Nine Linear Elamite Texts Inscribed on Silver "Gunagi" Vessels (X, Y, Z, F', H', I', J', K' and L'): New Data on Linear Elamite Writing and the History of the Sukkalmaḫ Dynasty

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Nine Linear Elamite Texts Inscribed on Silver "*Gunagi*" Vessels (X, Y, Z, F′, H′, I′, J′, K′ and L′): New Data on Linear Elamite Writing and the History of the Sukkalmaḫ Dynasty*

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ABSTRACT

Nine Linear Elamite inscriptions are presented and analysed here, all written on *gunagi* type metallic beakers. In particular, seven of these vessels are part of H. Mahboubian's collection in London. It is proposed that the *gunagi* beaker type should be attributed to the late 3rd/early 2nd millennium BC while the names of the Early Sukkalmah rulers Ebarat II and Šilhaha (twentieth century BC) can be read among the sign sequences inscribed on some of them. The paper addresses the present understanding of Linear Elamite writing, along with typological, chronological and iconographic considerations on the *gunagi* vessels. It then presents an analysis of the sign sequences of the nine Linear Elamite inscriptions. This analysis leads ultimately to phonetic value identifications of some of the signs. This study is followed by a technical note on the chemico-physical examination of 13 samples collected from the Linear Elamite inscribed silver *gunagi* vessels of the Mahboubian collection.

KEYWORDS

Iran; bronze age; writing system; linear elamite; gunagi vessel; Sukkalmah dynasty; silver alloy; Kam-Firouz

کی نامور دادشان زینهار — بدان تا نهانی کنند آشکار
چو آزاد گشتند از بند او — بجستند به ناچار پیوند او
نبشتن به خسرو بیاموختند — دلش را به دانش برافروختند
نبشتن یکی نه که نزدیکِ سی — چه رومی چه تازی و چه پارسی
چه هندی چه چینی و چه پهلوی — نگاریدن آن کجا بشنوی

The captives [the divs], *bound and stricken, begged for their lives. "Destroy us not", they said, "and we will teach thee a new and fruitful art". He* [Tahmuras Shah] *gave them quarter to learn their secret. When they were released, they had to serve him, lit his mind with knowledge and taught him how to write some thirty scripts, such as the Ruman, Persian, Arabic, Sughdi, Chini and Pahlavi and thus delineate sounds.* (*Shahnameh*, Ferdowsi)

1. Introduction

Linear Elamite writing[1] was used in southern Iran (see Figure 1) between the second half of the third millennium and the beginning of the second millennium BC.[2] Generally written from the right to the left and from the top to the bottom, this writing system is still undeciphered in spite of important decipherment attempts based on the bi-script Susian inscriptions.[3] Because the Mesopotamian toponymic notion *Elam* is inappropriate when dealing with the Iranian plateau from an emic point of view, Linear Elamite writing will subsequently be referred to here as LE writing.[4]

From the Susian inscriptions, Hinz and Meriggi tried to identify several signs[5] by reading the names Puzur/Kutir-Inšušinak, Simpišhuk, Inšušinak and Susa. More recently a new, shorter list was proposed, including only a dozen or so signs (Figure 2). Since this writing is still undeciphered, the question of the language(s) written with these signs cannot be answered. At least in the 10 Susian inscriptions attributed to the local ruler Puzur/Kutir-Inšušinak (corresponding actually to only

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*Followed by a technical note by Faieta, Guida and Vidale, "A Preliminary Note on the Metallography."

[1]On Linear Elamite writing, see in general Desset, *Premières écritures iraniennes*, 92–127 and "Linear Elamite Writing", as well as André and Salvini "Réflexions sur Puzur-Inshushinak"; Hinz, "Zur Entzifferung der elamischen Strichschrift", "Eine neugefundene altelamische Silbervase" and "Eine altelamische Tonkrug-Ausschrift vom Rande der Lut"; Meriggi, *La scrittura proto-elamica, parte 1*, Salvini, Elam, iv) Linear Elamite; Stève, "Elam" and "Le syllabaire proto-élamite linéaire" and Vallat, "The most ancient scripts of Iran".

[2]This writing was not restricted to the reign of Puzur/Kutir-Inšušinak, at the end of the 3rd millennium BC (Desset, *Premières écritures iraniennes*, 98). Dahl, "Early writing in Iran" , 23 and 30 proposed that LE signs were not part of a true writing system properly speaking, but belonged to a '*mix bag of pseudo-texts with a non-standardized signary*', perhaps coding '*no information other than the powerful message of cultural independence*'.

[3]Hinz, "Zur Entzifferung der elamischen Strichschrift" and "Eine neugefundene altelamische Silbervase"; Meriggi, *La scrittura proto-elamica, parte 1* and Desset, *Premières écritures iraniennes*, 92–127 and "Linear Elamite Writing").

[4]Desset, *Premières écritures iraniennes*, 1 and "Here ends the history of 'Elam'".

[5]Hinz, "Eine neugefundene altelamische Silbervase", 44 and Meriggi, *La scrittura proto-elamica, parte 1*, 193–203 and 219–20.

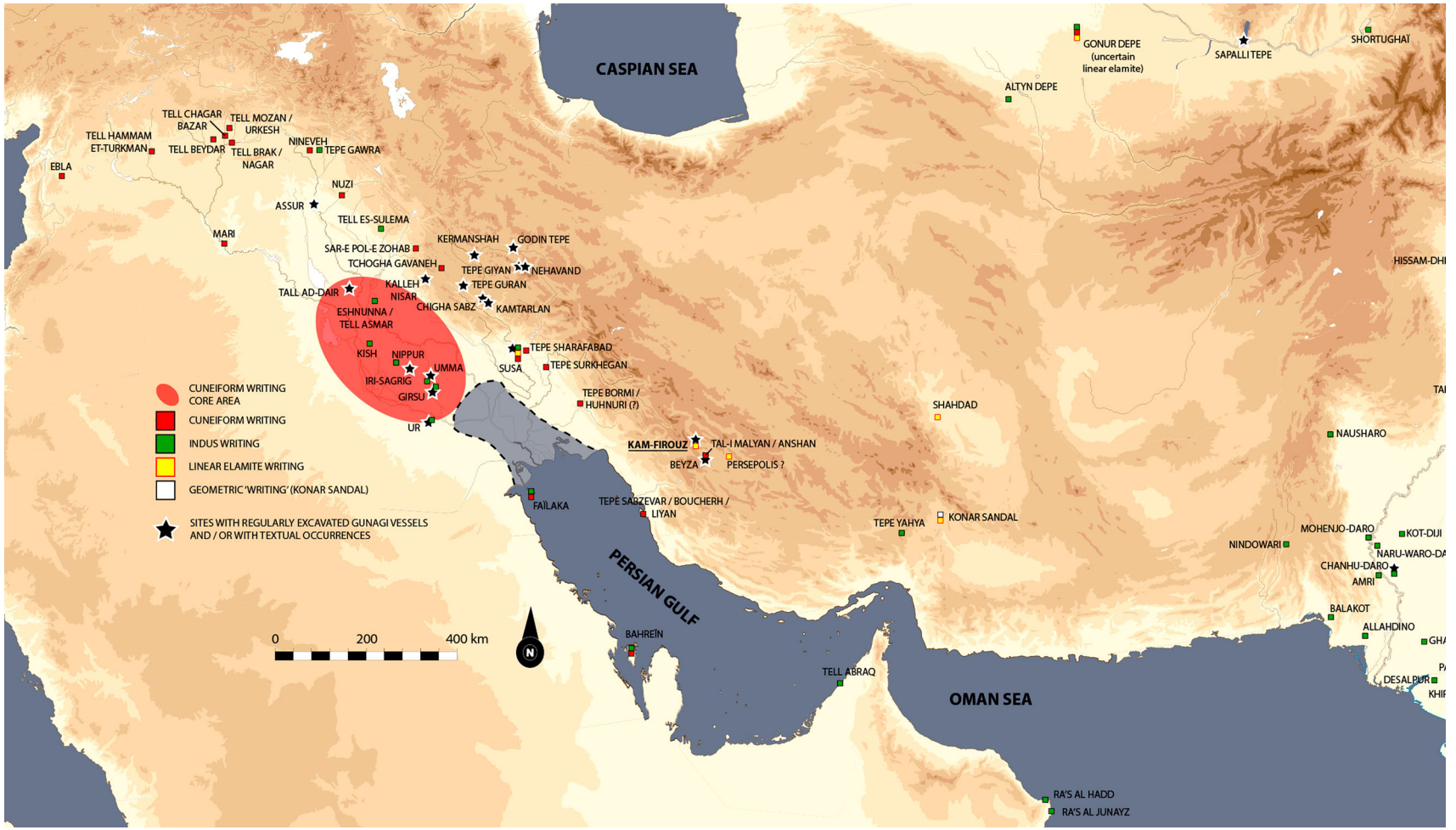

Figure 1. The distribution of writing systems in the late 3rd/early 2nd millennium BC Near East, showing the locations of the cuneiform (in red), Indus (in green), LE (in yellow) and geometric (in white) texts. Sites where evidence of "gunagi" vessels have been found are also shown.

three different texts;[6] Figure 9), the LE system was probably used to write either Elamite/Hatamtite[7] or Akkadian language texts in the 1st or the 3rd person singular, while language(s) spoken in Eastern Iran in the second half of the 3rd millennium BC (at Shahdad and Konar Sandal notably) are still elusive (is it/are they at least known or knowable language(s) … ?).

This writing system is probably a mixed one, mainly utilising phonograms/syllabograms but also including some logograms. The signs list presented here (Figure 4; updating the lists published in Desset,[8,9]) may contradict such a claim since 297 signs are recorded, which is far too much for a syllabic system, even with some logograms.[10] This signs list, organised according to the signs' shapes and not according to their hypothetical phonetic or logographic values, displays all the sign variants attested in the texts, graphically obvious (such as signs 194, 259, 256 and 195) or not. Used over large distances (1000 km as the crow flies between Susa and Konar Sandal) and quite a long period, it has been shown that a number of graphically distinct signs (signs n° 27, 28, 29, 30, 31, 7, 32, 110 and 112) were actually different shapes of the sign *in*, with western (Susa) and eastern (in Shahdad and Konar Sandal) regional variants (see here Figure 3).[11]

If the graphical variation in the LE writing reflects geographical and chronological features, the actual number of signs in use in a single region and during a limited span of time is probably more restricted than the 297 signs presented here in the list (Figure 4), probably around 100/110 signs. Two questions should consequently be raised:

- how many basic signs do all these variants truly correspond to?
- among these basic signs, what was the proportion of logograms (including determinatives) and phonograms/syllabograms used?

Distribution of the LE signs in the 37 inscriptions known as of 2017.

1: A, B, D, E, F, G, H, I, J, K, L, M, N, Q, R, T, U, X, Y, A′, C′, F′, J′
2: A, D, G, H, L, U, W
3: X, Y, Z, H′, I′, J′, K′, L′
4: A′
5: Y, L′
6: E, G, H, I, K, W, X, Y, Z, F′, H′, I′, J′, K′, L′
7: A′
8: A
9: Z
10: V
11: D′
12: D, S
13: D, F, G, H, Q, A′, F′, H′
14: Y, Z
15: H
16: H, H′
17: F
18: H, Y, Z
19: A′
20: D, I, K, Q, S, X, Y, Z, F′, H′, I′, J′, K′
21: D′
22: Y, L′
23: Q
24: Z
25: Y
26: Z, H′
27: Z
28: A, B, G, H
29: D, F, G, H, U
30: Q
31: C
32: D′
33: D, I
34: F, J
35: B, I
36: Q, Y, Z
37: D
38: C
39: G, W, X, Z, J′
40: A, C, Z
41: Z
42: Y, L′
43: E′
44: I
45: W, A′
46: X, Y, F′, H′, K′, L′
47: R
48: D, F, H, Q, Z
49: V, F′, G′
50: I, Q, Y
51: Y
52: G, M
53: K
54: D
55: X
56: D′
57: B
58: K
59: K
60: Z
61: K
62: X
63: Y, Z, F′, H′, K′
64: X, J′
65: Y, L′
66: Z, I′
67: B
68: D, K
69: A
70: A, C, E, F, G, H, J
71: Q, Z, H′, K′
72: A, B, C, E, F, G, H, I, J, K, N, P, Q, U, W, X, Y, Z, A′, F′, H′, I′, J′, K′, L′
73: K
74: F, H
75: S, C′, D′, G′
76: K, N, W, Y, F′
77: A′
78: G, H, A′
79: D, K
80: F, G, L
81: W
82: N
83: A, B, C, D, F, G, H, I, K, P, R, U, V, X, B′, G′, H′, J′, K′
84: G, Z, I′
85: Y
86: W, Y, L′
87: A, C, I
88: B
89: C, E, W
90: K
91: Y
92: A, C, D, H, M, N , Q, U, L′
93: Z
94: B
95: B, D, I
96: X, Y, Z, J′
97: C, D, F, H, K, Q, Y, Z
98: A, E, J′
99: M, Y, Z, A′, I′, L′
100: Y
101: Y, L′
102: F, G, H, X, Y, B′, H′, J′, K′, L′
103: J, Q, W, Z, F′, K′
104: H, I, N, X, Y, Z, H′, J′, K′, L′
105: G, H, Y, Z, J′
106: D, F, F′, I′
107: N
108: K
109: W
110: S
111: W
112: W
113: W
114: I
115: A, B, D, F, G, H, Q, W
116: N
117: B′
118: C′
119: X, J′
120: Y, Z, L′

[6]Desset, "Linear Elamite Writing".
[7]Because of the imprecise nature of the label 'Elamite language', the designation of this language as (Elamite)/Hatamtite is preferred here (see Desset, "Here ends the history of 'Elam'").
[8]Desset, *Premières écritures iraniennes*, 102, fig. 32.
[9]Desset, "Linear Elamite Writing", fig. 3.
[10]The 'pure' syllabic systems, without logograms, usually work with 50–120 signs, such as the Cypriot syllabary (56 signs), the Cree syllabary (70 signs), the Cherokee syllabary (86 signs), the Inuktitut syllabary (108 signs), the Chinese syllabary 'fan-ch'ieh (62 signs) or the Japanese hiragana and katakana (50 signs for each of them). As the LE system probably used several logograms (mixed system), it should rather be compared with the Mycenaean Linear B for example, which consisted in 87 syllabic signs and around 120 logograms.
[11]Desset, *Premières écritures iraniennes*, 123–25 and "Linear Elamite Writing", fig. 7.

121: W
122: L
123: W
124: A, D, E, G, H, U, Y, Z, F′, K′
125: B, F
126: W
127: L
128: R
129: Z, H′, I′, J′, K′
130: Q
131: W
132: A, C, F, G, H, I, K, D′, H′
133: B, E, G, J, U, X, Y, C′, J′
134: I, M
135: A, E, F, I, P, X
136: D, F, Q, Z, F′
137: A, B, C, E, Q, Z , F′, H′
138: I, T, X, Y, I′, J′, K′, L′
139: A, B, E, X, Y, Z , J′
140: K, Q
141: F, H
142: W
143: W
144: W
145: W
146: D′
147: K
148: W
149: X, I′, J′
150: W
151: J
152: H
153: A, B, Y
154: F, J′
155: N
156: K
157: W
158: A, B, C, D, F, G, H, I′
159: Q
160: Y, Z, L′
161: Z
162: Y, L′
163: Y, L′
164: D
165: D, K′
166: W
167: X
168: Y, L′
169: A, B, D, E, F, I, Q, U, W, X, Y, Z, A′, F′, H′, I′, J′, K′
170: D, F, G, Q, X, Y, Z, C′, F′, H′, I′, J′, K′
171: F, I, M, W, Y, Z, A′, D′, K′
172: A, B, C, D, E, F, G, H, I, J, K, Q, U, W, X, Y, Z, F′, I′, J′, K′, L′
173: J
174: T
175: Z
176: Q, Z, H′, I′
177: X, Y, F′, K′
178: A′, B′
179: I, J′
180: D, Y, Z, L′
181: K, A′
182: A, D, E, K, M, P, C′
183: A, B, F, H, Q, R, X, Y, Z, F′, H′, I′, J′, K′
184: K
185: A, D, F, G, H, J, Q, U, W, X, Z, H′, K′
186: D′
187: H
188: Y
189: A, D, F, H, I, M, Y, Z
190: A, C, U
191: B, H
192: G
193: H
194: X, J′ **195**: Z, F′
196: D
197: Z
198: G
199: I
200: Q
201: A, D, E, F, I, K, P, U, A′
202: B, F, H, I
203: C, E, Q
204: D
205: K
206: K, M
207: Y, L′
208: B′
209: W, A′
210: I, M, Q
211: X, Y, Z, J′
212: A, D
213: N
214: Q, Y, Z, J′
215: X
216: W
217: D
218: Y
219: K
220: E′
221: E′
222: A′
223: A′
224: A′, J′
225: A′
226: A′
227: A′
228: F′
229: F′
230: F′, H′, I′, K′
231: X, F′, H′, J′, K′
232: F′, K′
233: X, F′
234: F′, I′, K′
235: F′
236: F′, H′, I′
237: F′
238: X
239: X
240: Z, H′
241: Z
242: Z
243: Z
244: Y
245: Y
246: Y
247: Y
248: Y
249: Y, I′, K′
250: Y
251: Y
252: Y
253: Y
254: Y
255: Y, J′
256: Y
257: G′
258: G′
259: H′, I′, K′
260: H′, K′
261: I′
262: H′
263: H′, I′, K′
264: H′
265: I′, K′
266: H′, I′, K′
267: H′
268: I′, J′
269: H′, I′, K′
270: Y
271: I′
272: J′
273: J′
274: J′
275: J′
276: J′
277: J′
278: K′
279: K′
280: K′
281: K′
282: K′
283: K′
284: K′
285: K′
286: K′
287: K′
288: K′
289: K′
290: K′
291: K′
292: I′
293: I′
294: L′
295: L′
296: L′
297: L′
Dividing sign: B, C, D, E, F, G, H, I, J, Q, S, U, Y, Z, A′, C′, D′, F′, I′, K′

Up to now, only 32 inscriptions were known.[12] The 24 with known proveniences (see Figure 1) were found in Susa (eighteen inscriptions[13]), Shahdad (one inscription), Konar Sandal (four inscriptions[14]) and perhaps near Persepolis (one inscription). In this paper, the complete texts of inscriptions X, Y and Z (Mahboubian

[12]A, B, C, D, E, F, G, H, I, J, K, L, M, N, P, Q, R, S, T, U, V, W, X, Y, Z, A′, B′, C′, D′, E′ (uncertain LE inscription), F′ and G′ (see Desset, "Linear Elamite Writing").
[13]Of these 18 Susian LE inscriptions, 10 (A, B, C, E, F, G, H, I, P and U) may be associated with certitude to Puzur/Kutir-Inšušinak (Desset, *Premières écritures iraniennes*, 94–95). See Dahl "Early Writing in Iran", 257 for their hypothetical discovery context in Susa.
[14]Concerning the tablets recently found in Konar Sandal, displaying LE inscriptions and for the first time the so-called 'geometric' system, see Desset, "A New Writing System Discovered in 3rd Millennium BCE Iran". Although some scholars may have questioned their authenticity, it is to be reminded that three of these four documents were found in November/December 2006 in an official regularly led excavation (trench XV), witnessed by many persons including notably Pr. Massimo Vidale and Pr. Holly Pittman.

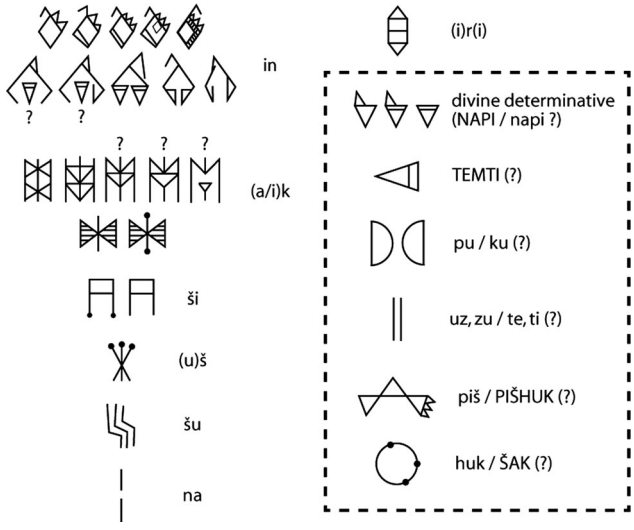

Figure 2. Phonetic (and logographic) values currently proposed for the LE writing system (Desset, *Premières écritures iraniennes*, 127, fig. 46 and Linear Elamite Writing, fig. 10); the values in the dotted line rectangle are uncertain

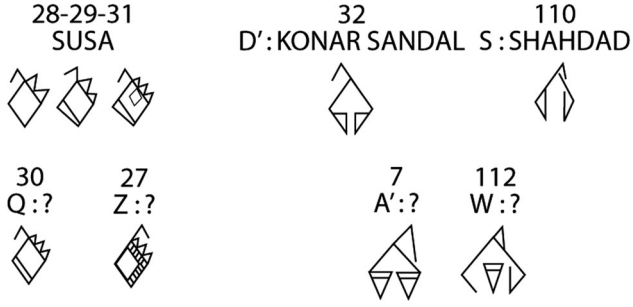

Figure 3. Graphical variants of the LE sign in.

collection), already partially published,[15] are finally edited while five new inscriptions are published, four from the Mahboubian collection (H', I', J' and K') and one from an auction internet site (L'). Consequently, 37 LE inscriptions are now available (Figures 5 and Figure 6 (a,b)).

