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The Proto-Elamite writing in Iran

François Desset

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Naissance de l'état, naissance de l'administration : le rôle de l'écriture en Égypte, au Proche-Orient et en Chine

Emergence of the state and development of the administration: the role of writing in Egypt, Near East and China

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Erratum

Il a été porté à notre attention que deux erreurs se sont glissées dans l'article intitulé «The Significance of Predynastic Canid Burials in Ancient Egypt» publié par Mary Hartley dans le volume 25 (2015) de notre revue. Page 59, à la fin du 5e paragraphe, l'intention de l'auteur était de faire référence à Van Neer et al. 2004: 120 au lieu de Friedman et al. 2011: 120. Le nom de l'auteur a aussi été mal orthographié («Freidman» au lieu de «Friedman»). La rédaction d'*Archéo-Nil* présente ses excuses pour les désagréments occasionnés.

It was brought to our attention that two errors occurred in the article entitled "The Significance of Predynastic Canid Burials in Ancient Egypt" published by Mary Hartley in the volume 25 (2015) of our journal. On page 59, end of the fifth paragraph, the author's intent was to reference Van Neer et al. 2004: 120 instead of Friedman et al. 2011: 120. The name of the author was also regrettably misspelt ("Freidman" instead of "Friedman"). *Archéo-Nil*'s team sincerely apologises for any hurt or confusion these errors may have caused.

Archéo-Nil est une revue internationale et pluridisciplinaire à comité de lecture («peer review») dans le respect des normes internationales de journaux scientifiques. Tout article soumis pour publication est examiné par au moins deux spécialistes de renommée internationale reconnus dans le domaine de la préhistoire ou de l'archéologie égyptienne. L'analyse est effectuée sur une base anonyme (le nom de l'auteur ne sera pas communiqué aux examinateurs ; les noms des examinateurs ne seront pas communiqués à l'auteur).

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Proto-Elamite Writing in Iran

François Desset, Tehran University, Iran

In the Near East, the most ancient writing systems currently known in the world appeared at the end of the 4th millennium BC: the proto-cuneiform writing in Southern Mesopotamia and the proto-elamite writing on the Iranian Plateau. Both used for administrative and accounting purposes, these writing systems displayed important parallels, such as the numerical systems and the numerical value signs, and dissimilarities since most of their signs differed from each other.
Because of the apparent break in the scribal tradition on the Iranian Plateau around 2800 BC, the proto-elamite writing did not give birth to any offspring which could have helped us in its decipherment, contrary to the proto-cuneiform writing and its heir, the cuneiform writing. For this reason, although it is known for more than one century thanks to the French excavations in Susa, the proto-elamite writing remains still largely undeciphered and only the shared elements with the proto-cuneiform writing (such as the numerical systems) are finally well understood.
In the mind of the non-specialists, the Near East is usually reduced to (Southern) Mesopotamia. In order to render all the complexity of the historical context which witnessed the invention of writing in the Near East, this paper presents state of the art research on the Iranian Plateau and the important scientific corpus of the proto-elamite tablets.

Au Proche-Orient, apparaissent lors de la fin du 4e millénaire av. J.-C. les plus anciens systèmes d'écriture connus au monde à l'heure actuelle *: l'écriture proto-cunéiforme en Basse-Mésopotamie et l'*écriture p*roto-élamite sur le Plateau Iranien. Utilisés à des fins comptables et administratives, ces deux systèmes d'écriture présentaient d'importantes similitudes, tels les systèmes numéraux et les signes à valeur numéral, tout en se démarquant nettement puisque la très grande majorité de leurs signes différaient l'un de l'autre.*
Par la rupture de la tradition scribale sur le Plateau Iranien vers 2800 av. J-C., l'écriture proto-élamite n'a engendré aucune descendance avec laquelle dérouler *le fil du déchiffrement, contrairement à l'écriture proto-cunéiforme et son héri-*

*tière, l'écriture cunéiforme. Pour cette raison, et bien qu'elle soit connue depuis plus d'un siècle déjà par les fouilles françaises de Suse, l'*écriture p*roto-élamite reste toujours en grande partie indéchiffrée et seuls les* éléments *partagés avec l'écriture proto-cunéiforme (tels les systèmes numéraux) sont finalement bien compris.*
Pour les non spécialistes, le Proche-Orient se réduit généralement à la (Basse) Mésopotamie. Afin de rétablir la complexité du contexte historique dans lequel l'apparition de l'écriture au Proche-Orient s'est inscrite, cet article est une mise au point sur le Plateau Iranien et présente l'état actuel de nos connaissances sur l'important corpus scientifique des tablettes proto-élamites.

