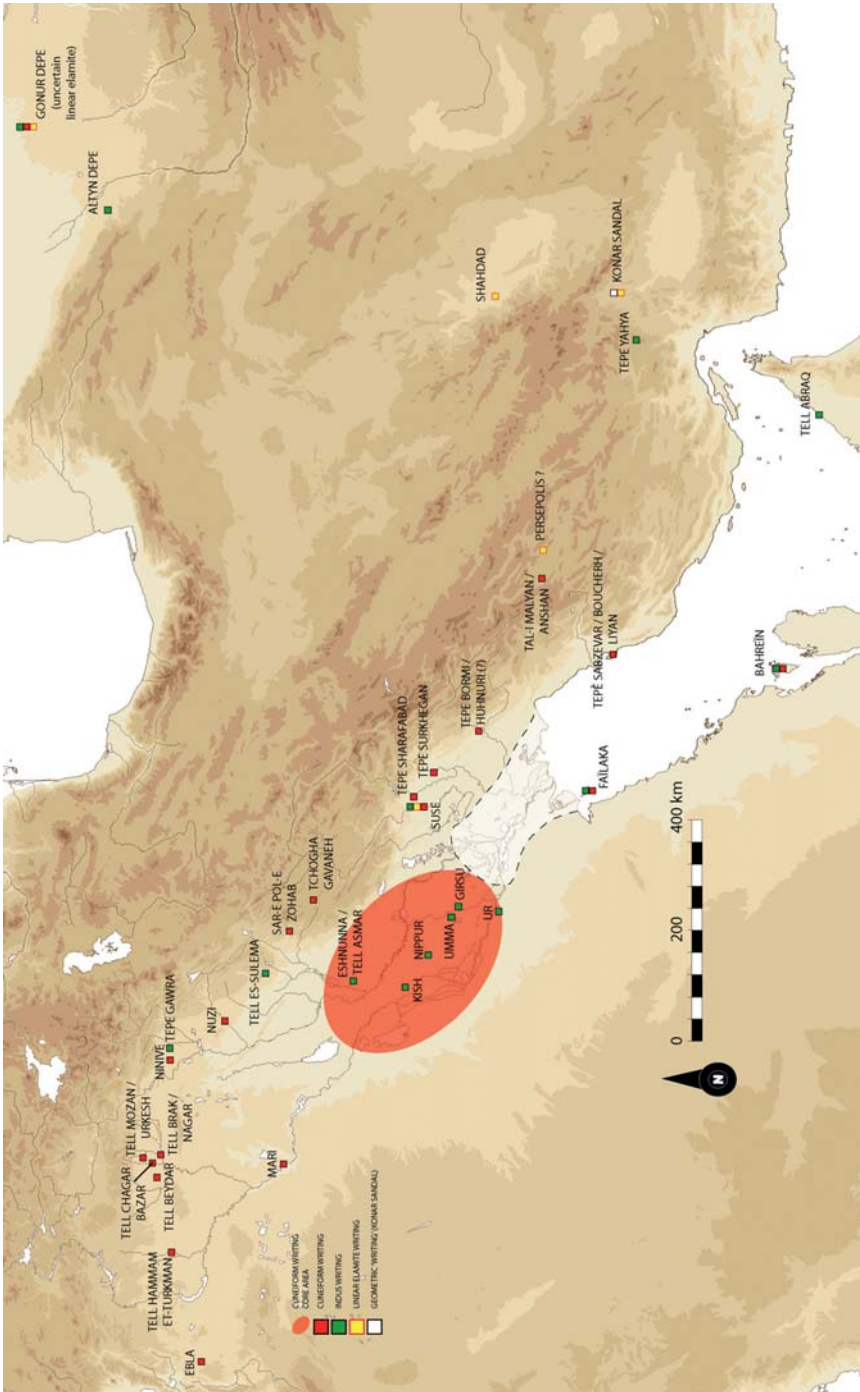


Pl. 12.  $\alpha$  subgroups analysis (to be read from left to right). In black, according to the first dividing hypothesis; in red, according to the second dividing hypothesis. Probable subgroups are suggested in each sequence.