H. Mahboubian personally stated, based on the documents left by his father Benjamin Abol Ghassem Mahboubian, that the vessels with the LE inscriptions X, Y, Z, H', I', J' and K' (cf. Figure 15(a), n° 13–19), were found in commercial excavations in the area of Kam-Firouz (30°19′26″N; 52°11′49″E ; cf. Figure 1), some 40 km northwest of Tal-i Malyan/Anšan, while the other vessels in their collection (Figure 15(b), n° 21–26) come from Beyza (29°58′20″N ; 52°24′07″E), 4,5 km south of Tal-i Malyan/Anšan. These sites were both excavated between 1922 and 1924.

2. Description of the Vessels Bearing LE Inscriptions X, Y, Z, H', I', J', K' and L'

I was given the opportunity to examine the vessels belonging to H. Mahboubian's collection (LE inscriptions X, Y, Z, H', I', J' and K' ; Figures 7–13) in London on the 4th and 5th of November 2015,[16] to collate their inscriptions, and to collect 13 samples from fragments of LE inscribed silver vessels (see Figure 18) which were submitted for physico-chemical analysis in Rome ISCR, thanks to Pr. M. Vidale (see the technical note after this paper).

The seven inscriptions belonging to H. Mahboubian's collection were written on truncated cone metallic (silver alloy) beakers, like F' belonging to the Schöyen Collection,[17] made of a metallic sheet shaped by hammering and annealing with a circular short base, a slightly convex lower wall, then a carinated transition to the upper wall, slightly constricted/concave in the case of X, Y, J' and K', and finally a carinated rim bent outward and then inward to form a flat surface. Y and Z also display spouts, probably soldered in the case of Z. These vessels were apparently thoroughly cleaned as very few residues of their original corrosion remained. Although Q (the Marv Dasht inscription) and L' were also written on silver truncated cone vessels, they probably belonged to another type while W and A' are completely different vessels.

LE inscriptions X, Y, Z, F', H', I', J' and K' were written on the same type of metallic beaker. Similar vessels, mainly in bronze, have been found in excavations (almost always in funerary deposits) in contexts usually attributed to the beginning of the 2nd millennium BC in the Central Zagros (Kalleh Nisar, Tepe Guran, Chigha Sabz, Kamtarlan II, Chaman, Tepe Giyan, Godin Tepe, Nehavand and Kermanshah), at Susa, in Bactriana and in the Indus Valley (Chanhu Daro), while in Mesopotamia (at Tello/Girsu, Ur, Tall ad-Dair and Aššur), they have been recorded there from the Neo-Sumerian/Ur III period to the Old Babylonian/Assyrian one (see Figure 1

[15]In Mahboubian, *Elam, Art and Civilization*, 50–55 and Desset, *Premières écritures iraniennes*, 120–23. The complete copies of W and A' are still missing.
[16]Mr Houshang Mahboubian has stated that these pieces were formerly in the possession of his father, Dr Benjamin Abol Ghassem Mahboubian and were exported to Europe before 1970. The present Iranian antiquities law, forbidding the export of antiquities, was not passed until 1972 following an initiative by Dr Firouz Bagherzadeh, formerly Director of the National Museum of Iran.
[17]Vallat, "Textes historiques élamites," 187–88.

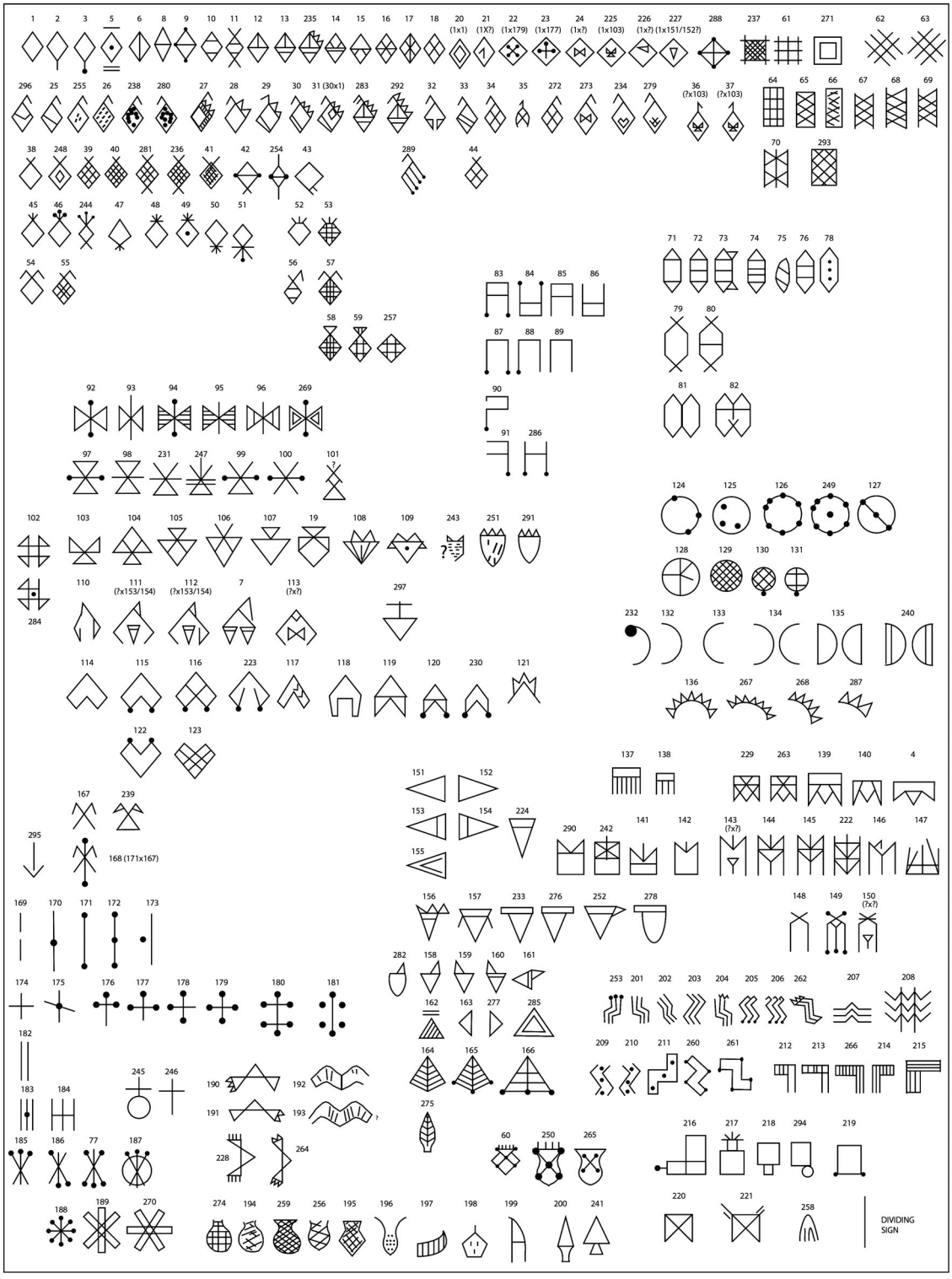

Figure 4. LE signs list.

for their spatial distribution and Figure 15(a–d) for the 61 documented specimens of this type of vessel, shown with the same scale).[18]

Eight of these 61 vessels bear LE inscriptions (Figure 15 (b), n° 13–20; X, Y, Z, F', H', I', J' and K'), while six displayed cuneiform texts (Figure 15(a), n° 1–6; see below).

[18]For this type of metallic vessel, see in general:

- Calmeyer, *Datierbare Bronzen aus*, 52–5 ('*Gefässe mit konkaver Wandung*');

Text	Material	Description	Found in regular digs ?	Discovery place	Bigraphic ? (cuneiform or geometric text)	Puzur-Inshushinak's mention (dating) in akkadian ?	First publication	Remark
A	stone ?	slab (fragmentary statue ?)	yes	Susa (?)	yes	direct mention	Scheil 1905 MDP 6	
B	stone ?	fragmentary votive boulder ?	yes	Susa (?)	yes	indirect mention (joint by André and Salvini 1989)	Scheil 1905 MDP 6	
C	alabaster	fragmentary statue	yes	Susa (?)	yes	indirect mention	Scheil 1908 MDP 10	
D	sandstone	fragmentary votive boulder ?	yes	Susa (?)	no	no	Scheil 1908 MDP 10	
E	sandstone	slab (?)	yes	Susa (?)	no	no	Scheil 1908 MDP 10	
F	sandstone	step (?)	yes	Susa (?)	no	direct mention (cf. André and Salvini 1989)	Scheil 1908 MDP 10	
G	sandstone	step (?)	yes	Susa (?)	no	direct mention (cf. André and Salvini 1989)	Scheil 1908 MDP 10	
H	sandstone	step (?)	yes	Susa (?)	no	direct mention (cf. André and Salvini 1989)	Scheil 1908 MDP 10	
I	limestone	female figure statue (goddess ?)	yes	Susa (Acropolis, tr. 93)	yes	direct mention	Scheil 1913 MDP 14	
J	clay	cone	yes	Susa (Acropolis)	no	no	Scheil 1935 MDP 26	
K	clay	fragmentary cone	yes	Susa (Acropolis)	no	no	Scheil 1935 MDP 26	
L	clay	fragmentary cone (?)	yes	Susa (Acropolis)	no	no	Scheil 1935 MDP 26	
M	clay	fragmentary lens (?)	yes	Susa (Acropolis)	no	no	Scheil 1935 MDP 26	
N	clay	tablet	yes	Susa (Acropolis)	no	no	Scheil 1935 MDP 26	
O	clay	tablet	yes	Susa (Donjon)	no	no	Scheil 1935 MDP 26	**It is not linear elamite !**
P	gypsum	?	yes	Susa (Acropolis, 'chantier 1')	no	no	de Mecquenem 1956	
Q	silver	vase	no	Persepolis (?)	no	no	Hinz 1969	
R	clay	tablet	yes	Susa (Louvre ?)	no	no	Hinz 1969	
S	clay	ceramic pot	yes	Shahdad (cemetary A, gr. 30)	no	no	Hinz 1971	
T	limestone	?	yes	Susa (Louvre ?)	no	no	André et Salvini 1989	
U	limestone	step (?)	yes	Susa (Louvre ?)	no	direct mention (cf. André and Salvini 1989)	André et Salvini 1989	
V	stone ?	Indus / Persian Gulf related seal	no	?	no	no	Winkelmann 1999	
W	silver	vase	no	?	no	no	cf. CDLI	
X	silver	vase	no	Kam-Firouz	no	no	Mahboubian 2004	
Y	silver	vase	no	Kam-Firouz	no	no	Mahboubian 2004	
Z	silver	vase	no	Kam-Firouz	no	no	Mahboubian 2004	
A'	metal	vase	no	?	no	no	Phoenix Ancient Art catalog 2007 No. 1 item no. 47	
B'	clay	tablet	yes	Konar Sandal, tr. XV	yes	no	Madjidzadeh 2011	
C'	clay	tablet	yes	Konar Sandal, tr. XV	yes	no	Madjidzadeh 2011	
D'	clay	tablet	no	Konar Sandal, tr. XV (?)	yes	no	Madjidzadeh 2011	
E'	clay	tablet (brick ?)	yes	Konar Sandal south	no	no	Madjidzadeh 2011	**linear elamite uncertain**
F'	silver	vase	no	?	no	no	Vallat 2011	
G'	gold	seal	no	?	no	no	Christie's London, 14/04/2011, lot n° 321	
H'	silver	vase (fragment)	no	Kam-Firouz	no	no		Mahboubian collection
I'	silver	vase (fragment)	no	Kam-Firouz	no	no		Mahboubian collection
J'	silver	vase	no	Kam-Firouz	no	no		Mahboubian collection
K'	silver	vase	no	Kam-Firouz	no	no		Mahboubian collection
L'	silver	vase	no	?	no	no	Timeline auctions internet site, 25-27/02/2016, lot n° 1534	

Figure 5. List of the 37 LE inscriptions.

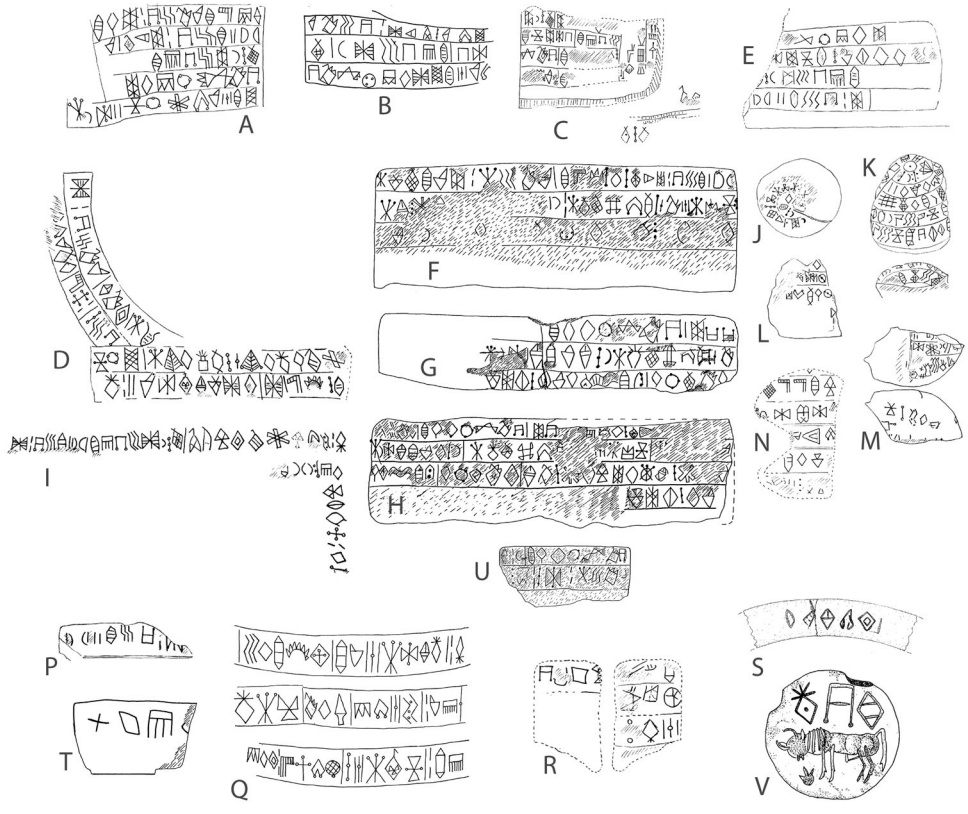

Figure 6. LE inscriptions (1st part). (a) LE inscriptions (2nd part). (b) LE inscriptions (3rd part). (c) The 37 LE inscriptions known in 2017. (with the drawings of Meriggi, La scrittura proto-elamica, parte 1, pl. 1, 2, 3 and 4 for the inscriptions A–E and I–R, André and Salvini, "Elam, iv) Linear Elamite", figs. 3, 4, 5, 6 and 7 for F, G, H, T and U, Hiebert and Lamberg-Karlovsky, "Central Asia", fig. 4 for S, Winkelmann, Ein Stempelsiegel mit alt-elamischer Strichschrift, figs. 1 and 2 for V; the other drawings, from W to L' are by the author).

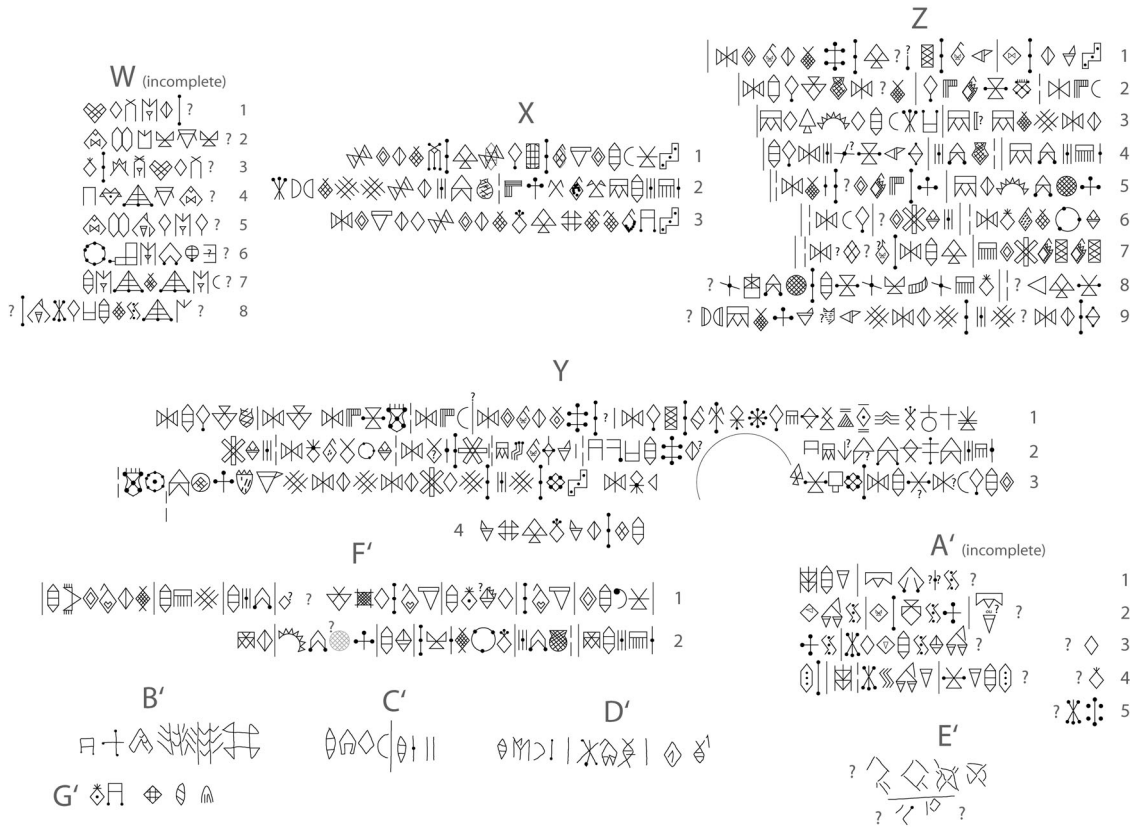

Figure 6. Continued

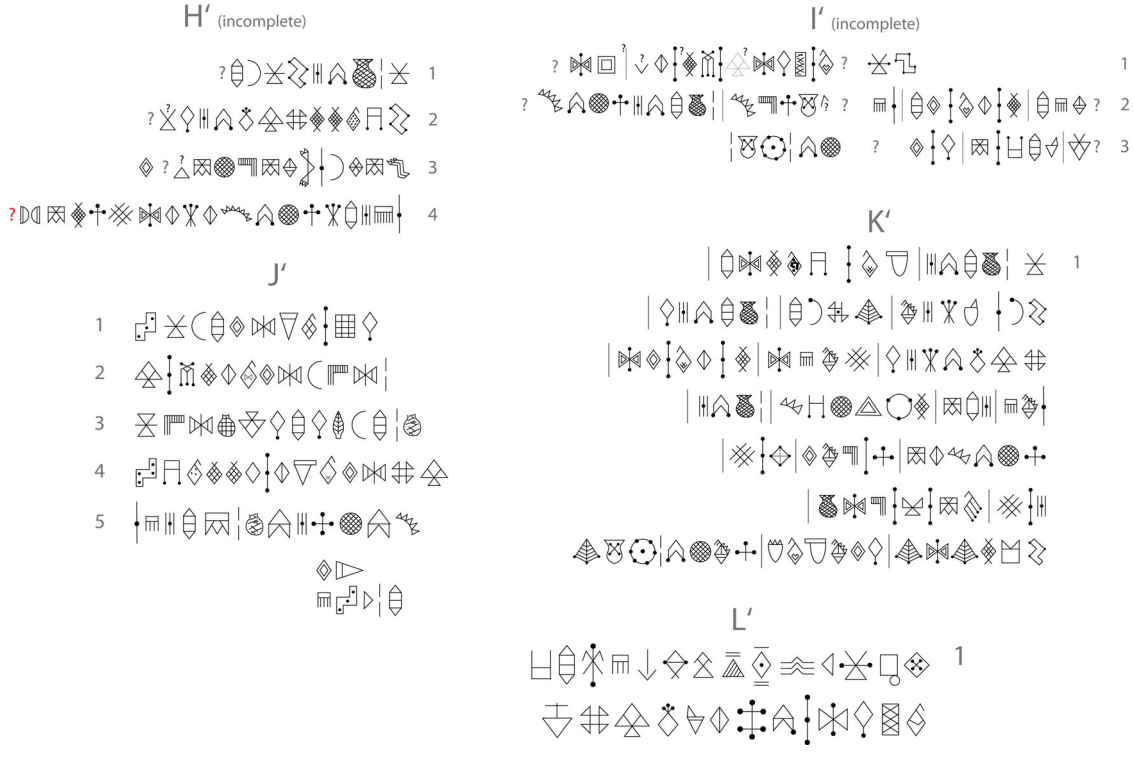

Figure 6. Continued

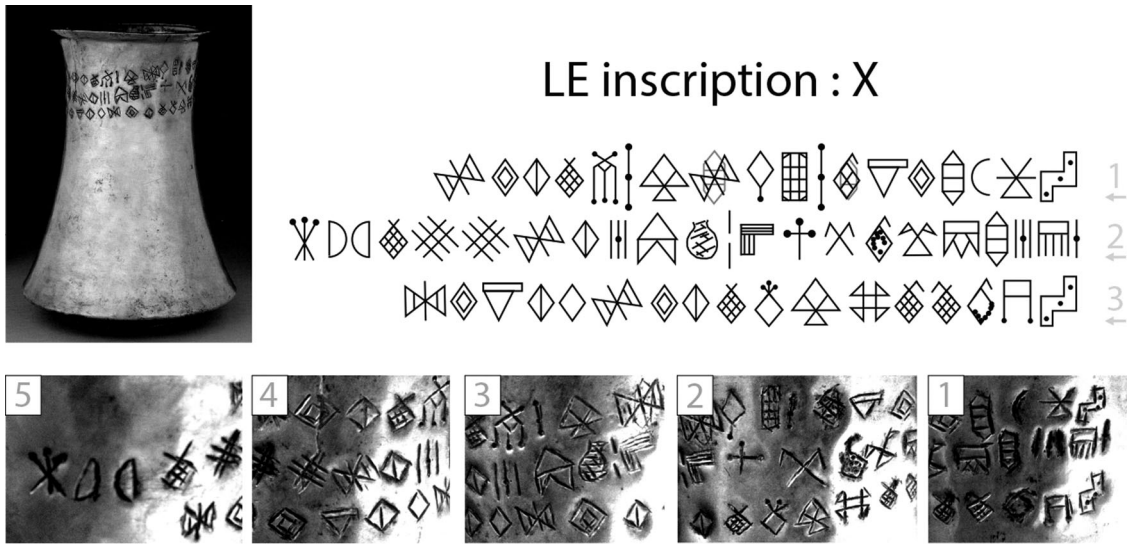

Figure 7. LE inscription X (H. Mahboubian collection); 14 cm high; diameter, rim: 8 cm, carination: 10.5 cm, base: 6.5 cm.