Introduction[1]

The invention of writing is an important matter for us, since here lies the origin of one of the fundamental features of our civilization. But some 5000 years ago, this invention, whose success was yet to be proven, was very probably not considered as revolutionary, drawing only the attention of the few persons able to handle it in some granaries and warehouses. Only its long history and current omnipresence have given writing its importance, and these aspects should be set aside in any issue concerning its invention in order to avoid any anachronistic consideration.
Among the most ancient writing systems, the Mesopotamian proto-cuneiform and the Egyptian hieroglyphic writings are generally under the spotlight, leaving the neighbouring areas in the dark. However, the Iranian Plateau probably played in this matter an important but usually unrecognized role.
The epigraphist of the French mission in Susa, Vincent Scheil, published the first two proto-elamite tablets in 1900 (Scheil 1900: 130–131), well before the discovery of the first proto-cuneiform tablets in Uruk from 1928. Associated for a time to what is currently known as the Linear Elamite writing, another but more recent Iranian writing system, Scheil labelled in 1905 (Scheil 1905: 60) the clay tablets which were then found in Susa as 'proto-elamite' only with regard to their specifically Susian geographical nature (Elam meant Susa in V. Scheil's mind), without any linguistic consideration (the language currently known as 'Elamite' was the 'Anzanite' language in Scheil's terminology). During the 20th century, later excavations (starting with Tepe Sialk in the 1930s) soon contradicted the exclusive Susian nature of these tablets while the 'proto-elamite' concept, originally only charged with a geographical value, underwent a frog-leaping 'semantic inflation' through which it was not restricted any more to qualify a specific type of tablets, but also some archaeological contexts, some layers, a material culture style, a period and eventually a civilization (Abdi 2003).
Since these tablets are not restricted to Susa, since the proto-elamite concept inflated so much that it lost its descriptive value and finally because this concept was built on the Mesopotamian toponymical notion of '*Elam*', which should be avoided when dealing with the Iranian Plateau with the 'Iranian' point of view, this writing system will be referred below as PE writing[2].

1. I would like to thank here John Alden and Kathryn Kelley for their precious comments.
2. See Desset 2012: 3–91.

Archaeological contexts

Currently, the PE writing system has been found in 8 Iranian sites (see **Fig. 1**):
– Susa (1557 texts and fragments)[3],
– Tal-i Ghasir (or Tall-e Geser; 1 tablet) [4],
– Tal-i Malyan (32 tablets or fragments)[5],
– Tepe Yahya (26/27 tablets discovered in different rooms of the phase IVC2 building; see below, section 11.3 and fig. 31)[6],
– Shahr-i Sokhta (1 tablet)[7],
– Tepe Sialk (among the 19 tablets found in phases IV.1 and IV.2, 5 were probably written with PE signs: S-28, S-1620, S-1623, S-1624 and S-1626)[8],
– Tepe Sofalin (≈ 137? PE tablets were described as coming from this site, but only 16 were up to now published[9]),
– and Tepe Ozbaki (1 tablet found in Marral Tepe)[10].