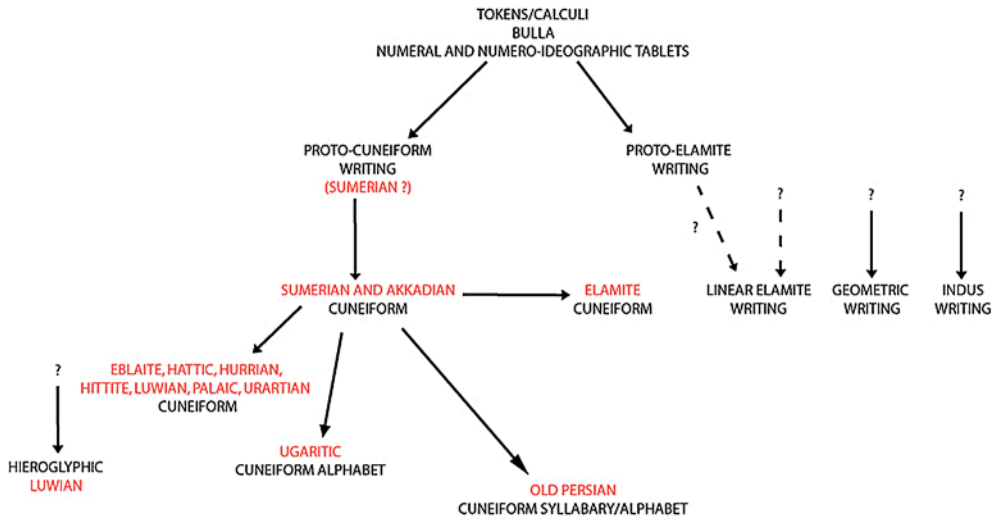




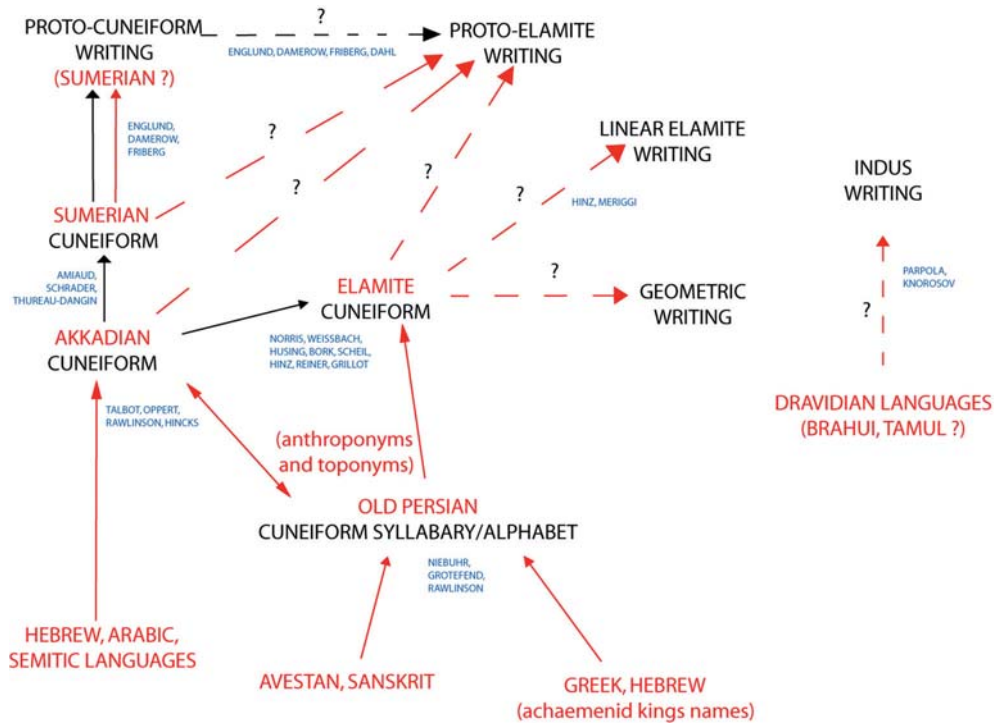
Pl. 13.  $\beta$  subgroups analysis (to be read from left to right). In black, according to the first dividing hypothesis; in red, according to the second dividing hypothesis. On the right, possible subgroups repetitions are suggested.



Pl. 14. writing systems diffusion map, between ca. 2500 and 1800 BCE.



Pl. 15. Near Eastern writings genetic connections (in black, writings; in red, languages). Proto-Elamite, Linear Elamite, Geometric and Indus writings (and ‘hieroglyphs’ used to write Luwian from the second half of the 2<sup>nd</sup> millennium BCE) do not belong to the cuneiform family (on the relations between Proto-Cuneiform and Proto-Elamite writings, see Desset 2012: 63-81).



Pl. 16. schematic history of Near Eastern writings decipherment (the red arrows represent decipherment through language approach; the black arrows represent decipherment through writing approach) and names of the main scholars involved (in blue).

With the discovery of the Konar Sandal Geometric graphic system, four Near Eastern writing systems are undeciphered-Proto-Elamite, Linear Elamite, Geometric and Indus writings. Concerning Proto-Elamite tablets, comparisons with Proto-Cuneiform (Dahl 2005a: 4-5 and 2005b: 86-98 and 113) will not probably bring any more information. Hypotheses built on languages such as Elamite, Akkadian or Sumerian may help in their decipherment and above all in the understanding of their non-numerical (anthroponymical) signs-strings. As for Linear Elamite and Geometric writings, our rather limited knowledge of the old Elamite language likely constitutes the only way (with Akkadian language for some Linear Elamite inscriptions) toward their decipherment. Finally, if Indus writing was not transcribing known or knowable language(s) such as Dravidian, the likelihood of its decipherment would be low or impossible (Parpola 2005: 46).