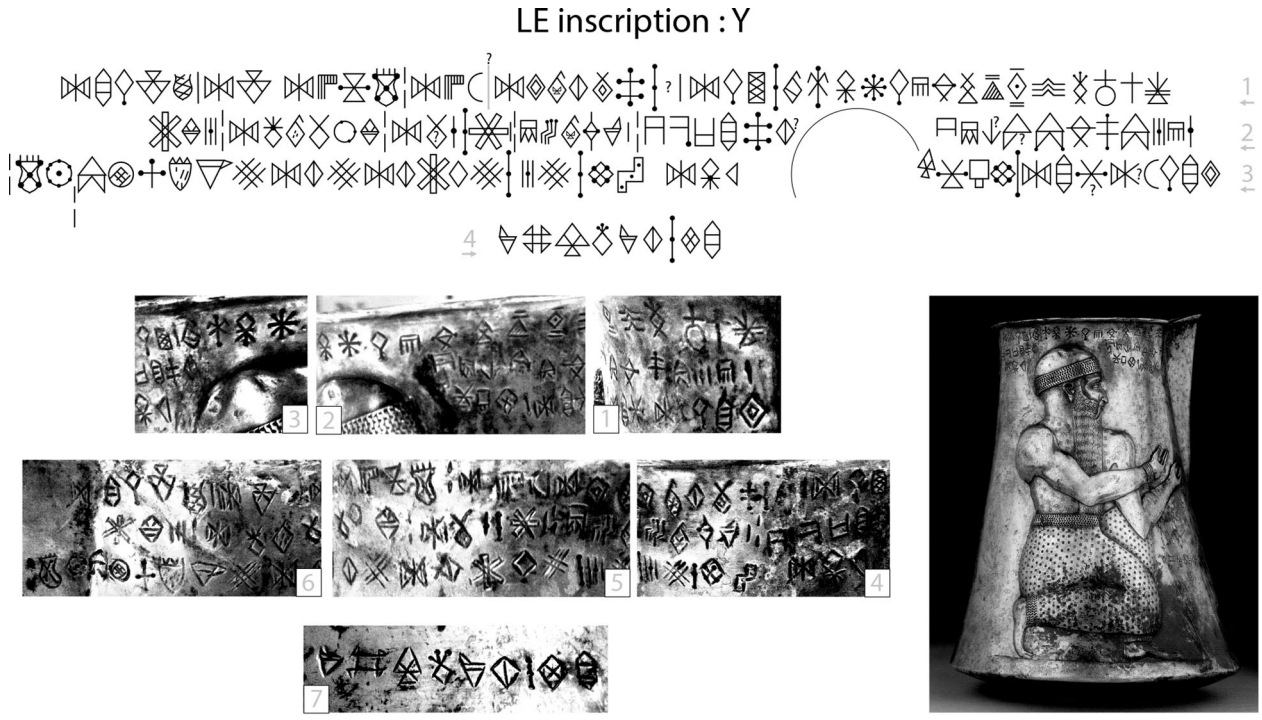

Figure 8. LE inscription Y (H. Mahboubian collection); 16.5 cm high; diameter, rim: 8 cm, carination: 12.5 cm, base: 7 cm.

- Tallon, *Métallurgie susienne I*, 209–10 ('*nous avons donc affaire à un type de vase apparu au début du 2ème millénaire en Mésopotamie, au Luristan, en Susiane, dans l'Indus et en Bactriane, qui semble avoir eu une vie plus longue au Luristan où sont également attestées des variantes avec anse et bec-verseur*');
- and Bellelli, *Vasi iranici in metallo dell'Età del Bronzo*, 71–8 and 115 (for the '*bicchieri a profilo cilindrico, lati concavi e a clessidra*'), 78–20 (for the '*bicchieri a profilo cilindrico, lati concavi convergenti verso l'orlo*') and 81–3 (for the '*tazze*'). Among the 171 vessels reported in her catalogue, the numbers 82, 83, 84, 86, 87, 88, 89, 90, 92, 99, 103, 104 and 157 are very similar to the vessels under consideration here.

  For the vessels found in Kalleh Nisar, see Vanden Berghe, *Het Archeologisch onderzoek naar de Bronscultuur van Luristan*, fig. 70; in Tepe Guran (not mentioned in Bellelli, *Vasi iranici in metallo dell'Età del Bronzo*), see Thrane, *Excavations at Tepe Guran in Luristan*, pl. 9. 16–28; in Chigha Sabz, Kamtarlan II and Chaman, see Schmidt, et al., *The Holmes Expeditions to Luristan*, pl. 124 a, c, e and 126 c; in Tepe Giyan, see Contenau and Ghirshman, *Fouilles du Tepe Giyan, près de Nehavend*, pl. 31 and Herzfeld, *Iran in the Ancient East*, fig. 228; in Godin Tepe, see Young, *Excavations at Godin Tepe*, fig. 30.4; in Nehavand, see Mohammadifaret al., "Introducing pre-Islamic Bronze,", 55 (mu1); in Susa, see Tallon, *Métallurgie susienne I*, n° 766–71 (sous-type C2), 209–210; for Bactriana generally see Amiet, "Bactriane proto-historique", fig. 16 n° 2 and Pottier, *Matériel funéraire de la Bactriane*, fig. 32, n° 240 and for Sapalli Tepe, see Askarov, *Sapalli-tepa*, 163, fig. 25: 7; for Chanhu Daro, see Mackay, *Chanhu-Daro excavations*, pl. 73: 38; for the vessels found in Mesopotamia, see Cros et al., *Nouvelles fouilles de Tello*, 134 (Tello/Girsu) and Müller-Karpe et al., "Antikenhandel ./. Kulturgüterschutz" (7 and 111 for Aššur, 10 and 112 for Tall ad-Dair, 49–50 and 126 for Ur and 92 and 144 for Tello/Girsu).

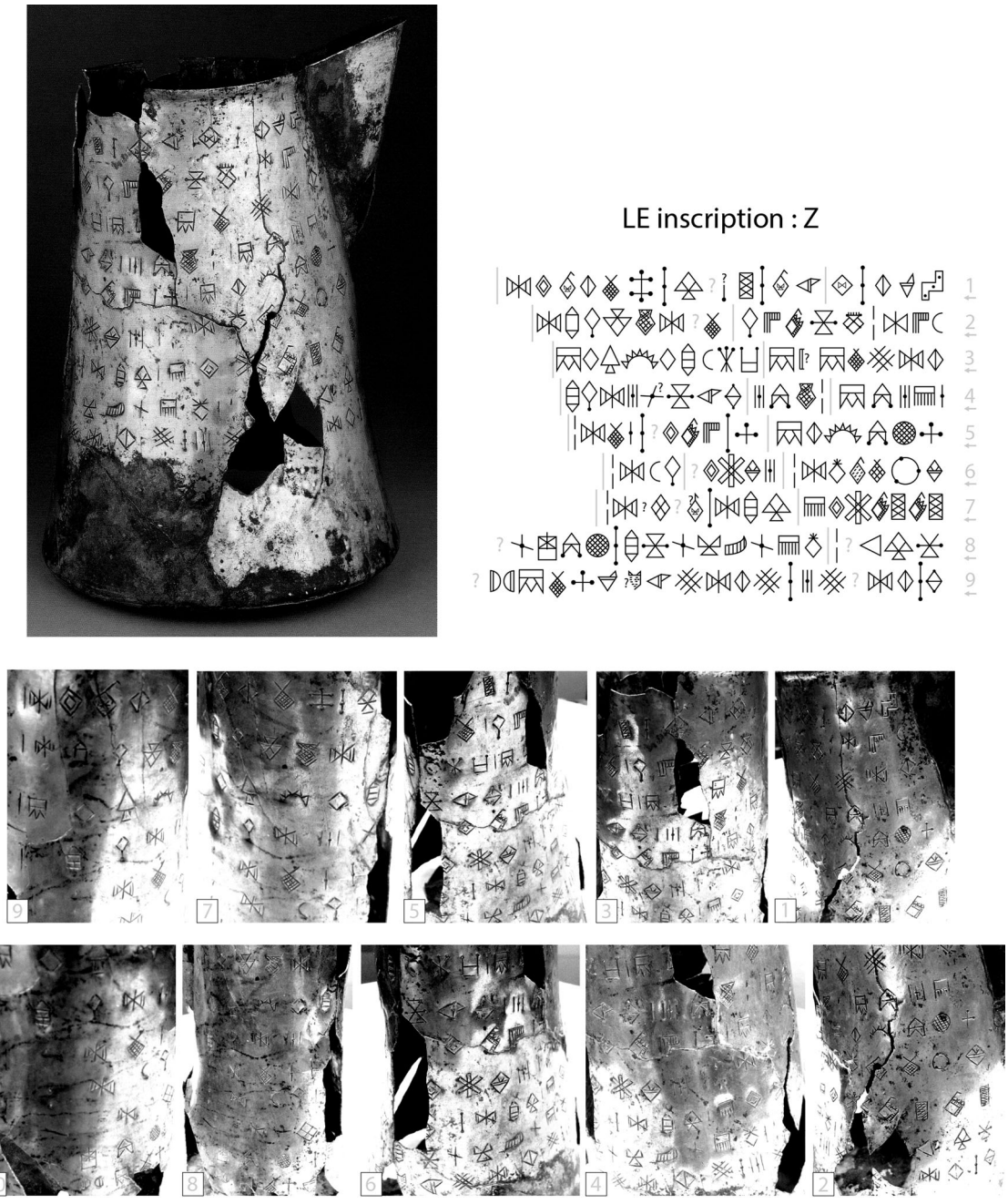

Figure 9. LE inscription Z (H. Mahboubian collection); 20 cm high.

Some of the vessels were equipped with a riveted cast handle (Figure 15(a), n° 6–12) or a spout (Figure 15 (b), n° 13 and 14) while a few displayed a repoussé and chased/engraved decoration (Figure 15(b), n° 14, see below for this specific scene; Figure 15(a), n° 5 and Figure 15(b), n° 21–26, with ibexes, stags, undetermined horned animals, hillocks, plants in bloom, friezes of scales and rosettes; Figure 15(c), n° 44 depicts what is probably a much more recent scene). The circular bases may be concave, flat or convex; the vessel walls are usually slightly constricted/concave but they may also be straight; and the rim can be simple, slightly everted or bent outward and then inward to form a flat surface. Made in silver or copper alloy, of the 56 vessels with a rather specific archaeological provenance, 37 come from the Central Zagros (including those attributed to Luristan), which may, therefore, be seen as the main production centre for this type of artefact. Outside of the Central Zagros, vessels of this type were also reported from Susa (4) and Mesopotamia (13 vessels recorded at Tello/Girsu, Ur, Tall ad-Dair and Aššur), as well as from Sapalli Tepe in Bactriana, and from

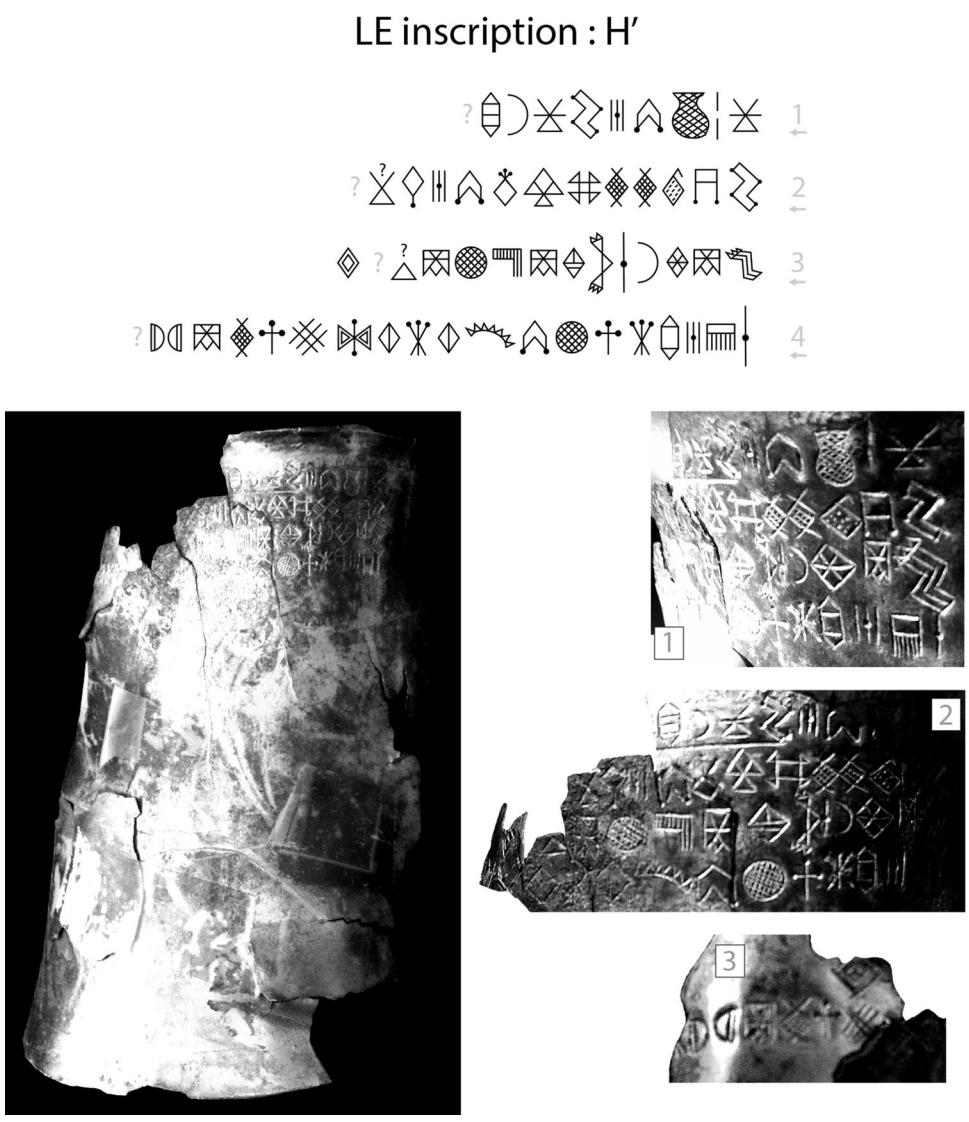

Figure 10. LE inscription H' (H. Mahboubian collection).

Chanhu Daro in the Indus valley (not documented in Figure 15(a–d)).

Among these artefacts, six (Figure 15(a), n° 1–6) display cuneiform inscriptions written in Sumerian, Sumero-Akkadian or Elamite/Hatamtite, which notably recorded the ancient name of this type of vessel: the *gunagi* vessel.

- On a silver alloy vessel, an inscription written in Elamite/Hatamtite (Figure 15(a), n° 1)[19]:

  Oh, Napiriša, you who created a kingdom of heroes, for Kindat/du (I ?) the lord, you, you protect him. Bring it about and accomplish it for Kindat/du (I ?). Napiriša is your protection. As for the fomenter of trouble, may you take him prisoner, may you not prolong (his days), may you exact tribute from him […]. (the final part of the inscription could not be translated)

- On a copper alloy vessel, written in Sumerian (Figure 15(a), n° 2; for the inscription)[20]:

  (For) ^{d}*I(n)dat/du* (I), *grandson of* ^{d}*Ebarat* (I), *son of* ^{d}*Kindat/du* (I ?), *the shepherd of Utu, the beloved one of Inana, king of Anšan, king of Šimaški and NIM/Elam;*

  Kiten-rakit/dap/bi, sukkalmah of NIM/Elam[21] *and tebir, his servant, fashioned* (this object) *for him.*

[19]Mahboubian, *Elam, Art and Civilization*, 46–7 and Basello, "Akkadian and Elamite Inscriptions," 16–7.
[20]See Steinkeller, "New light on Shimashki," 221–2.
[21]The second part of this inscription contains the most ancient mention of an 'Iranian' sukkalmah (of NIM) and shows that this office was then subordinated to the lugal of Anšan/lugal of Šimaški (Steinkeller, "New light on Shimashki," 222; in a Mesopotamian context, the title of Sukkalmah was used since pre-sargonic Girsu, while it had been used a few decades before with the Ur III senior official IR/Arad-Nanna). Perhaps this text documents the origin of the Sukkalmah line, a family of 'Mayors of the palace'/'prime ministers', initially in the service of the Šimaškean kings and who would have progressively or suddenly replaced their former

- On two fragments of a silver alloy vessel, written in Elamite/Hatamtite (Figure 15(a), n° 3)[22]:

  Šilhaha prays by making sacrifice. May Napiriša hear his prayer. Amma-tedak […] *has given birth to a boy. Let Šilhaha provide the burnt offering because he has gained the palace. Napiriša* […];

  […] *Šilhaha has installed the sacrificers in the palace. He has provided them with 14 bulls, the* […] *will be provided. He has installed the* […] *for the palace, he has provided 140 sheep. Let the burnt offering by the people of Anšan take place for Amma-tedak because Napiriša has granted a line of succession for the lord* ^{d}*Ebarat* (II)[23].

- On a copper alloy vessel with a handle, inscription written in Sumero-Akkadian (Figure 15(a), n° 6)[24]:

  (For) *Atta-hušu, son of the sister of Šilhaha, he who holds the ŠA.BU.DAM of the people of Susa;*

  Ibni-Adad, the assistant teppir, his servant, made for him and gave him (this) *bronze gunagi vessel.*

- On a silver alloy vessel, two inscriptions written in Sumero-Akkadian (Figure 15(a), n° 4[25])[26]:

  (For) *Ebarat* (II)*, king of Anšan,*

  Temti-agun, sukkalmah of NIM / Elam and Šimaški, son of the sister of Šilhaha, established the justice in Susa and NIM / Elam, made this silver gunagi vessel for him (and) *for his own life offered it to* ^{d}*Napiriša*;

  Kuk-sanit, teppir of Susa, beloved son of the sukkalmah Temti-agun[27].

- On a silver alloy vessel, two inscriptions written in Sumero-Akkadian (Figure 15(a), n° 5)[28]:

  "(For) *Pala-iššan, son of the sister of Šilhaha, beloved brother of Temti-Agun, sukkal and teppir of the people of Susa*";

  "*Ukal, GÌR.NÍTA of the people of Susa, made this silver gunagi vessel*".

These six *gunagi* vessels may be attributed to the reigns of the Šimaškean/Sukkalmah rulers Kindatu,[29] Indatu I, Šilhaha, Atta-hušu, Temti-Agun and Pala-iššan,[30] between the end of the twenty-first century BC and the end of the twentieth or the nineteenth century BC in the Middle Chronology. Bronze and silver *gunagi* vessels are also mentioned in Ur III texts from Umma (the oldest being dated of Šulgi 48, in the middle of the twenty-first century BC according to the Middle Chronology) and Iri-Saĝrig,[31] as well as in texts from Susa, at the time of Pala-iššan.[32] Finally, as previously said, most of the *gunagi* vessels found in regular excavations

masters while keeping their title as Sukkalmah. In this perspective, Kiten-rakit/dap/bi is maybe to be associated to Ebarat II and Šilhaha, the founders of the Sukkalmah dynasty (see also Glassner, "Les premiers Sukkalmah," 327–8 on that point).

[22]; Mahboubian, *Elam, Art and Civilization*, 48–9, Glassner, "Les premiers Sukkalmah," 325 and Basello, "Akkadian and Elamite Inscriptions," 18–9

[23]According to Glassner "Les premiers Sukkalmah," 325, Šilhaha is presenting offerings to the deceased Ebarat II, in order to let the latter guide the deceased Amma-tedak, perhaps his daughter, on the way leading to Napiriša. Glassner considered whether the offering of a *gunagi* vessel was generally linked to the deceased or to their commemoration. It may be useful to repeat here that almost all the *gunagi* type vessels found in regular excavations come from graves.

[24]Sollberger, "A tankard for Atta-hushu," 30–1 and Basello, "Akkadian and Elamite Inscriptions," 6.

[25]On the circumstances surrounding that vessel, see also: http://www.spiegel.de/wissenschaft/mensch/raubgut-becher-koennte-aus-tempel-von-anschan-stammen-a-856561.html http://www.thetimes.co.uk/tto/news/uk/article3900610.ece?CMP=OTH-gnws-standard-2013_10_21

[26]Müller-Karpe, "Aspects of Early Metallurgy", Glassner, "Les premiers Sukkalmah," 325–326 and Glassner, "Une inscription inédite" and Basello, "Akkadian and Elamite Inscriptions," 6

[27]Kuk-sanit has perhaps reused the vessel when his father died. According to Glassner "Les premiers Sukkalmah," 326, the *gunagi* vessel could be offered when somebody died or for commemorating a dead person.

[28]Mahboubian, *Elam, Art and Civilization*, 40–1, Vallat, "Temti-Agun I," 76–27, Glassner, "Les premiers Sukkalmah," 326 and Basello, "Akkadian and Elamite Inscriptions," 1–7.