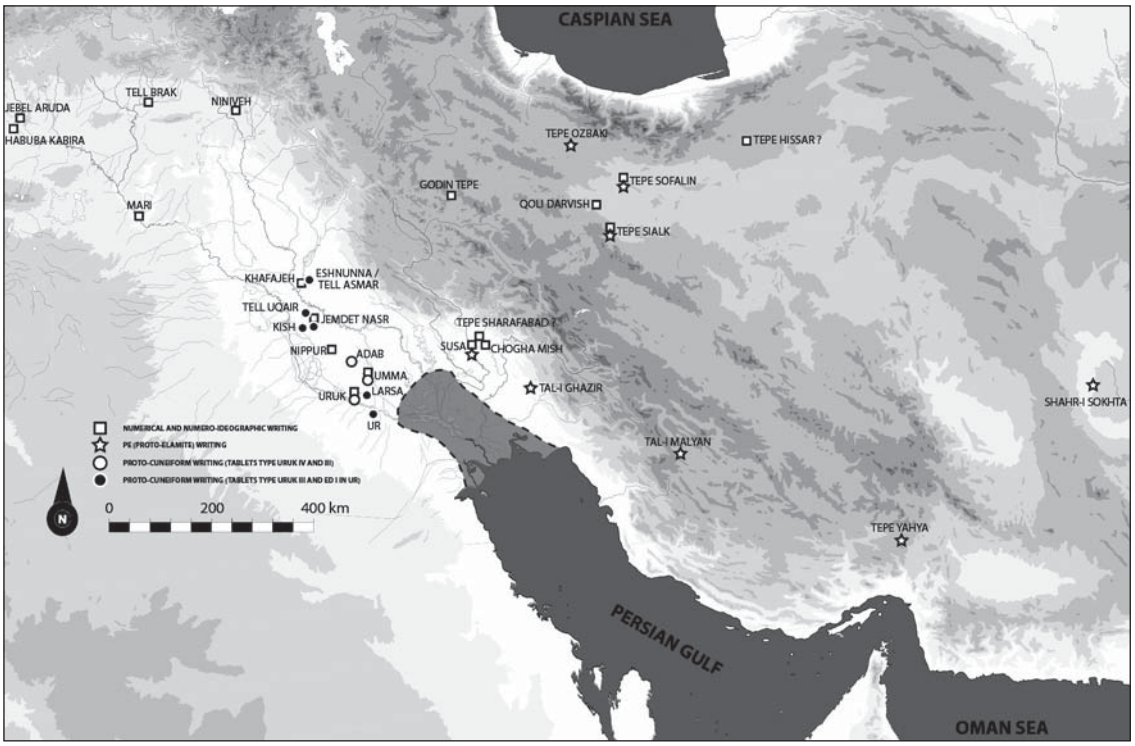


Fig. 1
Map of the archaeological sites where numerical/numero-ideographic (white rectangles), PE (white stars) and proto-cuneiform (white and black circles) tablets have been found.

3. Scheil 1905 (MDP 6); 1923 (MDP 17); 1935 (MDP 26), Mecquenem 1949 (MDP 31);1956; Stève & Gasche 1971: 126–127; Vallat 1971; 1973; Stolper 1978; the unpublished documents available through the Cuneiform Digital Library Initiative (CDLI) internet site (see also Dahl 2013: 236–238 for the hypothetical discovery context of the Susian tablets). The number of texts found in Susa up to now may change because of the collation of fragments belonging actually to the same tablets.

4. Mc Cown 1949: 54; Caldwell 1968: 348; Whitcomb 1971: 31 & pl. XI.A; Alizadeh 2014: 45, fig. 87.E & pl. 6.F.

5. Stolper 1976; 1985; CDLI internet site.

6. Lamberg-Karlovsky & Tosi 1989; Damerow & Englund 1989; Potts 2001: 10–14.

7. Amiet & Tosi 1978: 20 & 24. According to Amiet 1986: 114 and Dahl 2005b: 82, this tablet has not been written with PE signs

8. Ghirshman 1934; 1938/1939: vol. 1: 65–68, pls. XXXI, XCII & XCIII; Glassner 1998; Desset 2012: 13–18. See also Amiet 1985 for more information about the archaeological context

9. Hesari 2011: 43–44; 2013: figs. 58, 73 & 74; Dahl et al. 2012; 2013: 358.

10. Madjidzadeh 2001: 145; 2010, vol. 1: 160; Vallat 2003a. Some PE tablets have also been reported in Tepe Sagzabad (Hesari 2011: 38; Dahl et al. 2012: 60), in the Qazvin plain.

Consequently, 88% (1557/1760) of the PE tablets known in 2016 come from Susa, more specifically from the old excavations led there in the first half of the 20th century.
Concerning the distribution area of the PE tablets, it must be noticed that they were much more widely spread than the proto-cuneiform documents (**Fig. 1**), which were limited to Southern Mesopotamia only. It seems also that these two writing systems excluded each other since, up to now, both of them have never been found on the same site. The meaning of this mutual exclusion is still elusive: was it due to the redundancy and pointlessness to use two different systems or did it reflect any identity border?

Content of the texts

The PE tablets are exclusively local administrative documents accounting objects such as cereals, cattle or workers and attributing them sometimes to institutions or persons whose names might have been written (see below). In comparison with the contemporary proto-cuneiform tablets, their semantic field of application seemed to be more restricted since no PE lexical list was found up to now.

Writing system and signs

4.1. Writing system

As far as we can understand this still mainly undeciphered system, it can be characterized as a mixed system composed of signs with logogrammatic and/or phonetic value(s), like the contemporary proto-cuneiform system (Glassner 2000: 213 & 289; 2009). Furthermore, according to their context of use, some signs probably displayed different logogrammatic and/or phonetic values (polysemy phenomenon), such as the signs M387/N23, M390/N24 and M347/N51 (see **Fig. 2**), which had at least a numerical value and a non numerical one.
Because a sign may have different semantic values, it is consequently recommended to talk of a numerical/non-numerical value sign or a logogrammatic/phonetic value sign instead of a numerical/non-numerical sign or a logogrammatic/phonetic one.

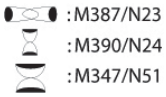


Fig. 2
PE signs M387 / N23, M390 / N24 and M347 / N51.

4.2. PE signs semantic values typology

This is how the semantic values typology of the PE signs could be summarized. Basically, four semantic values (in italics) might be distinguished among the PE signs[11]:
I. logogrammatic value signs
I.1 logogrammatic numerical value signs
I.2 logogrammatic non-numerical value signs:
I.2.a logogrammatic object value signs (accounted by a postposed numerical notation; with a pictographic appearance or not)
I.2.b logogrammatic individual/household/institution value signs (with a pictographic appearance or not)
(I.2.c other logogrammatic non-numerical non object value signs?)
II. phonetic value signs (syllabograms)

11. See also Dahl et al. 2013: 366–367.

4.3. Signs frequency

Because of the difficult distinction between 'nuclear' signs, graphical variants of these nuclear signs and composite signs, the number of signs used in PE tablets was much debated. From the most updated work (Dahl 2002: 1; 2009: 24; Englund 2004a: 140; cf. also Dahl's signs list available in the CDLI internet site[12]), around 1400 or 1900 non-numerical value signs were recorded, classified according to their shape and labelled with respect to the signs list published by Meriggi (1974: 8–24). Each sign may be then transcribed with the letter M (standing for Meriggi) followed by the number attributed by Meriggi in his signs list (M388 is for example the 388th sign in Meriggi's list). On the contrary, the numerical value signs are transcribed with the letter N (standing for numerical) followed by the number attributed by Damerow & Englund (1987: 166) in their numerical value signs list. These conventions are used here. The use frequency of these signs displays an interesting pattern. Dahl (2002: 2-3; see also Englund 2004a: 140) could show that in the currently known tablets, out of 1900 signs, 1050 were only used once (hapaxes), 300 twice, 350 from 3 to 10 times and 200 more than 10 times, including 16 signs used from 100 to 300 times. The three most used signs are M218 (453 occurrences), M388 (528 occurrences) and M288 (709 occurrences; see **Fig. 3**).

PE writing, like the proto-cuneiform system, was organized around a core of 300/400 non-numerical value standardized signs (qualified here as nuclear signs), used frequently and known by all the users of the PE writing, for which had been created some graphical variants due to geographical or chronological (evolution of the signs in time; see below, section 10.5) reasons[13] or which

Name	Drawing	Name	Drawing	Name	Drawing
M1		M54		M305	
M9		M66		M346	
M32		M157		M371	
M36		M218		M387	
M36-AD		M288		M388	
M36-TA		M297			

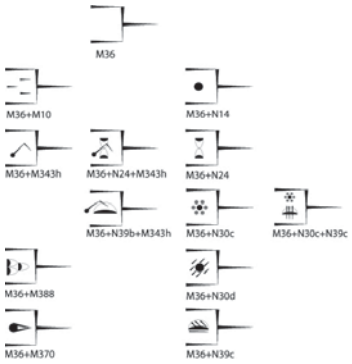
Fig. 3
Most frequent PE signs (Dahl 2002 : table 3)

12. cdli.ucla.edu/tools/cdlifiles/prE_signlist.zip

13. The variants are transcribed with the name of the nuclear sign followed by a latin letter corresponding to the variant (such as M343h or M393f). This notion of graphical variation is still problematic since, strictly speaking, a sign is a variant from another one if it differs slightly graphically from it but keeps the same semantic value. In the case, that we cannot still identify currently, where two signs are graphically close but with complete different meanings, these signs should not be considered as variants but as two different nuclear signs.

could be combined in order to create composite signs. Independently from the nuclear signs, other signs used with a low frequency had been created for very precise and limited purposes and were probably understood by only few members of the PE scribal community.