[29]Kindatu is very probably a contemporary of Išbi-Erra of Isin, according to the hymn of Išbi-Erra and a tablet from Isin, dated of the 13th or the 19th year of this ruler (Stolper "On the Dynasty of Shimashki," 47–8 and "Political History," 20 and de Graef, "Annus simashkensis," 72), in 2004 or 1998 BC according to the Middle Chronology. Kindatu is very likely the Šimaškean ruler who took Ur and led to an end of the Ur III dynasty in 2003 BC (in Middle Chronology or 1995 BC according to the New Middle Chronology proposed by Sallaberger and Schrakamp, "Philological Data for a Historical Chronology," table 39).

[30]Pala-iššan would have reigned in Susa at the end of the twentieth or in the nineteenth century BC according to the Middle Chronology (Vallat, "Le cylindre de Hute-kazan" and "Temti-Agun I," 77 and Glassner, "Les premiers Sukkalmah," 326–7).

[31]Owen, "Treasures of the Sacristy," 34. At the time of Šu-Sin of Ur, two bronze gunagi were listed in the sacristy of a temple in Iri-Saĝrig, among other precious artefacts used for ritual purposes.

[32]Sollberger, "A tankard for Atta-hushu," 32, Hinz and Koch, *Elamisches Wörterbuch*, 513 and Petrequin, "Les vases k/guna(n)gi".

While in all the late 3rd/early 2nd millennium BC textual references (in the tablets of Iri-Saĝrig and Susa as well as on the vessels of Atta-hušu, Temti-Agun/Kuk-sanit and Pala-iššan/Ukal), gunagi was written *gu-na-gi*$_4$, in the texts of Umma it could be written *gu-na-an-gi*$_4$, *gu*$_4$*-na-an-gi*$_4$ or *ku-na-an-gi*$_4$, probably betraying a foreign word, written syllabically and perhaps originally spelled *k/gunank/gi* (according to Hinz and Koch, *Elamisches Wörterbuch*, 531, it was an Elamite/Hatamtite word). These orthographic variations in the texts of Umma are maybe a clue to the recent creation (in the highland) and adoption (in the plain) of the word (and the vessel), at the time of Šulgi, a short time before its cuneiform orthography was fixed as *gu-na-gi*$_4$ and mentioned in such a shape in the early 2nd millennium BC 'Iranian' cuneiform texts (at Susa and on the vessels themselves).

In all the textual references (Umma, Iri-Saĝrig and Susa), the gunagi were either made in silver (KÙ.BABBAR) or bronze (UD.KA.BAR/*zabar*), which is totally consistent with the 61 specimens currently known, produced either from silver or copper alloys sheets (there are no golden gunagi). In the textual mentions of the gunagi in Umma, the weight of these vessels was sometimes mentioned, ranging from 83 g to 354 g (210 g on average):

30 shekels for three gunagi : 10 shekels (ca. 83 g) per gunagi
50.5 shekels (5/6 mina + ½ shekel) for two gunagi : 25.25 shekels (ca. 210 g) per gunagi
30 shekels (1/2 mina) for one gunagi : 30 shekels (ca. 250 g) per gunagi

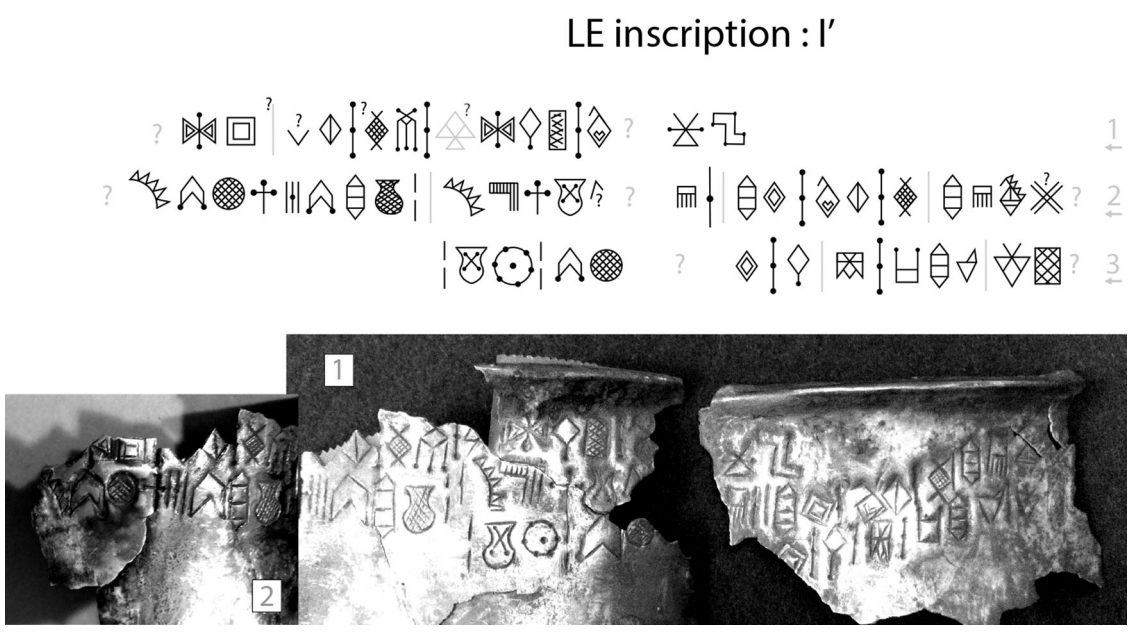

Figure 11. LE inscription I' (H. Mahboubian collection).

Figure 12. LE inscription J' (H. Mahboubian collection); 16 cm high; diameter, rim: 8 cm, carination: 12 cm, base: 6 cm.

30 shekels (1/2 mina) for one gunagi : 30 shekels (ca. 250 g) per gunagi
95 shekels (1.5 mina + 5 shekels) for two gunagi : 42.5 shekels (ca. 354 g) per gunagi
68 shekels (1 mina + 8 shekels) for three gunagi : 22,666 shekels (ca. 188 g) per gunagi

The weight of 9 of the gunagi vessels found in Mesopotamia is also known (Figure 15d, n° 46, 47, 51, 52, 53, 55, 57, 58 and 59), ranging from 70–365 g, with an average weight around 140 g, which is consistent with the previously mentioned textual data. According to Sollberger, "A tankard for Atta-hushu," 32), the gunagi dedicated by Ibni-Adad to Atta-hušu weighs 439 g (ca. 52 shekels), which is far heavier than the weights recorded in the tablets of Umma or in the Mesopotamian gunagi vessels. Indeed, when this vessel (Figure 15(a), n° 6) is compared to the other ones (Figure 15a–d), it really ranks among the biggest ones.

Figure 13. LE inscription K' (H. Mahboubian collection); 13.5 cm high; diameter, rim: 7.5 cm, carination: 10.5 cm, base: 6.5 cm.

come either from Central Zagros funerary contexts attributed to the beginning of the 2nd millennium BC or from Neo-Sumerian/Ur III to Old Babylonian/Assyrian dated graves in Mesopotamia. Consequently, these three independent sources of information give the same result and anchor the *gunagi* vessels between ca. 2050 BC and 1850 BC (in the Middle Chronology). LE inscriptions X, Y, Z, F', H', I', J' and K' probably belonged also to this period, slightly after the reign of Puzur/Kutir-Inšušinak, to which this writing system should then not be restricted.

These six cuneiform inscriptions give rise to a few comments:

- three of them specifically mention the highland god Napiriša while the Susian god Inšušinak is never mentioned;
- Anšan is regularly mentioned;
- while Elamite/Hatamtite language cuneiform inscriptions are extremely rare in the late 3rd and first half of the 2nd millennium BC,[33] two of the six cuneiform written *gunagi* display Elamite/Hatamtite language inscriptions. Furthermore, the content of these two Elamite/Hatamtite language inscriptions (Kindatu and Šilhaha inscriptions) differs greatly from the other four Sumerian or Sumero-Akkadian inscriptions which only display "classic" dedication texts from minor officials to major officials. The Kindatu Elamite/Hatamtite inscription contains praise and a malediction formula involving Napiriša while Šilhaha's one seems to be a religious or cult text with Napiriša's commitment;
- the only title used in the Elamite/Hatamtite language inscription is *temti*, "lord";
- in two of these inscriptions, the name of some officials is preceded by the divine determinative (were they divinised or deceased?).

Figure 14. LE inscription L' (11 cm high: Timeline auction internet site: http://www.timelineauctions.com/lot/silver-vessel-with-proto-elamite-text/60060/).

[33]Currently, less than 20 Elamite/Hatamtite language cuneiform inscriptions are known for this period (Desset, *Premières écritures iraniennes*, 137–9).

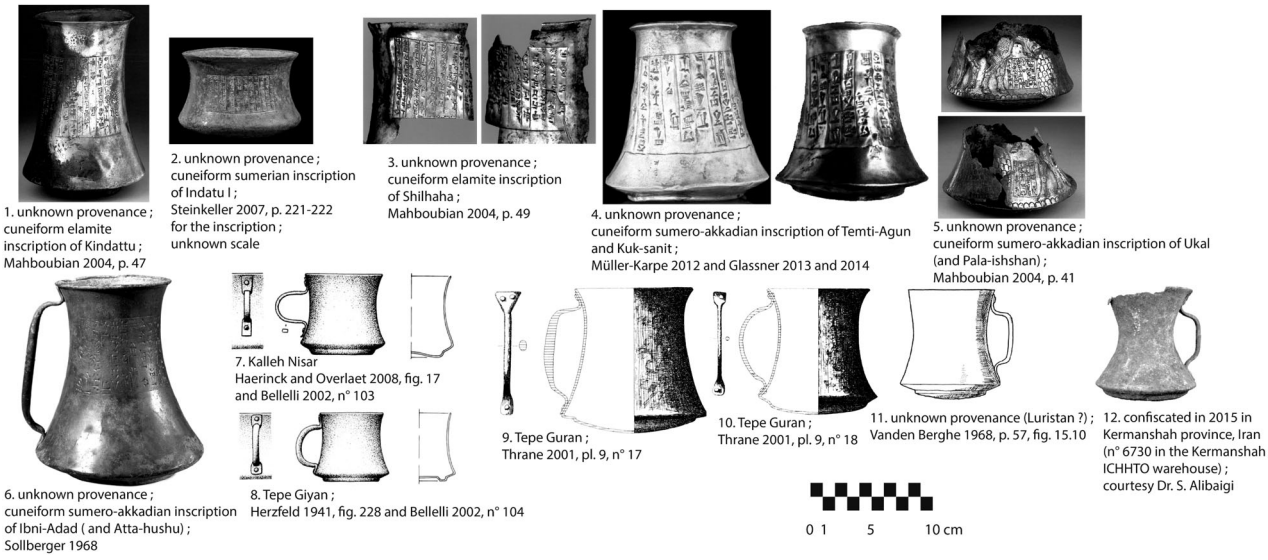

Figure 15. Gunagi vessels 1–12. (a) Gunagi vessels 13–26. (b) Gunagi vessels 27–45. (c) Gunagi vessels 46–61. (d).

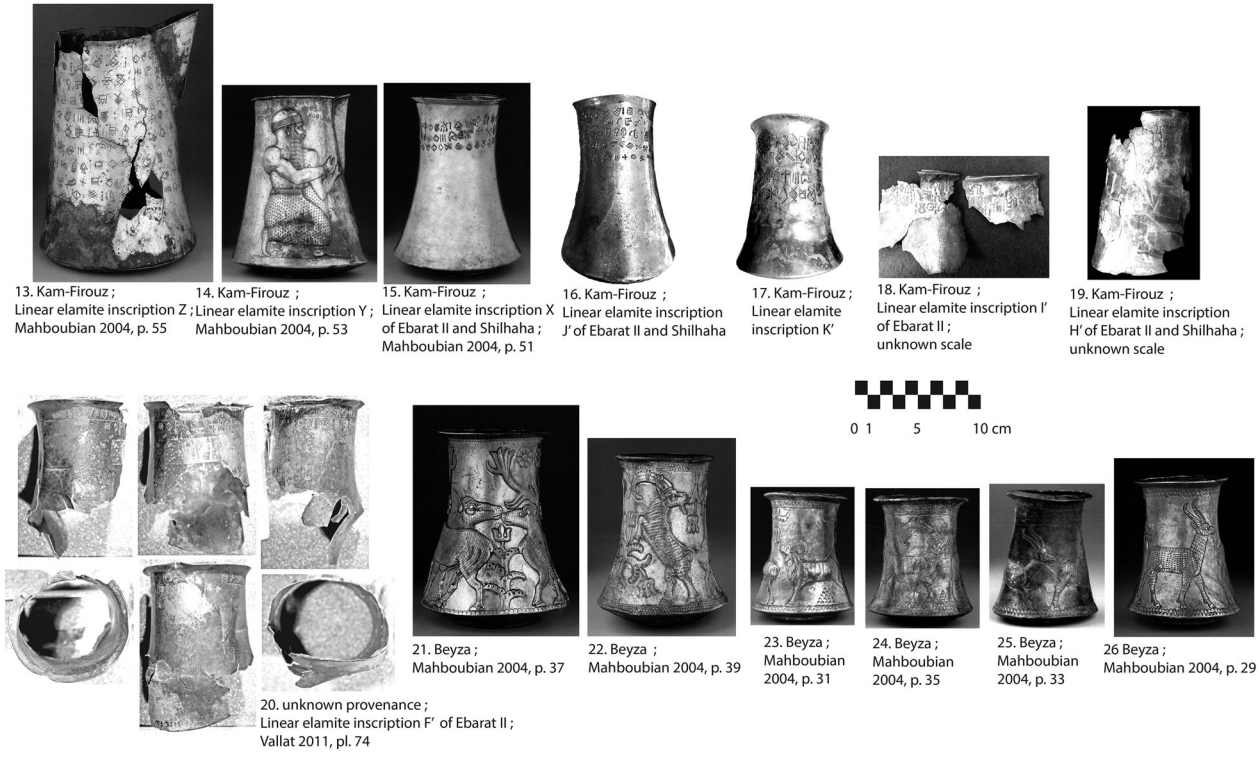

Figure 15. Continued

The *gunagi* vessel bearing the LE inscription Y (Figures 15(a), n° 14 and Figures 16 and 17) displays also an important hammered repoussé[34] and chased/engraved decoration (the LE inscription Y was probably written after the completion of this decoration). A man is represented kneeling upon the ground shown with a line, bare-foot, his two arms stretched in front of him and his hands opened up (he is wearing a bracelet on the right hand). Several elements relate this figure to Near-Eastern iconography:

[34]The repoussé technique started to be used to decorate metallic vessels in the mid-3rd millennium BC (Helwing, "Silver in the early state societies,", 418).

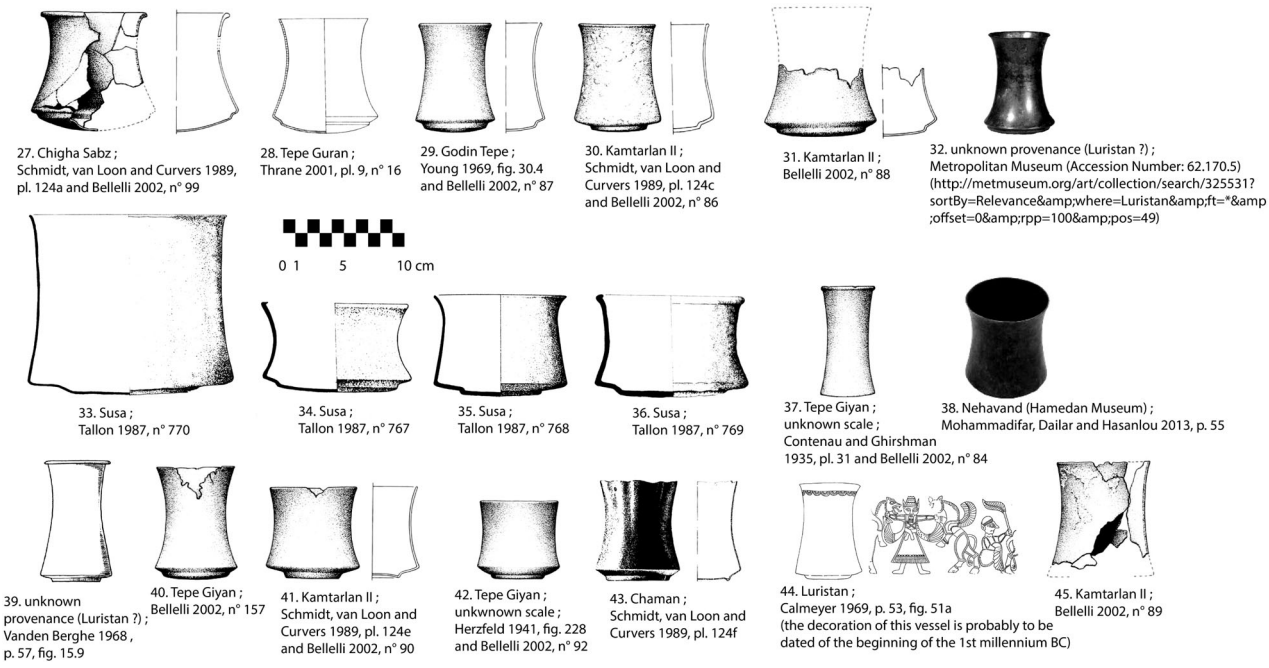

Figure 15. Continued

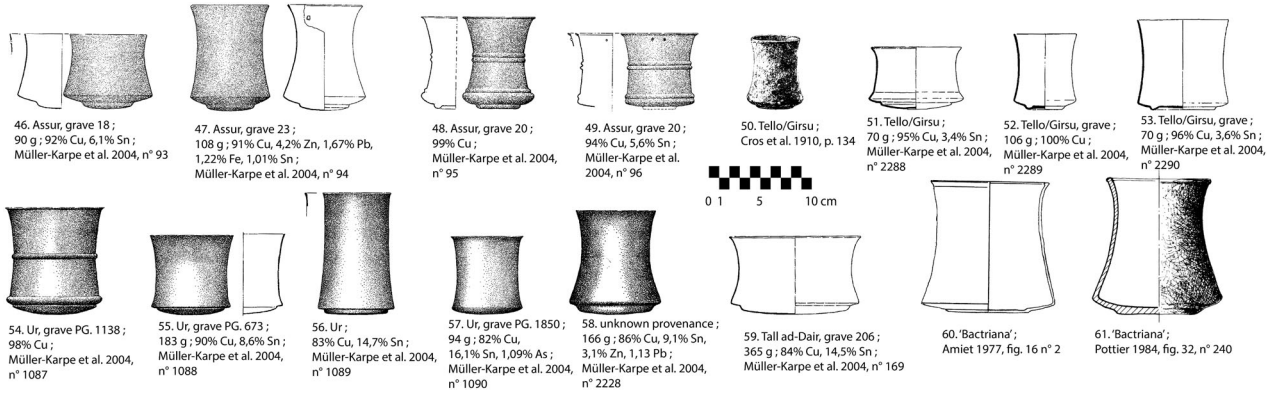

Figure 15. Continued

- he is wearing a specific hemispheric hat with a decorated band, used as a symbol of kingship in the Near East from the post-Akkadian period, at the end of the 3rd millennium and the beginning of the 2nd millennium BC. The first ruler known to wear it was Gudea of Lagaš[35] while it was notably used also by Ur-Nammu (on his stele), the šakkanakku of Mari Ištup-ilum and Puzur-Ištar (on their statues) as well as Anubanini (on his relief in Sar-e Pol-e Zohab) or Hammurabi of Babylon (on his law code stele);
- the man on the silver vessel also displays a conventionally represented royal beard with three rows of curls extended by long strands down to his belt, which may be compared to the documents just mentioned (except the Gudea statues, since this ruler was normally represented beardless). This type of beard was first represented in the Akkadian period, with the so-called Nineveh head or the Pir Hussein Naram-Sin stele;
- this figure is represented in an awkward pseudo-profile (see his left arm, in an offering/praying position?) reminding one of the position of a kneeling god on the Puzur/Kutir-Inšušinak boulder bearing the LE inscription B or more precisely the representation of the king Hammurabi in his law code stele.

[35]Benoît, *Les civilisations du Proche-Orient ancien*, 285 and 287.

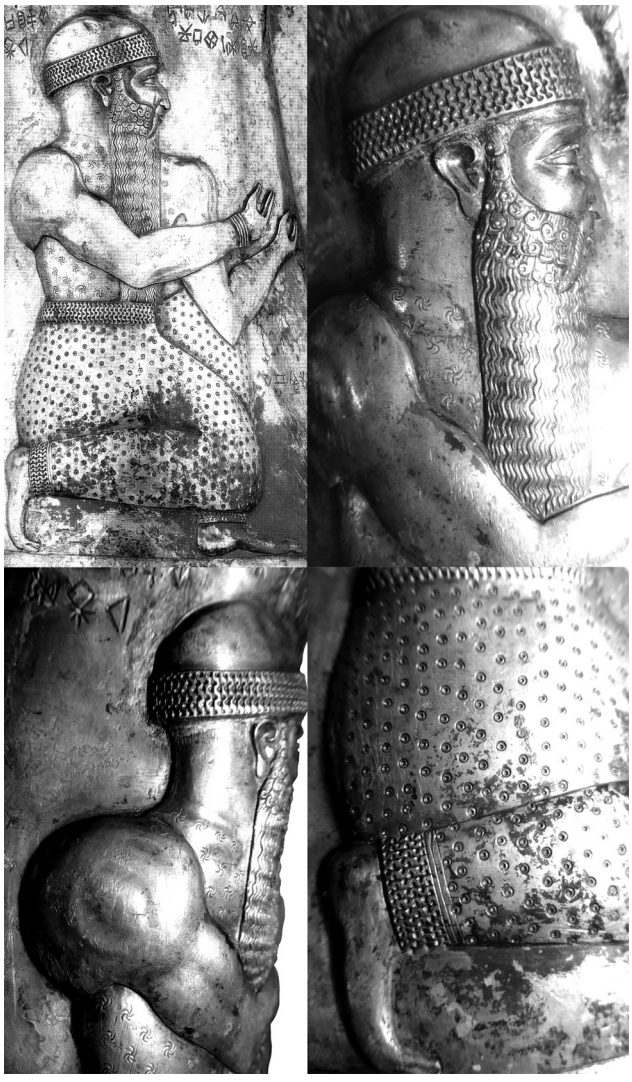

Figure 16. The figure represented on the silver gunagi with the LE inscription Y (from Mahboubian, *Elam, Art and Civilization*, 53).

Figure 17. The figure represented on the silver gunagi with the LE inscription Y.

These elements – hat, beard and position – strongly relate the figure to the late 3rd – early 2nd millennium BC Near-Eastern royal iconography, which is consistent with the proposed dating of the *gunagi* type vessel (ca. 2050–2850 BC). However, this character also displays, through his clothes, very original features. His baggy trousers decorated with regularly positioned punched dots and fringes at the waist and the ankles and his sleeveless top decorated with curly motifs are not at all common, while all the Syro-Mesopotamian rulers were typically represented at the end of the 3rd/beginning of the 2nd millennium BC with different kind of robes, frequently with their right arm uncovered. They also differ clearly from eastern 3rd – early 2nd millennium BC masculine costumes (kilt, tunic leaving one shoulder bare …) as they are documented in the BMAC/Oxus civilisation (through the iconography on the metallic vessels), in the Indus civilisation or in the Halil Rud/Jiroft civilisation (iconography of the chlorite artefacts).

The sleeveless top with curly motifs might be compared to the star pattern incised on the torso of Untaš-Napiriša (2nd register) on the stele of Untaš-Napiriša in Susa and on the torsos of two late 2nd millennium BC royal statuettes in gold and silver found in 1904 in a cache of precious objects in the Acropolis of Susa,[36] but coming perhaps originally from the *suhter*,[37] a tabernacle containing the statuettes of the royal family and the insignia of power built in the *kumpum kiduya* (external chapel) dedicated to Inšušinak, maybe located in the *hiyan* (royal palace) thought to have been built on the tell of the Apadana.[38] In contrast, based on stylistic arguments,[39] Pittman attributed these last statuettes to the 1st half of the 2nd millennium BC (Sukkalmah period).

The dotted baggy trousers are even more surprising. First, until now, the most ancient representations of

[36]sb 2758 and sb 2759; see de Mecquenem, "Trouvaille de la statuette d'or" and Tallon, "The 'Trouvaille de la statuette".
[37]Grillot, "Le 'Suhter' royal de Suse," 10.
[38]Vallat, "Le palais élamite," 37–41 and Grillot, "Le monde d'en bas en Susiane," 142–3.
[39]Pittman, "Reconsidering the trouvaille".

Figure 18. Examples of sampled LE inscribed silver alloy gunagi vessel fragments belonging to the Mahboubian collection.

trousers in Near-Eastern iconography date back to the 1st millennium BC with some cavalrymen represented on the Neo-Assyrian low-reliefs, before their important spread in the Achaemenid iconography (on the Apadana of Persepolis notably) where various Iranian peoples practising horse-riding (including the Medians) were shown with this costume (see for this part: Trousers in costume history).[40] Woollen trousers, recently found in the Yanghai cemetery (Xinjiang, China), were radiocarbon dated between the thirteenth and the tenth century BC and would be among the oldest specimens found up to now in the world according to Beck et al.,[41] who also advocated the idea that trousers had been used (and created) for horseback riding, in association with the development of mobile pastoralism and mounted warfare. The *gunagi* vessel bearing the LE inscription Y from the Mahboubian collection, approximately dated around 2050–1850 BC, would then contradict such an assertion, constituting the most ancient evidence currently known of trousers in the world. Furthermore, the trousers depicted on the *gunagi* vessel were decorated with regularly positioned dots in a circle, reminiscent of dotted robes or skirts depicted on 2nd millennium BC Susian ('Elamite') relics such as the two statuettes previously mentioned, but also the Sirukduh stele (unknown provenience), the statuettes belonging to the Inšušinak temple deposit, a faience female figurine from the Pinikir temple in Dur-Untaš-Napiriša / Chogha Zanbil (Sb 5089), the Untaš-Napiriša stele, the lower part of a statue (Sb 62) representing Untaš-Napiriša and the Napirasu statue (only the Untaš-Napiriša stele and the Napirasu statue featured dots in circles; see Pittman[42] for all these references).

Besides the aspects of hat and beard that respect the late 3rd/early 2nd millennium BC Mesopotamian royal iconographic codes, the figure on the *gunagi* vessel with the LE inscription Y also shows clothing elements appropriate for what would be the royal Susian ("Elamite") costume in the 2nd millennium BC (sleeveless top with motifs and dotted decoration), while the

[40]Beck et al., "The Invention of Trousers".
[41]Beck et al., "The Invention of Trousers".
[42]See note 39 above.

trousers constitute a very interesting singular occurrence in such a remote period.

3. Physico-chemical Analyses and Brief Review of the History of Silver–copper Alloys

Thirteen samples from fragments of LE inscribed silver alloy *gunagi* vessels (see Figure 18) from the Mahboubian collection were collected on the 4th/5th of November 2015 and sent to Rome for physico-chemical analysis at the Istituto Superiore per la Conservazione ed il Restauro (ISCR), under Pr. Massimo Vidale's supervision (see the technical note related to this paper). It was not possible to take samples from the complete vessels bearing the LE inscriptions X, Y, Z, J' and K' but, among others, H' and I' were sampled.

The preliminary results (see below the technical note by R. Faieta, G. Guida and M. Vidale[43] for more details) show that:

- the vessels were produced with a silver–copper alloy, composed generally of 93–96% silver and 4–7% copper;
- the analysis of the microstructure proved that the metal foils had undergone a prolonged hammering, involving many cycles of heat treatment (annealing) alternating with cold working steps;
- on the surface of the vessels' walls, a patina was present showing the interaction (oxidation) between the vessels and their deposit contexts, betrayed by elements such as O, Na, C, Mg, Al, Si, S, Fe, Ca, P, Ti or K.

Roughly one millennium after the first evidence of smelting copper ores in Iran, silver was being extracted from lead by cupellation around 3500 BC, as attested by litharge remains found in the Central Iranian plateau at Tepe Sialk III and Arisman (involving perhaps the Nakhlak/Anarak ore deposit), at Tepe Hissar II, at Ilgynli Depe and Fatmalı (Turkey).[44] The most ancient silver artefacts also date to roughly the same period in the mid-4th millennium BC, with two silver buttons found in Sialk III.5 layers, just before the initial production of metallic vessels made from chased copper or silver sheet in Sialk III.7.[45]

The most ancient copper–silver alloys are also attributed to the late 4th millennium BC with examples coming from Arslantepe VIA and Uruk (Riemchengebaüde).[46] As Table 1 shows, the addition of copper to silver apparently started around 3000 BC and became common in the 3rd millennium BC, since pure silver is relatively soft and alloying it with copper increased its hardness and strength (by comparison, modern sterling silver is usually composed of 92.5% silver and 7.5% copper).[47]

In Table 1, four of the seven Oxus vessels are characterised by high purity silver and only one out of seven includes more than 1.5% copper. Ur silver vessels were also made of a rather pure silver (95–99%) but here the addition of copper was more frequent, reaching 5% in some cases (Ur silver vessels also frequently displayed traces of gold, indicating that silver may have been produced from argentiferous gold/electrum by cementation and not through the cupellation of lead ores). Finally, the gunagi corpus analysed here by Faieta, Guida and Vidale[48], compared to the Oxus and Ur assemblages, shows a higher copper percentage (5.75% on average), reaching 10% in one sample (sample 13, corresponding to LE inscription H').[49]

The copper content found in late 3rd/early 2nd millennium BC western Iranian silver–copper alloy vessels foreshadows later standards, with two kinds of silver–copper alloys attested in the Achaemenid period,[50] one with a low copper content (2% copper)[51] and another one with high copper content (25/30% copper),[52] while the composition of Sassanid silver–copper alloy vessels is quite close to the gunagi corpus with, on average, 4–8% copper.[53]

[43]See note * above.
[44]Stöllner, "Prehistoric and Ancient Ore-Mining in Iran," 50–4, Pernicka, "Copper and silver in Arisman," 237–8, Thornton, "The Emergence of Complex Metallurgy," 319, Nezafati and Pernicka, "Early Silver Production in Iran," 44, Helwing "Early Metallurgy in Iran," 117 and "Silver in the Early State Societies," 413 and Hansen and Helwing "Die Anfänge der Silbermetallurgie," 44–5.
[45]Helwing, "Early Metallurgy in Iran," 118–20 and forthcoming.
[46]Müller-Karpe, "Aspects of Early Metallurgy," 109, Helwing, "Silver in the Early State Societies," 416 and Hansen and Helwing, "Die Anfänge der Silbermetallurgie," 42.
[47]Meyers, "Technical Study," 147 and Moorey, *Ancient Mesopotamian Materials*, 238.
[48]See note * above.
[49]In Ancient Egypt, according to Gale and Stos-Gale, "Ancient Egyptian silver," 114), 'for the 37% of analysed artefacts which exceed 6% copper, it can be safely assumed that copper has been intentionally added, probably to harden the silver to achieve better resistance to wear. This practice seems to have been followed, rather erratically, from the earliest times, there being one such Predynastic object and several from Old Kingdom times'.
[50]Oudbashi and Shekofteh, "Chemical and Microstructural Analysis," 432
[51]As in the two bowls analysed in Simpson et al., "Achaemenid Silver," 437 or in the plate and the spoon analysed by Oudbashi and Shekofteh, "Chemical and Microstructural Analysis," 425.
[52]As in the two bowls analysed in Oudbashi and Shekofteh, "Chemical and Microstructural Analysis," 425.
[53]Meyers, "Technical Study,", 151.

4. Analysis of the *Gunagi* Corpus LE Inscriptions

Considering the vessels on which they were written as well as their content (see below), the nine LE inscriptions X, Y, Z, F', H', I', J', K' and L' belong to a coherent corpus of texts, which will be referred to here as the *gunagi* corpus (even if L' is not, properly speaking, written on a *gunagi* type vessel). The gunagi corpus displays common sign sequences arranged in a similar order (see Figures 19–24), therefore appearing to deliver similar messages. The sign sequences of the gunagi corpus differ considerably from the Susian Puzur/Kutir-Inšušinak corpus, with which they share with certainty only a single three sign sequence (see below, remark 4.6) probably corresponding to a title. The clear difference between these two corpora might be explained if they recorded different languages, or if the inscriptions in the two corpora refer to different topics, follow different formulae, or relate to different groups or statuses of persons. Because of the differences in sign sequences between the two corpora, it seems likely that Puzur/Kutir-Inšušinak and Inšušinak are not mentioned in the gunagi corpus.

LE inscriptions X, Z, F', H', I', K' and L' are written from right to left. The main text in Y is also written from right to left, but the line inscribed close to the knee of the figure (Figure 8, line 4) was probably written from left to right. Surprisingly, J' was also written from left to right (the text of J' is nevertheless presented in the figures below as though it had been written from right to left). In most of the inscriptions, the signs were written in different horizontal lines, but in K' they were written in only one line inscribed like a helix wrapping around the vessel. The signs on Z were inscribed according to a very regular layout, intended to cover the whole surface of the vase, as a kind of decoration. Dividing strokes were used only in Z, F', I' and K' (perhaps also in Y'), complicating the study of the sign sequences in the other cases.

Furthermore, some inscriptions (X, H', K' and J') were actually composed of two different parts labelled X1, X2, H'1, H'2, K'1, K'2, J'1 and J'2. Thirteen texts are consequently examined here, X1, X2, Y, Z, F', H'1, H'2, I', J'1, J'2, K'1, K'2 and L' (see Figures 19–24), all to be read from right to left in the following figures (Figures 19–43).

Twelve noteworthy features (remarks 4.1–4.12) can be distinguished in the sign sequences of these thirteen texts. Figures 19–24 show the sign sequences in the texts that relate to these observations, with remark 4.1 in the text corresponding to the black box numeral 1 in the figures, remark 4.2 in the text to numeral 2 in the figures, and so on.

4.1 All the inscriptions, except L', start with one of two different signs: 211/260/261 or 231/247 (in green in the Figures 19–24; Figure 25).

These two signs were used as introductory signs, probably placed before personal names at the beginning of the inscriptions. In K'1 and H'1, 231/247 is used just before the same name, while 211/260/261 precedes four different names at the beginning of X1/F'/H'1/I'/J'1, X2/H'2/J'2, Z and K'2.

These two signs also appear at the end of the texts Y, Z and K'2 where they might have been used to introduce new names and propositions.

4.2 The name preceded by 211/260/261 in the second part of X, H' and J' (X2, H'2 and J'2) consists of four signs, reading from right to left (Figure 26):

The phonetic value of the first sign, *ši*, is known based on the Susian LE inscriptions of Puzur/Kutir-Inšušinak (see Figure 2). It should be noted that the 3rd and 4th signs of these sequences are similar, while sign repetitions are very rare in the *gunagi* corpus texts. The only "West-Iranian" royal name available at the end of the 3rd/beginning of the 2nd millennium BC (geographical and chronological spans of the *gunagi* vessels corpus), starting with *ši* and whose 3rd and 4th syllables are similar, is Šilhaha (*Ši-il-ha-ha*), one of the first members of the Sukkalmah dynasty.

If Šilhaha is indeed the name mentioned in the second part of the inscriptions X, H' and J' (X2, H'2 and J'2), this identification gives us the probable phonetic value of two other signs: (*i*)*l* and *ha* (Figure 27).

4.3 If the identification of Šilhaha in three texts (+ other tiny fragments not published here) of the *gunagi* corpus is correct, then the names of other rulers belonging to the Šimaškean or Sukkalmah dynasties, as known from the cuneiform Mesopotamian and Iranian sources, may be hypothesised to appear in the texts under scrutiny here.

In light of this possibility, we observe that a four sign anthroponomic sequence preceded by the introductory sign 211/260/261 appears in five texts – X1, F', H'1, I', and J'1 (Figure 28).

Notably, three of the five texts (X, H' and J') that contain the Figure 28 name also mention Šilhaha. In contrast to Šilhaha, however, the Figure 28 name always appears first, at the beginning of the inscription, showing perhaps a kind of pre-eminence. The phonetic value of its 3rd sign (sign 72) is very probably (*i*)*r*(*i*), following the Susian LE inscriptions of Puzur/Kutir-Inšušinak (see Figure 2). Considering a character associated with Šilhaha, with a pre-eminent authority over this last ruler,

Table 1. Comparison of the physical compositions of 3rd and early 2nd millennium BC silver alloyed artefacts.

	Silver	Copper	Gold	Lead	Others	Reference
'proto-elamite' bull figurine, around 3000 BC (?)	96–99%	In one sample (U4), 13.3% copper				[a]
Eastern Baluchistan seal, first half of the 3rd millennium BC (?)	96–97%	3–4%				[b]
Ur Royal Cemetery vessels, mid-3rd millennium BC	95–99%	1–5%				[c]
Enmetena vessel in Girsu, around 2400 BC	said to be made of "*purified silver*"					
Oxus vessel, late 3rd/early 2nd millennium BC	99.59%	0.41%				[d]
Oxus vessel, late 3rd/early 2nd millennium BC	99.43%	0.42%		0.15%		[e]
Oxus vessel, late 3rd/early 2nd millennium BC	99.37%	0.59%		0.04%		[f]
Oxus vessel, late 3rd/early 2nd millennium BC	98%	1.2%		0.66%		[g]
Oxus vessel, late 3rd/early 2nd millennium BC	side: 94.9% bottom: 93.8%	side: 0.57% bottom: 0.4%	side: 0.031% bottom: 0.029%	side: 0.027% bottom: 0.03%	side: 4.5% bottom: 5.7%	[h]
Oxus vessel, late 3rd/early 2nd millennium BC	side: 95.1% bottom: 90.8%	side: 0.46% bottom: 0.45%	side: 0.34% bottom: 0.045%	side: 0.02% bottom: 0.032%	side: 4.2% bottom: 8.6%	[i]
Oxus vessel, late 3rd/early 2nd millennium BC	90 to 92%	3.5%	1.5%		3 to 5%	[j]
Gunagi vessels, late 3rd/early 2nd millennium BC	93–96%; on average: 94.25%; in one sample, ca. 90%	4–7%; on average: 5.75%; in one sample, up to ca. 10%				[k]

[a]Hansen et al., "A proto-elamite silver figurine", (Meyers), 23.
[b]Heidari, Desset and Vidale, "Bronze Age glyptics" (seal n° 29)
[c]Moorey, *Ancient Mesopotamian materials*, 23.
[d]Inagaki, "A study on the BMAC", 112, table 1, vase a.
[e]Inagaki, "A study on the BMAC", 112, , table 1, vase b.
[f]Inagaki, "A study on the BMAC", 112, , table 1, vase c.
[g]Freeman, *Splendors of the Ancient East* (Meyers), 205 cat. 25.
[h]Arnold, *Ancient Art from the Shumei* (Meyers), 173, vase n° 5.
[i]Arnold, *Ancient Art from the Shumei* (Meyers), 173, vase n° 6.
[j]Vidale, *Treasures from the Oxus*, 74.
[k]Faieta, Guida and Vidale, "A Preliminary Note on the Metallography."

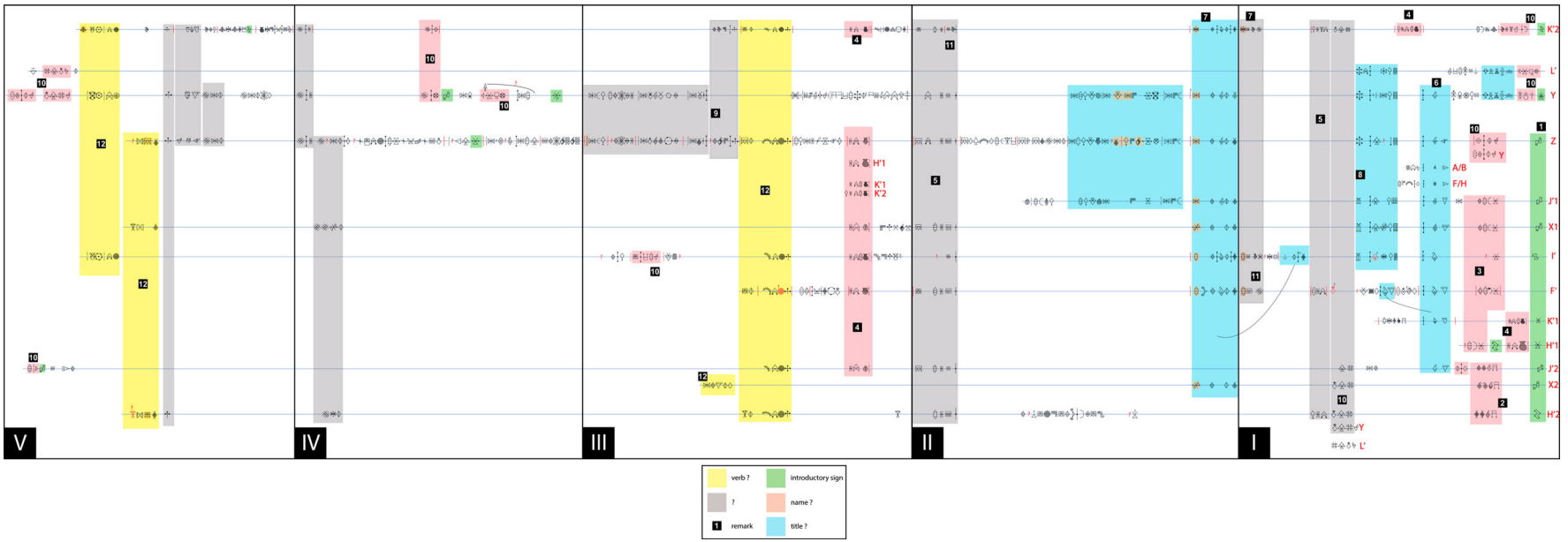

Figure 19. General view of the thirteen gunagi corpus LE texts (X1, X2, Y, Z, F′, H′1, H′2, I′, J′1, J′2, K′1, K′2 and L′) to be read from right to left. Five sections (I, II, III, IV and V) are used to present the texts in detail (in Figures 20–24); the sign sequences relating to the twelve remarks/comments to be found below are also indicated by a number in a black square.