Fig. 4
PE composite signs with a container sign (M36 here) in which were included numerical and/ or non-numerical notations.



4.4. Composite signs

Two main categories of composite signs may be distinguished (Dahl 2005a: 1–2 and 13) in the PE tablets (composite signs are transcribed with the sign + between two signs):

• in a non-numerical value signs representing probably a container, such as M36 (see **Fig. 4**), could be inserted with a numerical notation (M36 + N14 for example) recording a specific quantity and/or a non-numerical notation (such as M36 + M343h) determining probably the quality of the product contained.

• non-numerical value signs which did not stand for a container could be combined to other non-numerical value signs in two different ways (see **Fig 5**):

– by including the qualifying sign (with a logogrammatic or phonetic value) in the sign to be qualified (such as M370b + M72 or M362 + M59);

– or if the qualifying sign is too big or the sign to be qualified too small, by duplicating the sign to be qualified before and after the qualifying sign (such as M54 + M393f + M54).

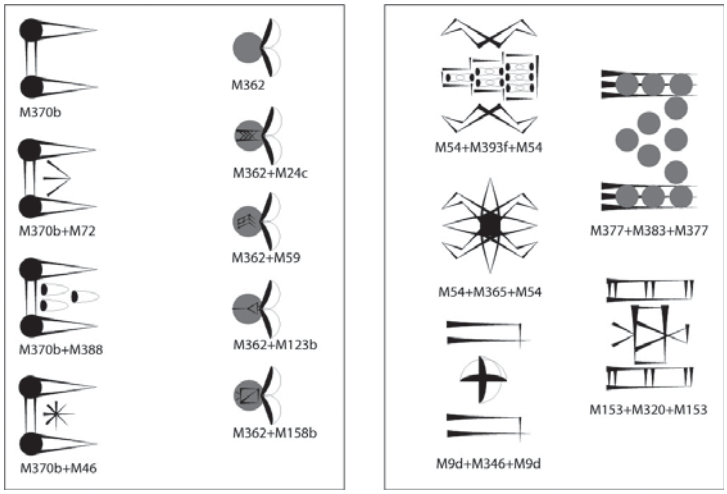


Fig. 5
PE composite signs with signs not standing for a container.

4.5. Meaning of the PE signs and comparison with proto-cuneiform signs

As PE writing use was dropped at the beginning of the 3rd millennium BC, contrary to proto-cuneiform writing, no more recent texts may be used to assist in the decipherment. The contemporary proto-cuneiform texts, better understood than the PE tablets thanks to the more recent cuneiform documents, have nevertheless been used as a possible deciphering track. It has been hypothesized that graphically close proto-cuneiform and PE signs could be also semantically related (see **Fig. 6**), suggesting that PE scribes were influenced by the proto-cuneiform tradition (Damerow & Englund 1989: 6–7; Englund 1996: 162; Potts 1999: 74) while it could well be advocated that both proto-cuneiform and PE scribes inherited these signs from a common ancestor (on that question see below, section 10.4).

Several PE signs have been related to proto-cuneiform ones on the basis of their graphical similitude (see **Fig. 6**):