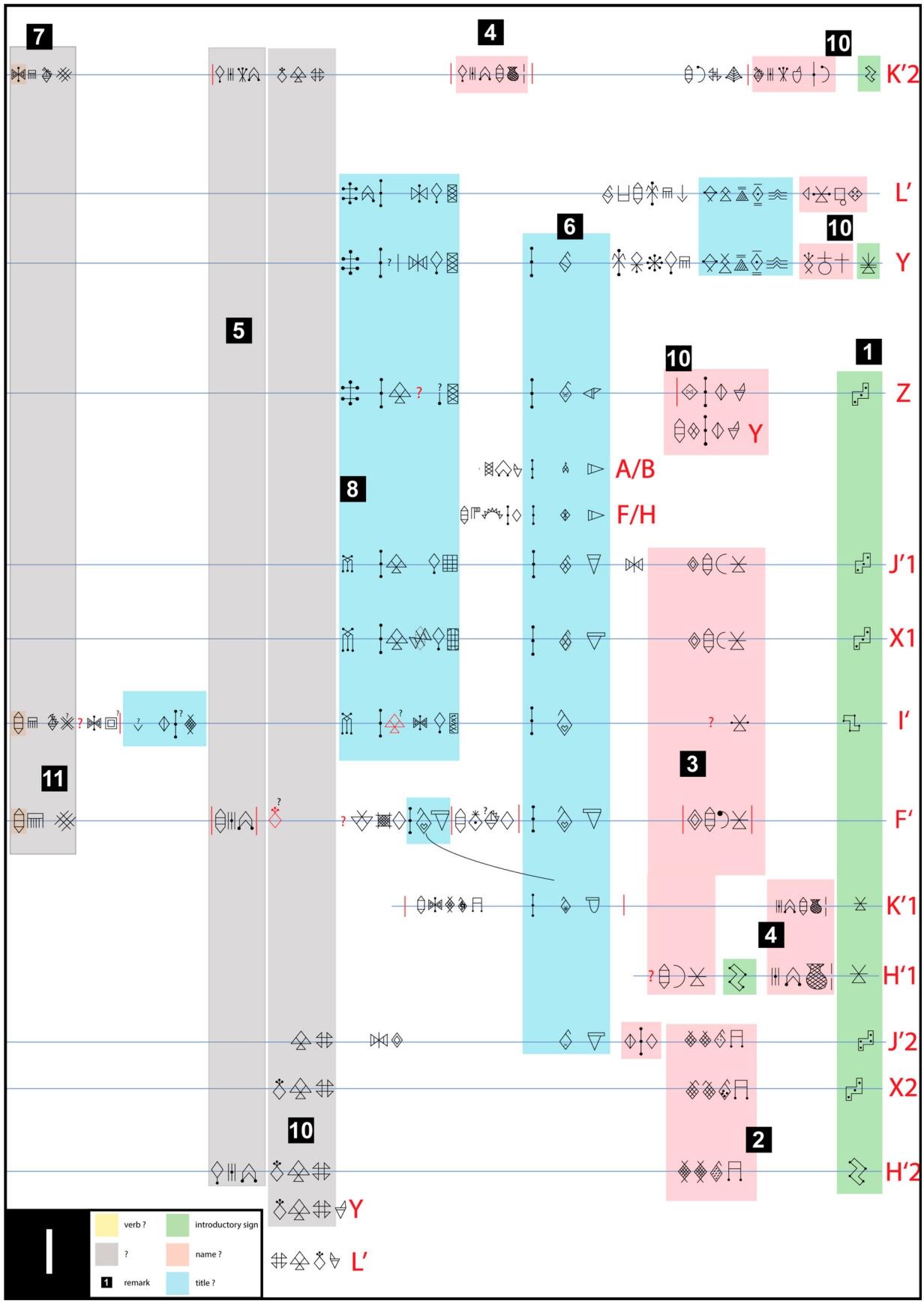

Figure 20. First section of the gunagi corpus LE texts (to be read from right to left).

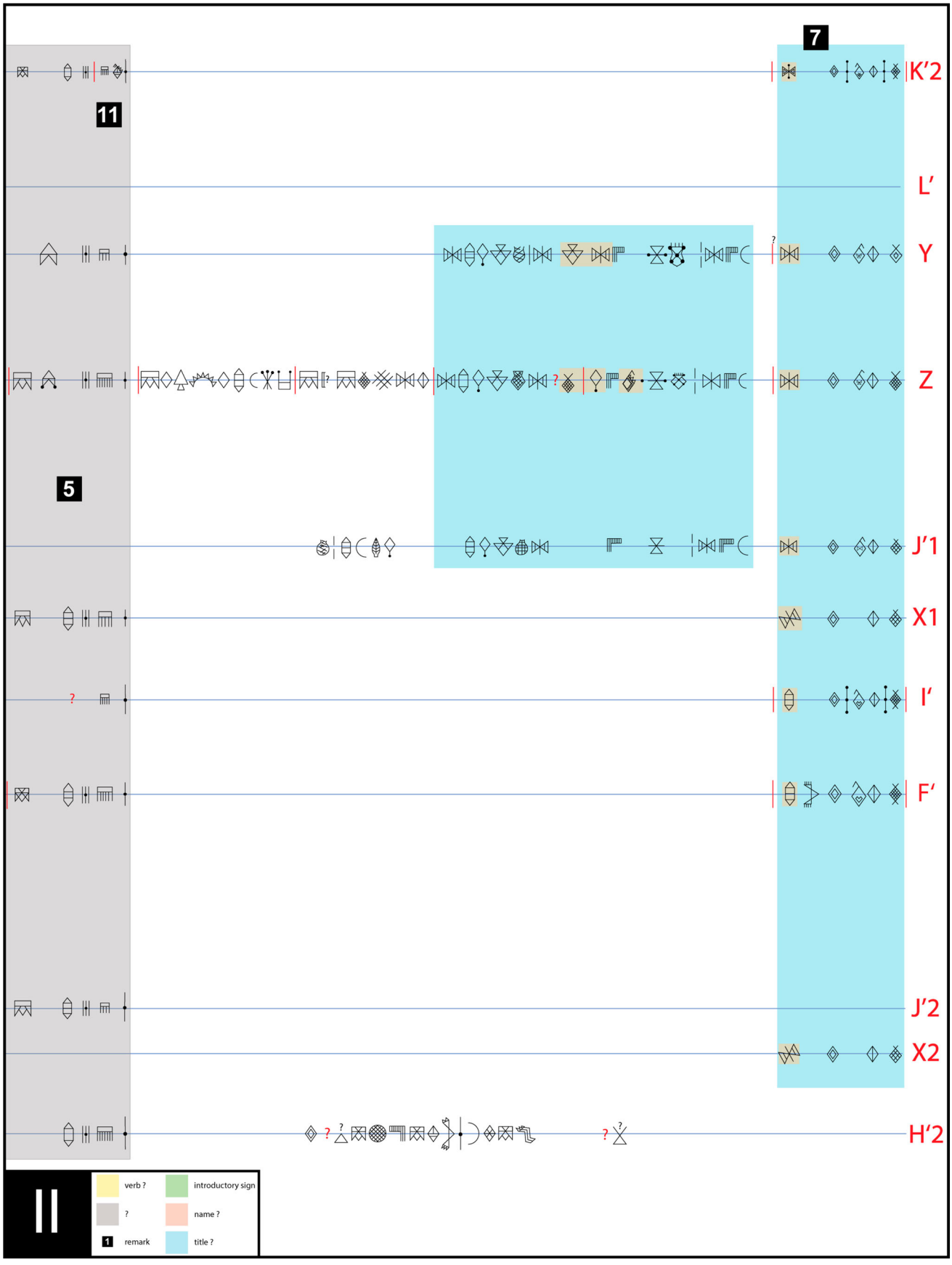

Figure 21. Second section of the gunagi corpus LE texts (to be read from right to left).

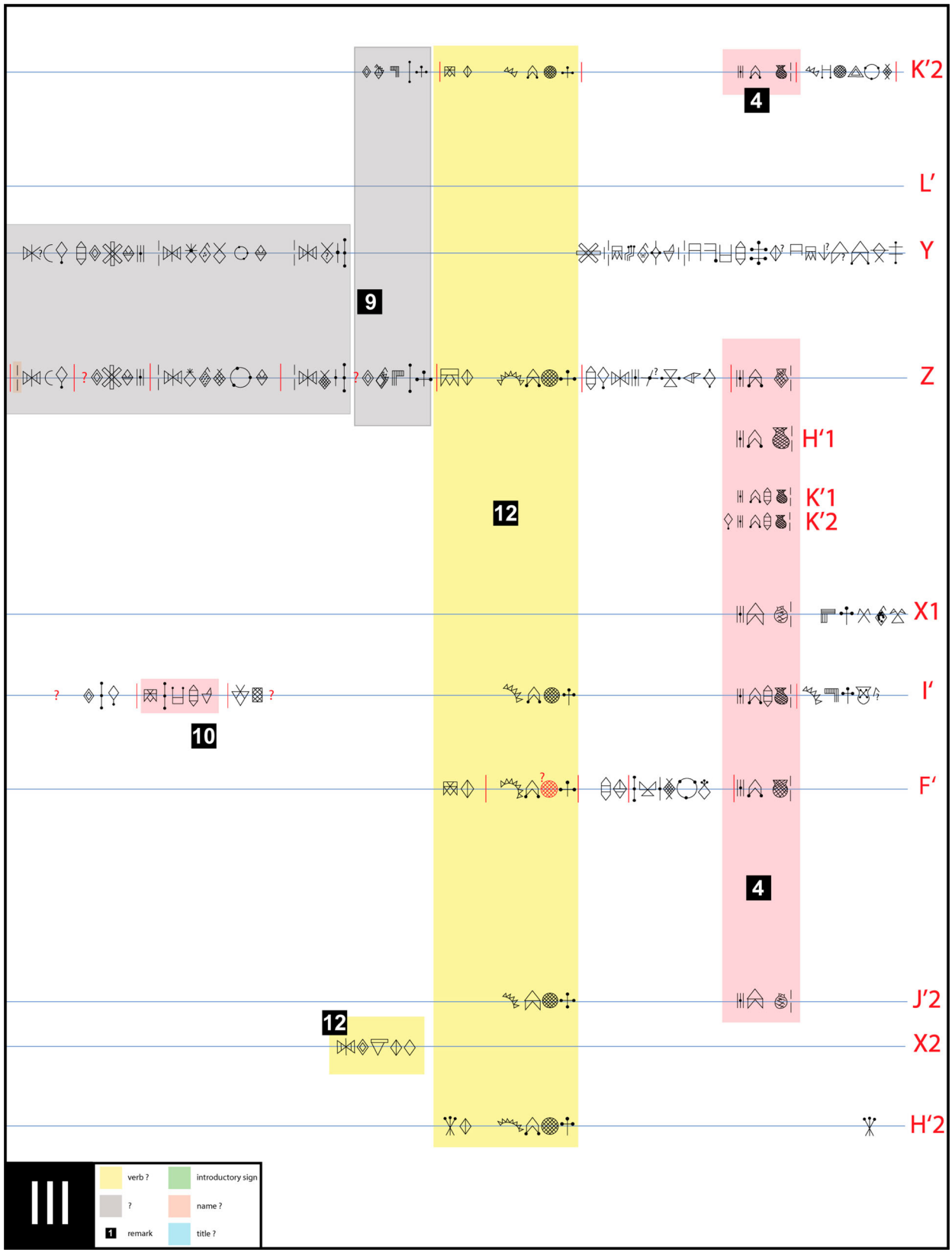

Figure 22. Third section of the gunagi corpus LE texts (to be read from right to left).

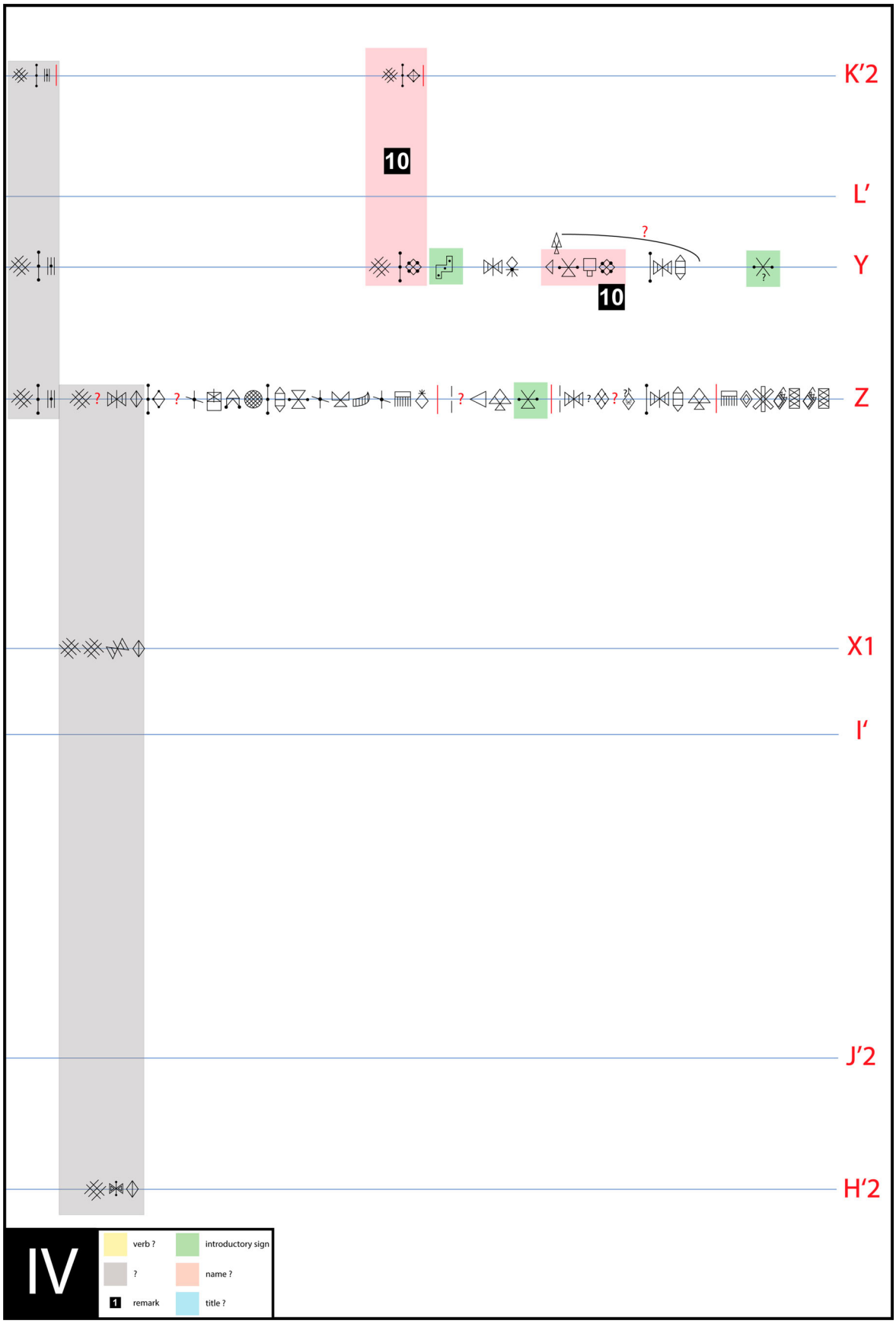

Figure 23. Fourth section of the gunagi corpus LE texts (to be read from right to left).

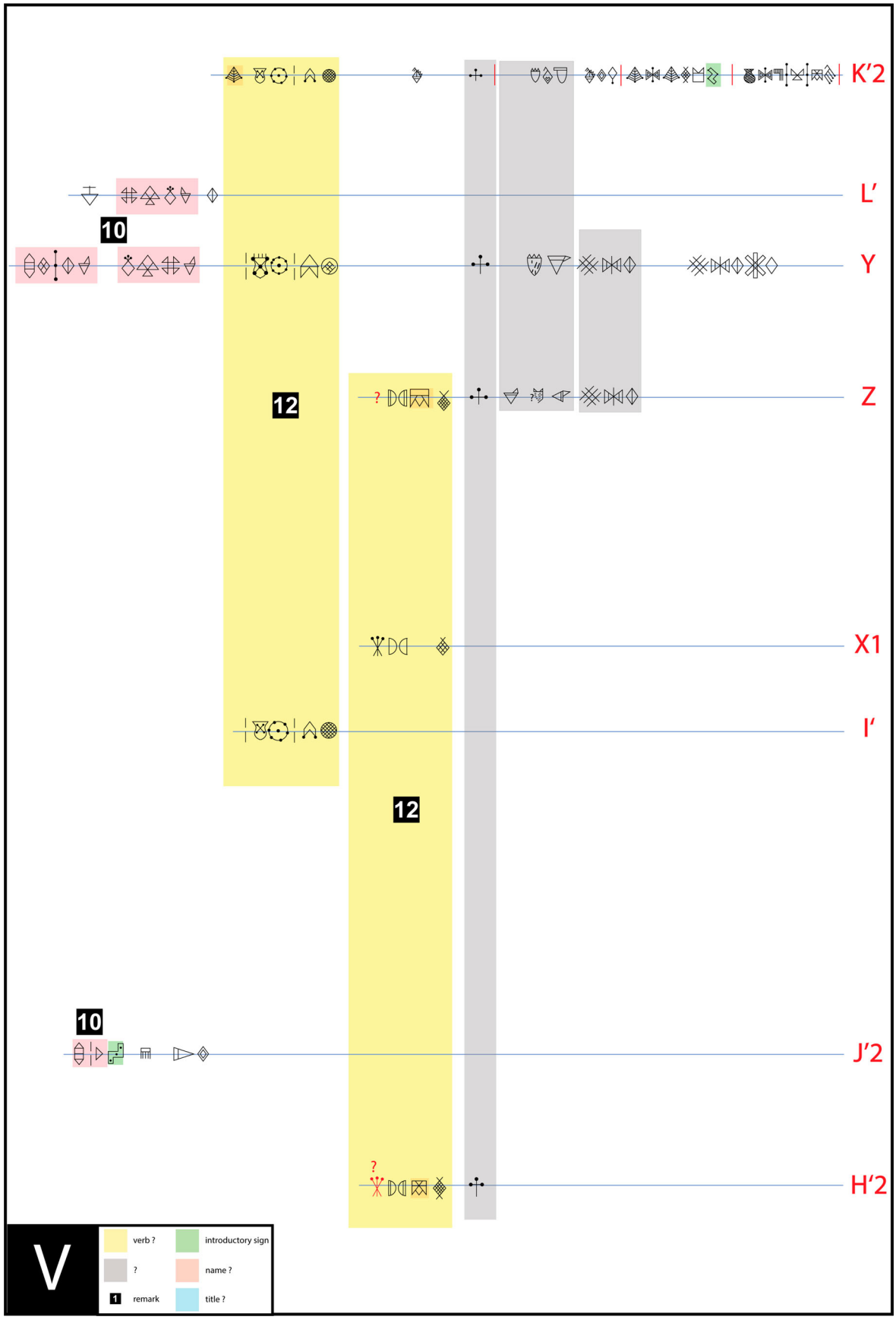

Figure 24. Fifth section of the gunagi corpus LE texts (to be read from right to left).

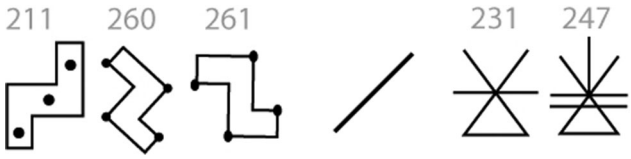

Figure 25. Signs 211/260/261 and 231/247.

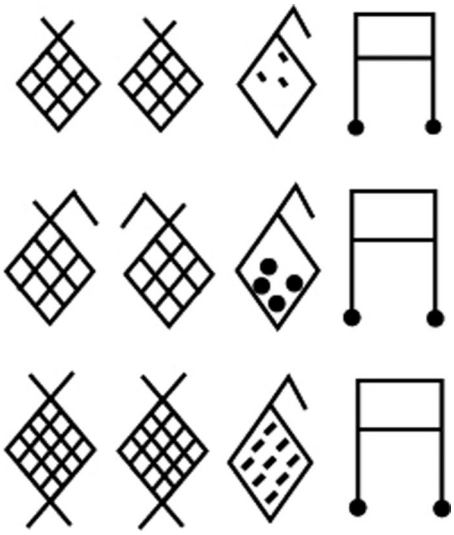

Figure 26. Šilhaha's LE sign sequences.

with a 4th syllables name whose 3rd syllable is (*i*)*r*(*i*), this could lead us to Ebarat II (*E/Ia – ba – ra – at*), revealing hypothetical phonetic values for 3 other signs: e/*ia*, *b*(*a*) and (*a*)*t* (Figure 29).

If these identifications are correct, both Šilhaha and Ebarat II were mentioned in X, H' and J' while Ebarat II alone appeared in F' and I', anchoring these five inscriptions in the Early Sukkalmah period. Unfortunately, the persons involved in Y, Z, K' and L' could not be determined (see below, remark 4.10).

If the phonetic value *e* for sign 231/247 is correct, then as this sign is sometimes used as an introductory sign (see remark 4.1), it could be understood as the Elamite/Hatamtite vocative interjection *e* (o). The other introductory sign (sign 211/260/261) could then be hypothesised to be the 1st person singular personal pronoun, *u,* (I or me).

4.4 In texts K'1 and H'1, the introductory/vocative interjection sign 231 is followed by a four or five sign name (Figure 30) which appears also in X1, Z, F', I', J'2 and K'2. This name appears nine times in the *gunagi* corpus (see Figure 22) and consequently seems to be quite important.

As previously proposed (see Figure 2), sign 169 has the phonetic value *na* while sign 72 probably records

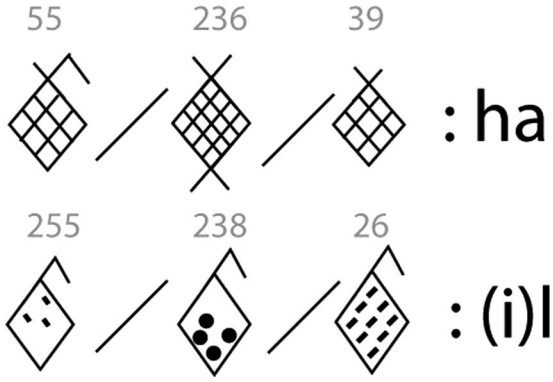

Figure 27. LE signs with the probable phonetic values ha and (i)l.

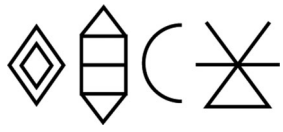

Figure 28. Ebarat (II)'s LE sign sequence.

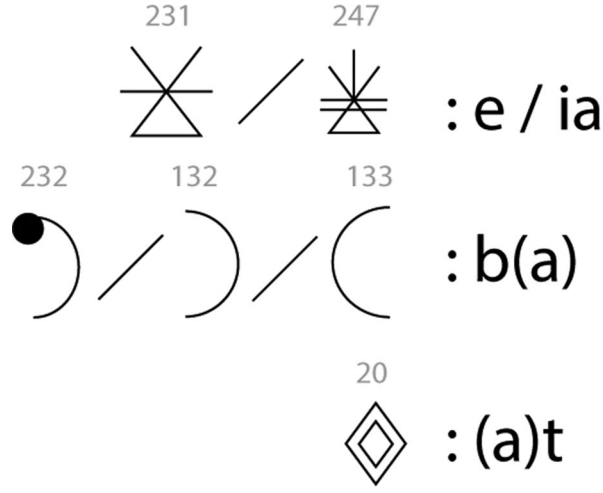

Figure 29. EL signs with the probable phonetic values e/ia, b(a) and (a)t.

the sound (*i*)*r*(*i*). Among the corpus of highland names currently known for the late 3rd – early 2nd millennium BC, starting with *na* and whose middle sound would be (*i*)*r*, the highland paramount deity Napiriša (*na-pi-*[*ir-*]*ri-ša*) is a good candidate. If this identification is correct, then the phonetic value of three other signs would then be revealed: *pi*, *ri* and *ša* (Figure 31).

H'1 and K'1 could start then with an invocation to Napiriša, while in X1, Z, F', I', J'2 and K'2, the name Napiriša appears in another position among the sign sequences.

If this sign sequence is, in fact, the LE writing for Napiriša, this theonym was manifestly not preceded by

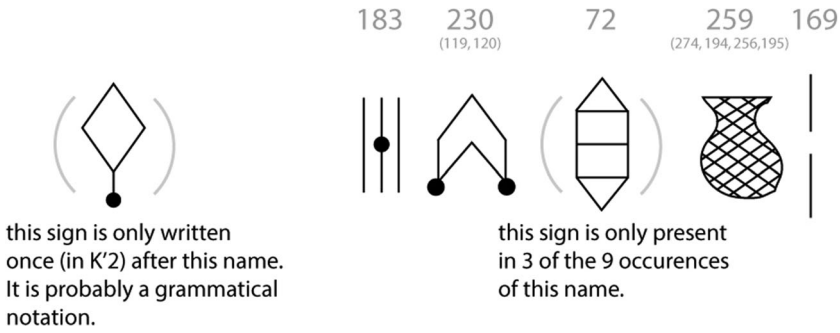

Figure 30. Possible LE sign sequence recording the theonym Napiriša.

the divine determinative observed before Inšušinak in the Susian LE inscriptions (see Figure 2). It can be speculated that this is because the Elamite/Hatamtite words *napi riša* were not always considered to be a theonym properly speaking, but simply meant the "great god". For example, in the *gunagi* vase of Kindatu (Figure 15(a), n° 1),[54] the cuneiform inscription written in Elamite/Hatamtite language mentions Napiriša twice (written phonetically *Na-pi-ri-ša*), without being preceded by any divine determinative, while Napiriša was qualified with the divine determinative in the vase of Šilhaha (Figure 15(a), n° 3).[55]

Until recently, the most ancient textual references of Napiriša were attributed to the Sukkalmah period,[56] but with the publication of the Mahboubian *gunagi* vessels collection, Napiriša may be traced back to the time of Kindatu of Šimaški (see Figure 15(a), n° 1)[57] and may be considered to be the main god of the (area under the control of the) Šimaškean dynasty[58] before being inherited and maintained by the Sukkalmah rulers in non-Susian contexts.

It should be recalled here, that among the six *gunagi* vessels displaying cuneiform inscriptions currently known (Figure 15(a), n° 1–6), three name Napiriša (Figure 15(a), n° 1, 3 and 4; Kindatu, Šilhaha and Temti-Agun's vessels), which clearly shows that this deity was frequently referred to on this kind of object. For this reason, it would seem reasonable to hypothesise that Napiriša was also frequently mentioned on the LE inscribed *gunagi* corpus. If Napiriša's identification is correct, then he is mentioned in seven of the nine LE inscribed *gunagi* vases (X, Z, F', H', I', J' and K') and absent in only Y and L'.

4.5 The identifications of sign 119/120/230 as *ri* and sign 183 as *ša* are maybe confirmed by:

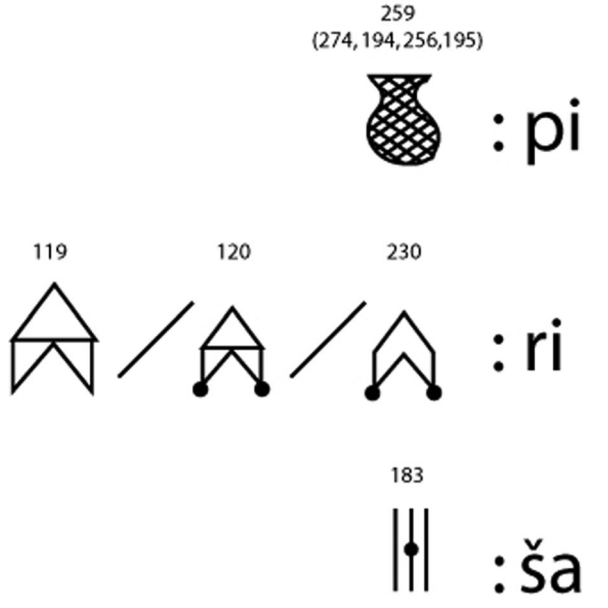

Figure 31. LE signs with the hypothetic phonetic values pi, ri and ša.

- the alternation in one sequence between signs 119/120/230 and 72 (Figure 32), which seem consequently to display the same or a close phonetic (consonant) value. As argued above, the phonetic value of sign 72 is probably (i)r(i).
- in a sign sequence inscribed in three texts (Figure 33), sign 183 is sometimes preceded by sign 185, whose phonetic value is very probably (u)š (see Figure 2). In this case, sign 185 could be used to stress the consonant sound *š* (*š-ša*).

The beginning of this sign sequence was perhaps to be read *riša*, "great"/"big".

[54]Mahboubian, *Elam, Art and Civilization*, 47 and Basello, "Akkadian and Elamite Inscriptions," 16
[55]Mahboubian, *Elam, Art and Civilization*, 49 and Basello, "Akkadian and Elamite Inscriptions," 18.
[56]de Miroschedji, "Le dieu élamite Napirisha," 34.
[57]Mahboubian, *Elam, Art and Civilization*, 46–7 and Basello, "Akkadian and Elamite Inscriptions," 16.
[58]It is interesting to note that Napiriša is not written among the ca. 40 divinities mentioned in the Naram-Sin treaty, which probably involved a highlander ruler (Marhaši?) with a religious tradition differing from the Šimaškean one.

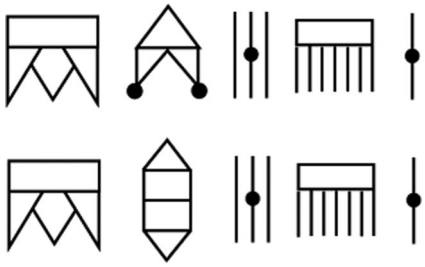

Figure 32. Alternation between signs 119/120/230 and 72 in a sequence appearing in 8 texts.

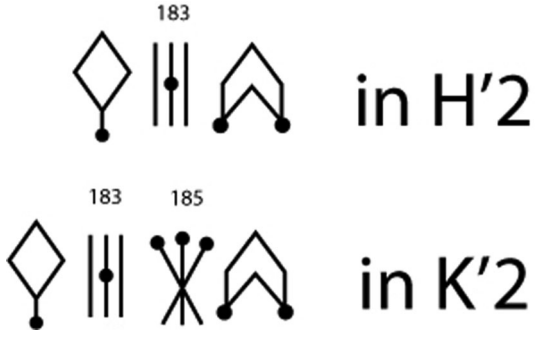

Figure 33. Sign 185 sometimes precedes sign 183 in a sequence appearing in 3 texts.

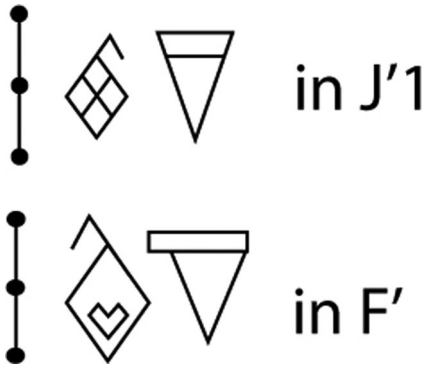

Figure 34 Probable three sign sequence title used in eight texts of the gunagi vessels corpus.

4.6 The names inscribed at the beginning of the texts, just after the introductory/vocative signs, were very frequently followed by a three sign sequence probably recording a title (Figure 34).

This sequence is the only semantic unit in common with the Susian Puzur/Kutir-Inšušinak LE texts corpus (LE texts A, B, F and H; see Figure 20),[59] where it is written directly after the name of the Susian ruler, probably here also as a title. Even though the signs used show some obvious variants between each inscription, the first sign of this three sign sequence in Z seems to be really different, while the last sign (sign 172, the stroke with dots) is absent in J'2. In X1, the scribe probably made a mistake while engraving the 2nd sign, thereafter corrected (the erasure is still visible).

In the Susian Puzur/Kutir-Inšušinak's corpus, Hinz and Meriggi understood the first sign of this sequence as the logogram meaning king (*sunki*) while I considered the title *sunki* as probably anachronistic at the end of the 3rd/beginning of the 2nd millennium BC (see here Figure 2).[60] This title actually only appeared in the Medio-Elamite period while the few Elamite/Hatamtite titles known for the Šimaškean kings and the Sukkalmahs describe the Šimaškean and early Sukkalmah rulers as *temti* and the later Sukkalmahs as *lik/gam/we rišaki* and *menik Hatamtik*.[61] The title *temti* (lord) seems consequently to be more convincing here. It still remain to be determined if it was written only with the first sign (a sign with the graphical variants 153/154/224/233/276/278) of this three sign sequence (as a logogram) or phonetically with these three signs (*te-im-ti* ?).

4.7 - In two sequences (see Figures 20 and 21), an interesting alternation between signs 96 and 72 is visible (Figure 35), since these sequences can end either with the sign 96 or the sign 72. The phonetic value of sign 72 is very probably (*i*)*r*(*i*), while sign 96 is a graphical variant of signs 94/95, to be read (*a*/*i*)*k* from the name of the Susian god Inšušinak (see Figure 2). This alternation probably betrays Elamite/Hatamtite animate nominal inflections with the locutive (1st person; -*k*) and delocutive (3rd person singular; -*r*) inflections. These two sequences also show other variants with signs 283 (probably a variant of the sign *in*; see remark 4.9 below), 172 and 228 sometimes present, sometimes absent.

If this hypothesis is correct, then X(1/2), Y, Z, J'(1) and K'(2) could have been written in the 1st person singular while F' and I' would have been written in the

[59]Desset, "Linear Elamite Writing", fig. 9.
[60]Desset, *Premières écritures iraniennes*, 119.
[61]Kindatu (Mahboubian, *Elam, Art and Civilization*, 46–7) is *temti*, Ebarat (II) is *temti* (Mahboubian, *Elam, Art and Civilization,* 48–9) while his name is preceded by the divine determinative, Sirukduh or Siwe-palar-huhpak is *lig/ka*[w/me rišaki], *meni*[k Hatamtik] and *ruhu-š*[ak of ?] (Farber, "Eine elamische Inschrift,"]), Siwe-palar-huhpak is *lig/kaw/me rišaki, menik Hatamtik* and *ruhu-šak* of Šilhaha or Sirukduh (Rutten, "Archéologie susienne," and Mahboubian, *Elam, art and civilization,* 44–5). Inšušinak is said to be *temti alim eli-ri* and *temti riša-ri*, 'temti of the Upper City and great temti', and Napiriša *temti* and *gina hite/ikri* 'leader of the army' [?].

It seems that the title *temti*, used for the rulers at the time of Kindatu and Ebarat II was only used for gods in the Middle/Late Sukkalmahs period, showing an evolution of titles familiar in other languages, including dominus (Latin), lord (English), seigneur (French), господин/gospodin (Russian) or خدا/khodâ (Persian).

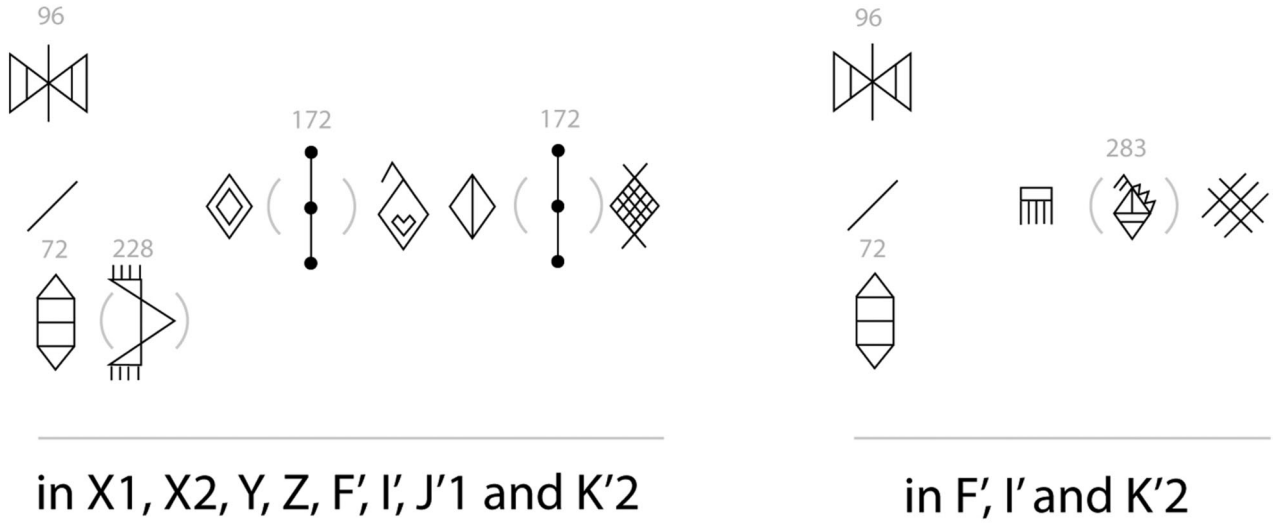

Figure 35. Two sign sequences displaying the alternation between signs 96 and 72.

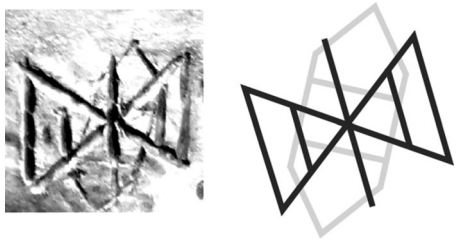

Figure 36. Erasure in text X1 of the sign 72, replaced by sign 96.

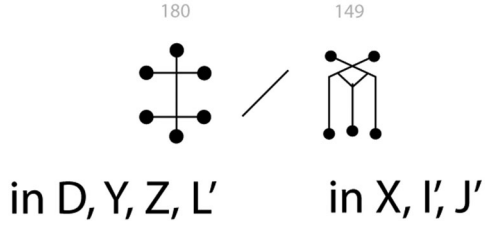

Figure 37. Graphical variants 180 and 149.

3rd person singular. It is relevant here to notice that in X1, sign 72 has been erased and replaced by sign 96 (Figure 36).[62]

4.8 The last sign of a sequence written in six texts (X1, Y, Z, I', J'1 and L') displays two variants (see Figure 20), 180 and 149 (Figure 37):

As sign 180 was also used in the Susian Puzur/Kutir-Inšušinak inscription D, the texts Y, Z and L' seem then to be closer to the Susian scribal tradition than X, I' and J'.

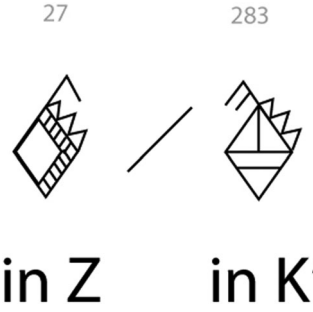

Figure 38. Graphical variants of the sign in.

4.9 A four sign sequence written in Z and K'2 (Figure 22) reveals another variant of the sign *in* (Figure 38).

With this comparison, signs 283 and 292 used in K' and I' (probably also sign 235 in F' which seems to be a broken 283) belong to the western variants of the sign *in*, in opposition to eastern/Kermanian variants.[63]

Considering the main area where the *gunagi* vessels were found, in Central Zagros (37 out of the 56 *gunagi* vases with a known provenience were found there, i.e. 66%; see Figure 1), and the mention of the early Sukkalmahs Ebarat II and Šilhaha, the use of western/Susian variants of the sign *in* is another argument to consider Western or South-Western Iran as the probable place of origin of the *gunagi* vessels corpus. It confirms the statement made by H. Mahboubian, according to which his father found the silver LE inscribed gunagi vessels presently in their collection in the area of Kam-Firouz, in the vicinity of Tal-i Malyan/Anšan.

[62]Desset, *Premières écritures iraniennes*, 126
[63]See Desset, *Premières écritures iraniennes*, fig. 43 and "Linear Elamite Writing", fig. 7.

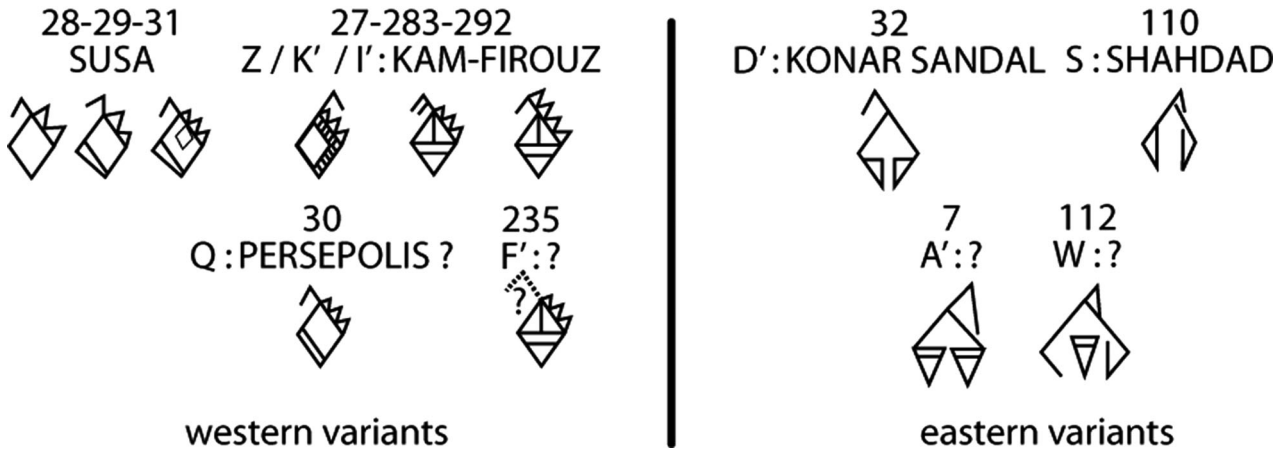

Figure 39. Graphical variants of the LE sign in (to be compared with Figure 3).

4.10 Besides the identification of the names of Šilhaha and Ebarat II (as well as maybe the name of Napiriša; see above, remarks 4.2, 4.3 and 4.4), several names inscribed in the *gunagi* vessels corpus remain undetermined, including probably anthroponyms and theonyms (based on the divine determinative introducing them; Figure 40).

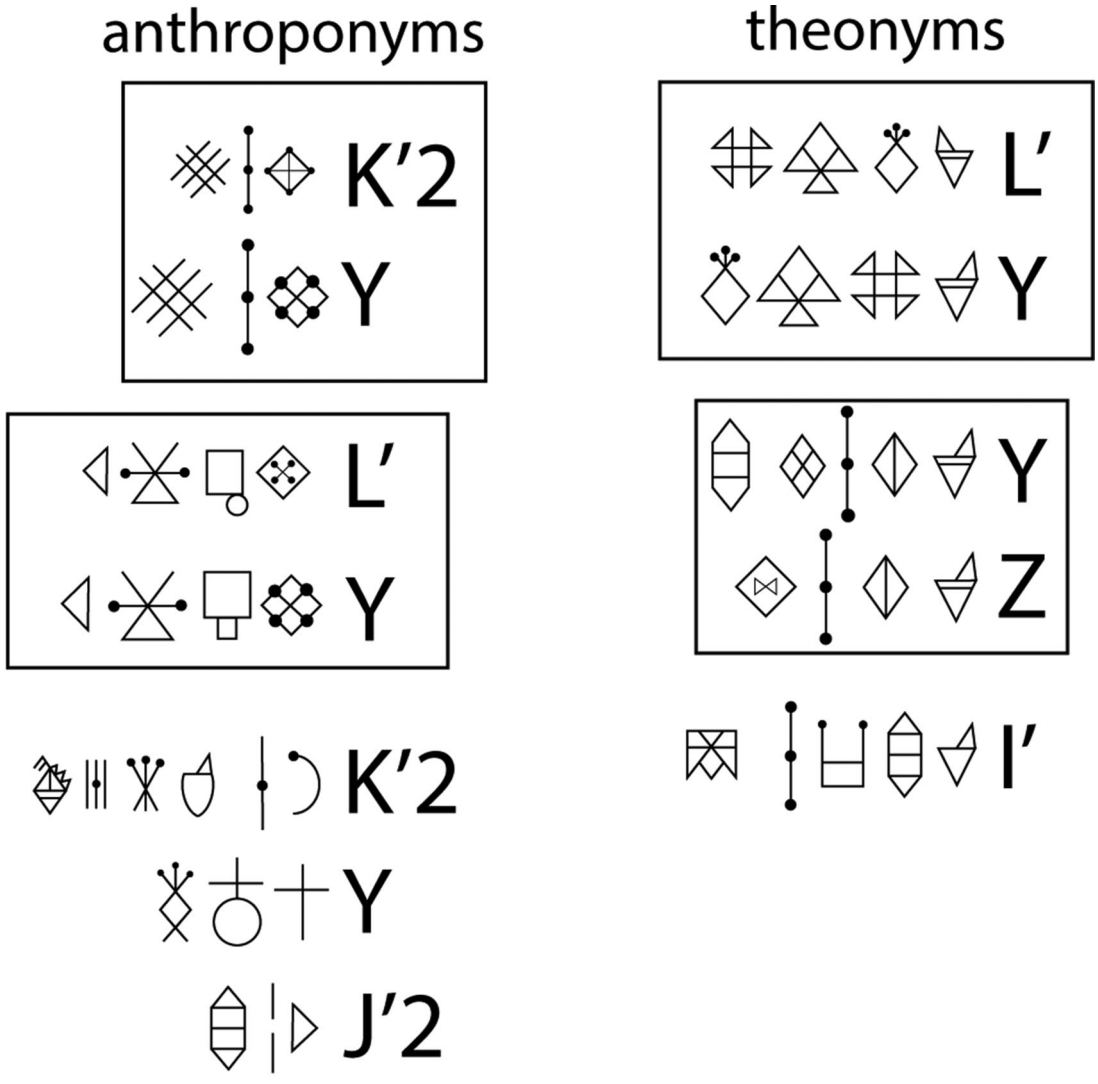

Figure 40. Undetermined anthroponyms/theonyms sequences in the gunagi vessels corpus.