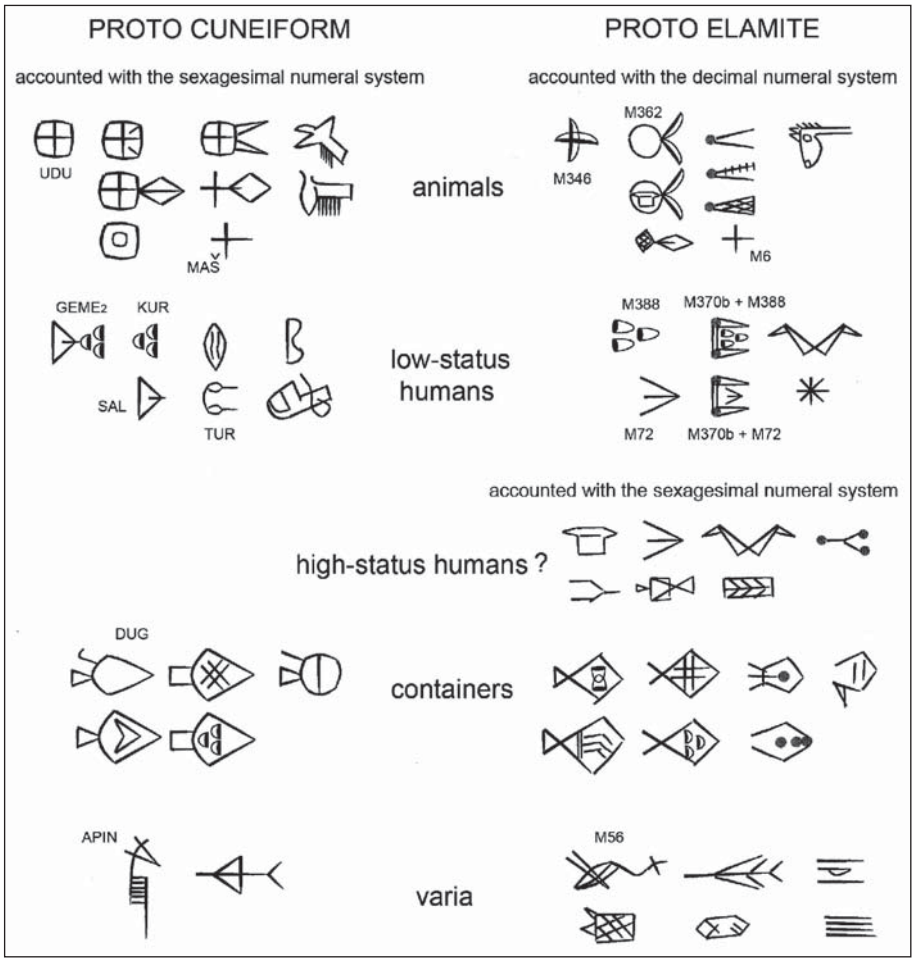


Fig. 6
Graphical (and semantical ?) correspondences between proto-cuneiform and PE signs and numerical systems used to account them (from Englund 2004a : fig. 5.14).

– PE sign M346 with the proto-cuneiform UDU, used to record the small cattle (caprinae) in general and more specifically sheep (female or male);
– PE signs M388 and M72 have been compared to proto-cuneiform signs KUR and SAL, meaning respectively male and female slave in proto-cuneiform texts. Consequently, M388 and M72 could respectively record male and female low status worker/slave, some Susian texts accounting for example up to 591 M388 (Scheil 1923: MDP 17, n° 45) and ≈ 1776 M72 (Scheil 1935: MDP 26, n° 205);
– the PE sign M370b was considered as graphically close to the proto-cuneiform sign TUR, expressing the notion of child (dumu). Composite signs M370b + M388 and M370b + M72 could then be interpreted as boy and girl low status worker/slave;
– the PE signs representing probably vessels or containers (from M260 to M283), in which might be inserted numerical quantity or non-numerical quality notations (see above, section 4.4), may be related to the proto-cuneiform signs DUG and KAŠ and their variants.
The efficient comparison cases between proto-cuneiform and PE non-numerical value signs seem finally rather more limited than it is usually stated. Moreover, several cases of close graphical appearance between proto-cuneiform and PE signs are misleading, since their meanings were very probably different:
– both the PE sign M56 and the proto-cuneiform sign APIN represent a plough/ard. But while APIN really stands for the agricultural tool, M56 probably stands for a determined (agricultural) area, usually followed by a spe-

cific grain quantity perhaps used to sow it (Scheil 1923: 2; Damerow & Englud 1989: 34 & 58; see below, section 7). M56 is consequently not a logogram with a pictographic appearance (the picture standing for the object) but a kind of 'metonymogram', a sign with a pictographic appearance but whose meaning is not the object it represents but rather a concept/object semantically related (metonymy principle; Gelb 1963: 99 labels this kind of sign *associative logogram*; see also Glassner 2000: 186). This metonymogrammatic feature is likely to concern other PE signs with pictographic appearance, although it should be noted here that the general appearance of the PE signs is usually more abstract, less pictographic than, for example, the contemporary proto-cuneiform signs. – both the PE sign M488 and the proto-cuneiform sign ŠE look like an ear of wheat/barley. But while the sign ŠE really means cereals (barley), the sign used in PE tablets to record this important object is very probably M288 (Scheil 1923; Damerow & Englund 1989: 32): . Not surprisingly, this is also the most frequently used PE sign (see above, section 4.3).