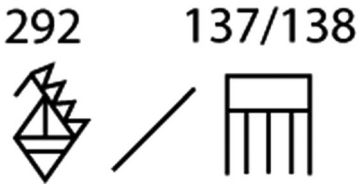

Figure 41. LE signs 292(/283) and 137/138.

It can first be stressed that the same anthroponym is mentioned in K'2 and Y as well as in L' and Y (in that respect, Y shows many similarities with L', along with Z) and that these two anthroponyms start with the same sign(/syllable ?). Concerning the theonyms (or divinised rulers?), two of them are probably mentioned on the 4th line of Y, inscribed from left to right (contrary to the rest of the inscription) near the knee of the figure (Figure 8), and may be compared to a theonym mentioned at the beginning of Z (probably the subject of this long inscription) and to another one at the end of L'.

This last comparison (between Y and L') displays an interesting feature, because in that case, after the divine determinative, the three sign sequence is reverse in L' compared to Y (see Figure 40). Furthermore, the three sign sequence of the theonym inscribed on the fourth line of Y,  , was also written just after the mention of Šilhaha (in X2, H'2 and probably J'2) and Napiriša (in K'2), perhaps corresponding there to a title or an epithet (see Figure 20).

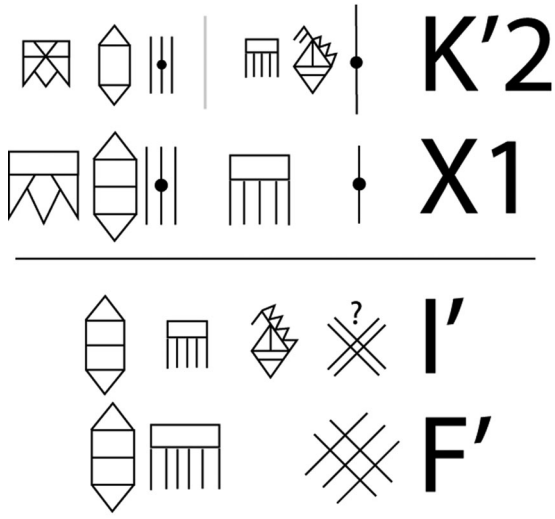

Figure 42. The two sign sequences where sign 292/283 could be written before sign 137/138.

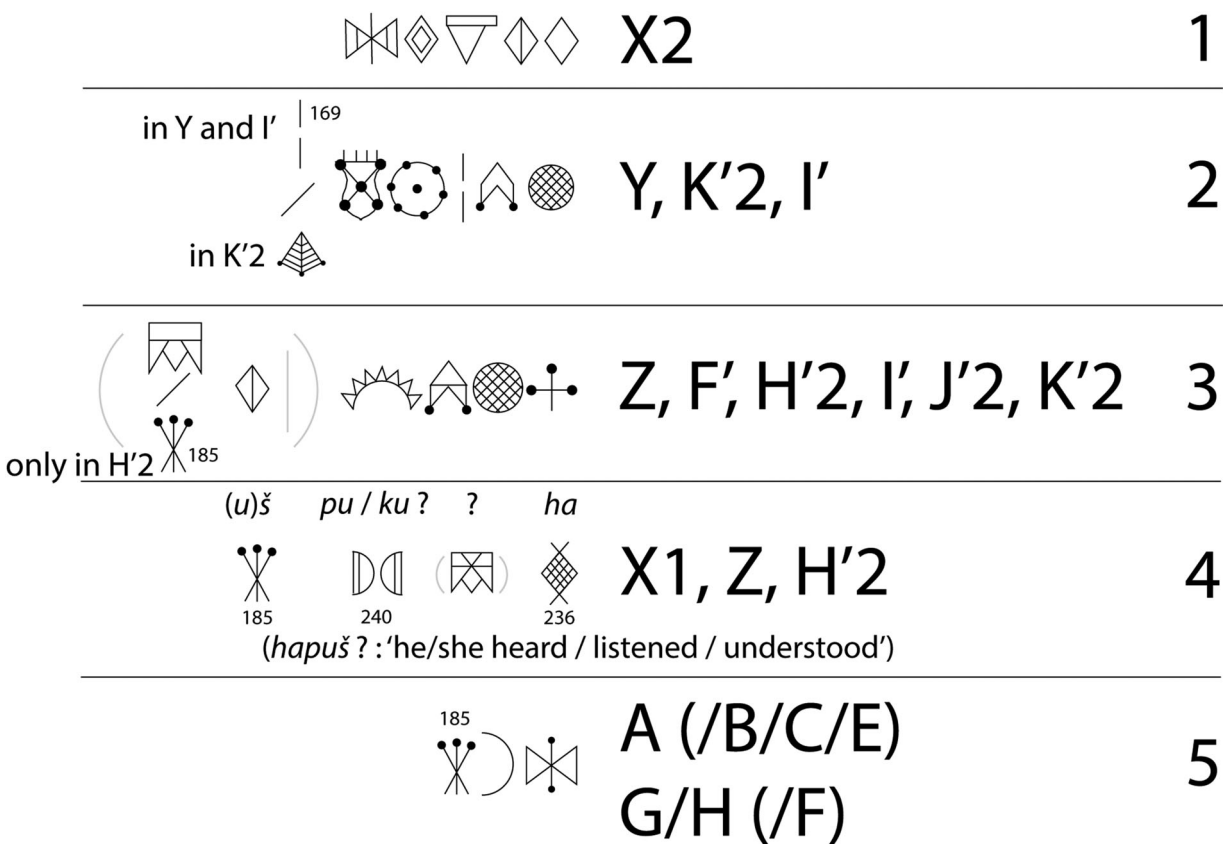

Figure 43. Possible verbal notations.

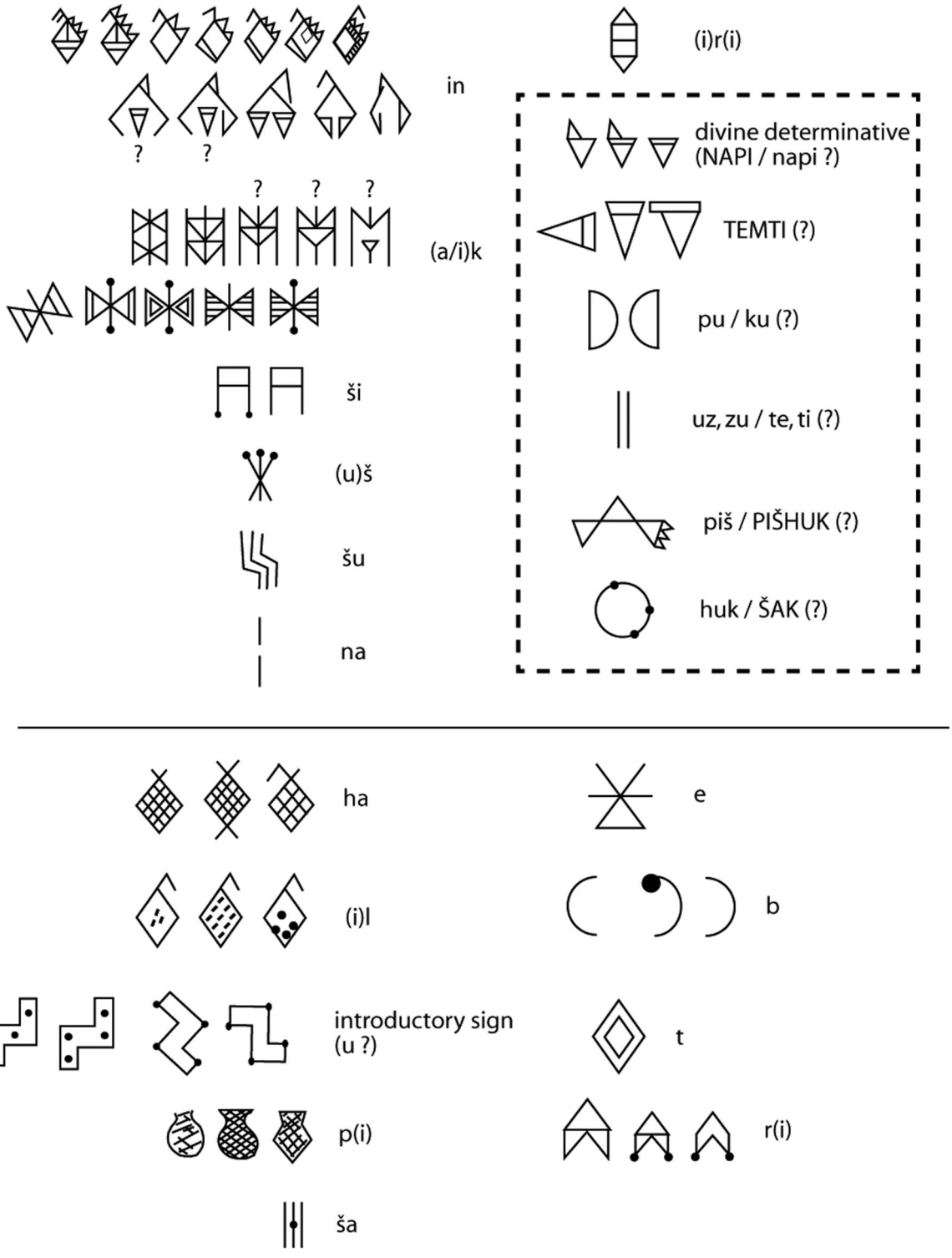

Figure 44. Phonetic (and logographic) values accepted and proposed in this paper for the LE writing system (to be compared with Figure 2).

4.11 Two sign sequences show a specific relation between the signs 292/283 (which is a variant of the sign *in*; see above remark 4.9) and 137/138 (Figure 41).

It seems that sign 292/283 could either be inscribed or not inscribed before sign 137/138 in two sign sequences (Figure 42), one inscribed in X1, Y, Z, F', H'2, I', J'2 and K'2, the other one in I', F' and K'2, without any reason or consequence that we can detect.

In these cases, sign 292/283, one of the graphical variant of sign *in*, was perhaps used to stress the phonetic

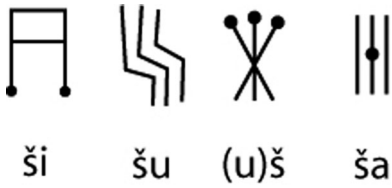

Figure 45. LE signs with the phonetic values ši, šu, (u)š and ša.

value of the sign 137/138 whose phonetic/consonant value may be hypothesised as *n*-(?). Sign 137/138 appears also as the sign used probably to record the last syllable of the toponym Susa in the title used by Puzur-Inšušinak in his LE inscriptions.[64] Susa was then probably recorded as Šušen (*šu-še-n*[?]).

4.12 Four sign sequences (sequences 1, 2, 3 and 4 in Figure 43), because of their position at the end of a text or of a proposition, probably displayed verbal notations (in the Elamite/Hatamtite language, the verbal predicate is usually at the end).[65]

While the verbal sequence 1 only appears in one inscription, verbal sequences 2, 3 and 4 were used in several texts, showing how standardised and repetitive they were, belonging to a coherent corpus both from the points of view of materiality and meaning. Sequences 3 and 4 could end with the sign 185, with the probable phonetic value (*u*)*š* (see Figure 2), like the verbal sequence present in the two most important Puzur/Kutir-Inšušinak Susian inscriptions, A/B/C/E and F/G/H (sequence 5).[66] In the Elamite/Hatamtite language, the verbal ending *–š* corresponds to the 3rd person singular of the verbal conjugation with an active and perfect aspect (conjugation I in the Stolper classification;[67] or verbal conjugation according to Grillot).[68] This 3rd person verbal ending present in X1, Z and H'2 would nevertheless contradict the animate nominal 1st person singular inflection (*-k*) observed notably in X and Z (see above, remark 4.7).

In the verbal sequence 4, the last sign (sign 185) probably meant *–(u)š*, while the middle sign (sign 240) was the first sign used in Susa in the sequences designating Puzur/Kutir-Inšušinak, with the hypothetical phonetic value *pu* or *ku*. For the first sign (sign 236), thanks to the name of the Sukkalmah ruler Šilhaha (see above, remark 4.2), the phonetic value *ha* was proposed. All in all, this sequence might be interpreted as *ha-pu-uš*, *hapuš*, the verb *hapu* (to listen/to hear/to understand) followed by the 3rd person singular ending *–š* of the verbal conjugation: he/she heard/listened/understood.

The verbal sequence 2 in Y and I' ends with sign 169, whose probable phonetic value was *na* (see Figure 2). It could betray the precative/optative verbal mood[69] or be the optative ending *-ni* followed by the particle *-a* expressing the consequence (according to Grillot)[70].

5. Conclusions

The vases studied here belong to a coherent *gunagi* beaker type (see Figure 15(a–d)) produced, in the current state of our knowledge, with an intensively hammered silver alloy (93–96% silver and 4–7% copper; see the technical note after this paper) in western highland Iran from 2050 to 1850 BC and possibly mainly used in funerary occasions,[71] perhaps during funeral banquets.[72] They perhaps come, like the other (non-inscribed) *gunagi* vessels of the Mahboubian collection, from royal related Sukkalmah grave(yards), commercially excavated by Benjamin Abol Ghassem Mahboubian in 1922–2924 in the vicinity of Tal-i Malyan/Anšan, in Kam-Firouz and Beyza areas.[73]

Independent information sources all confirm this chronological attribution:

- the archaeological contexts where this type of vessel was found,
- mention of them in the cuneiform texts,

[64]See Desset , "Linear Elamite Writing", fig. 9, sequence 4 and 411.
[65]Stolper, "Elamite," 84 and Grillot, *L'élamite, éléments de grammaire*, 71.
[66]See Desset, "Linear Elamite Writing", fig. 9, sequence n° 6.
[67]Stolper, "Elamite," 78
[68]Grillot, *L'élamite, éléments de grammaire*, 73
[69]Stolper, "Elamite," 80–1
[70]Grillot, *L'élamite, éléments de grammaire*, 82–3
[71]Most of the precious metallic vessels found in regular excavations in the Near East come either from hoards or graves.
[72]In that respect, Glassner ("Les premiers Sukkalmah," 325–26 and "Une inscription inédite," 323) suggested that this vessel type, at least in royal contexts, could be offered when somebody died or for commemorating a dead person.

According to J. Alden (personal communication), '*gunagi*' refers maybe to a specific function or symbolism inherent in the incurving cylindrical beakers. Perhaps these vessels, which from their size and shape appear to be parts of drinking/dining sets, were something used in a particular ceremony, a type of ewer celebrating a birth, coronation, marriage, adulthood or funeral, or alternatively were a traditional gift given at some important socio-political event (such as a visit from the king). Their provenience (in graves) indicates a personal significance rather than an institutional one, while their distribution (western Iran/Susa) reflects a shared cultural practice.
[73]http://www.mahboubiancollection.com/life-and-works/dr-benjamin-mahboubian-s-excavations

On the 'commercial excavations', see notably Abdi, "Nationalism, Politics," 53–4 for this activity in the late Qajar period. The first antiquity law passed in Iran in 1930 recognized that excavations for commercial exploitation purposes were still permitted on unregistered sites.

- partly, the iconography of the figure depicted in the vessel with the LE inscription Y (besides other interesting features)
- and the names of the Šimaškean and Sukkalmah rulers mentioned in the cuneiform and LE inscriptions written on these vessels, including notably Kindatu, Indatu (I), Ebarat (II), Šilhaha, Atta-hušu, Temti-Agun and Pala-iššan. The inscribed LE *gunagi* vessels studied here (see above, remarks 4.2–4.4) mentioned Šilhaha (in X, H' and J'), Ebarat II (in X, F', H', I' and J'; Šilhaha is always mentioned with Ebarat II) and perhaps the god Napiriša (in X, Z, F', H', I', J' and K'; Šilhaha and Ebarat II are always mentioned with Napiriša). As the careers of Ebarat II and Šilhaha are probably to be dated in the twentieth century BC, this enables precise dating of the *gunagi* vessels bearing the inscriptions X, F', H', I' and J'.

Napiriša seems to be particularly implicated in the cuneiform/LE inscriptions written on the *gunagi* vessels, probably because he was the paramount deity of (the highland territory under the control of) the Šimaški/Sukkalmah dynasties, in the Western Iranian plateau. Due to the possible function of the *gunagi* vessels, it can be speculated that Napiriša might have also displayed a specific funerary dimension.

The figure depicted on the *gunagi* with the LE inscription Y probably shows us a praying Šimaškean or Sukkalmah *temti*/ruler in an Anšanite (non-Susian) context, imitating some of the codes of the classic Near-Eastern royal iconography of that time, anticipating with his costume some 2nd millennium BC "Elamite" elements while displaying a strong highland specificity with these unexpected trousers. In particular, this figure seems clearly distinct from the characters depicted with "classic" Near-Eastern clothes in the so-called Anšanite type seals and the Tal-i Malyan GHI/Kaftari glyptics (J. Alden, personal communication).

After the conquest of Susa by Ebarat I of Šimaški from Ur III's ruler Ibbi-Sin, in the late twenty-first century BC (according to the Middle chronology), Šimaškean/Sukkalmah rulers and their chancellery probably saw there the LE inscriptions of Puzur/Kutir-Inšušinak. These monuments may have served as a source of inspiration, explaining why some Sukkalmah rulers used, seemingly episodically, the LE writing to record probably Elamite/Hatamtite language texts.

Concerning the study of the LE inscriptions written on the *gunagi* vessels, a "classic" approach has been taken here which has produced hypothetical phonetic values for certain signs through identifying proper names (see above, remarks 4.2–4.4). This approach is similar to, for example, S. de Sacy's identification of the names Papak, Ardešir and Šapur in Pahlavi Middle Persian inscriptions in 1787 or G. F. Grotefend's identification in 1802/1815 of the names Hystaspes, Darius I and Xerxes I written with the Old Persian cuneiform system.[74] Unfortunately, some anthroponym/theonym sequences resisted any decipherment attempts (remark 4.10). The main hypothesis in that respect would be to associate them with the names of Šimaškean and Sukkalmah rulers and high officers known in the cuneiform sources (such as Girname, Tazita, Kindatu, Indatu, Imazu, Indatu-napir, Kiten-rakid/tab/pi, Indatu-temti, Tan-Ruhurater, Hutran-temti, Hundahišer, Ammatedak, Atta-hušu, Temti-Agun, Pala-iššan, Kuk-Kirm/waš, Kuk-Sanit, Tem-Sanit, Kuk-Nahundi, Kuk-Našur or Tetep-mada) or the names of the gods mentioned in the Naram-Sin treaty (such as B/Pinikir, Hutran, Nahunte or Hu(m)ban to which should be added other deities such as Kiririša or Ruhurater). The presence in these LE inscriptions of toponyms/polities such as Anšan, Šimaški or Hatamti, of titles such as *temti*, *meni*, *lik*/*gam*/*we rišaki*, *ruhu-šak* and words like *gunagi* should also be borne in mind.

Figure 44 presents the LE sign values that can now be accepted, based on the identifications of Šilhaha, Ebarat (II) and perhaps Napiriša discussed above.

Based upon this list, LE writing may display an interesting feature: the graphical shape of some signs may relate to their phonetic values, as the example of the signs *ši*, *šu*, (*u*)*š* and *ša* perhaps betrays (see Figure 45).

Hypothetically with the same consonant value *š*, these four signs also display graphical similarities since they are all built with two or three vertical or sub-vertical strokes, usually punctuated by dots. These features might, therefore, be the LE graphical signature of the sound *š*. Some similarities may also be observed between the signs (*i*)*r*(*i*) and *r*(*i*); on the contrary, *in* and *na* look quite different. This hypothesis, however, needs further research and additional identifications to be confirmed.

Setting aside the hypothetical nature of some arguments put forward in this paper, the evidence presented here shows that it is reasonable to consider the *gunagi* vessels in the Mahboubian collection as genuine artefacts. This evidence is in the form of typo-chronological and iconographic considerations, physico-chemical analyses and, last but not least, consistent LE sign sequences differing completely from the Susian LE text corpus. To reach complete decipherment of the LE script and the

[74]On that topic, see Pope, *The Story of Decipherment*, 97–101. According to Pope, *The Story of Decipherment*, 95, Leibniz was the first in 1714 to mention 'the utility of proper names in decipherment. […] All the decipherments […] had as their starting-point the location and identification of proper names'.

inscriptions on these vessels would be in itself a great achievement. What is more, it could offer precious detail on the poorly understood transition between the Šimaškean and Sukkalmah dynasties.

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Disclosure Statement

No potential conflict of interest was reported by the author.

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