4.6. PE object signs sequences

4.6.a. Caprinae (?) signs sequences

Dahl (2005b: 89–96; 2009: 24–26) could identify in the Susian tablets a series of 8 signs always recorded in the same order: M362/M367/M346/M6/M362a-b/M367a-i/M346a/M6a. Since M346 and M6 are very close graphically from the proto-cuneiform signs UDU (sheep) and MAŠ (male kid/billy goat), Dahl suggested to see in these 8 Susian signs, the PE signs used to record the caprinae which would have been hypothetically written in the same order as in the proto-cuneiform texts: nanny goat (M362), billy goat (M367), ewe (M346), sheep/ram (M6), female kid (M362a-b), male kid (M367a-i), young ewe (M346a) and lamb (M6a), the signs used for the young ones being variants of the signs for the adults (see **Fig. 7**).

Fig. 7
PE signs recording the caprinae in Susa, according to Dahl (2005b: fig. 9)

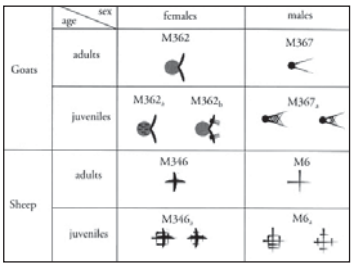
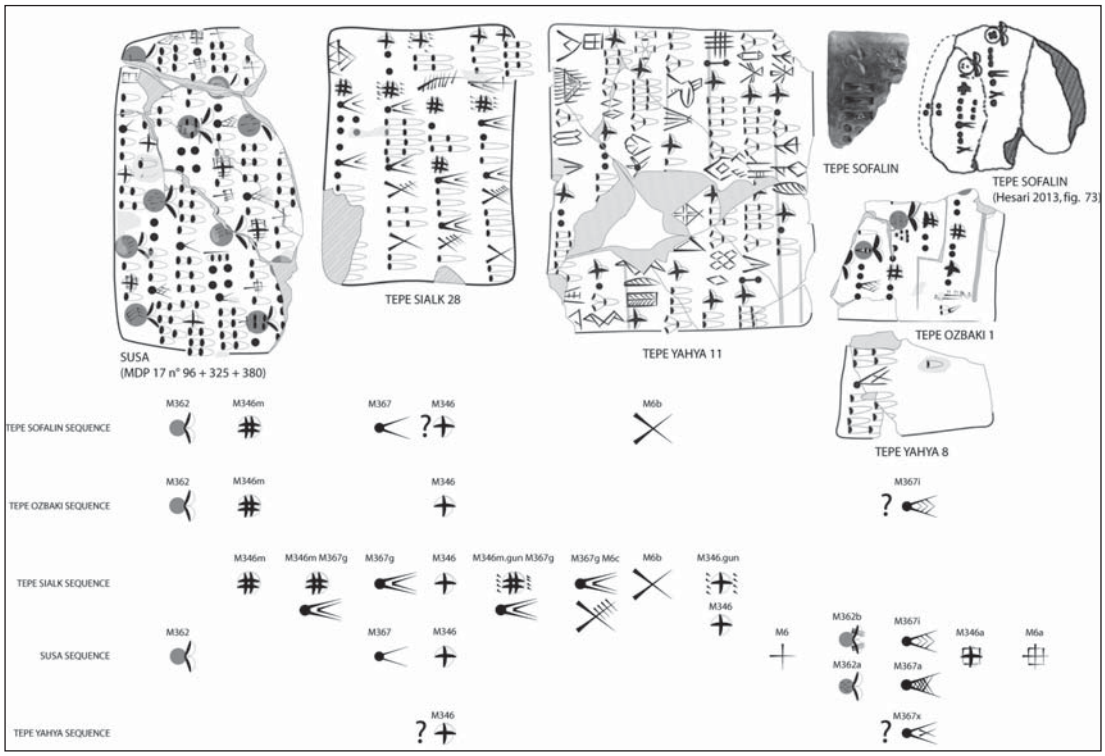


Fig. 8
Caprinae (?) PE signs sequences of Tepe Sofalin, Tepe Ozbaki, Tepe Sialk, Susa and Tepe Yahya. These signs sequences are to be read from left to right in this figure. Question marks show that the exact position of a sign in its sequence is unknown.



This interesting hypothesis faces nevertheless two problems. Firstly, if M6 is graphically close to the proto-cuneiform signs MAŠ, it should not mean sheep/ram but male kid/billy goat. Secondly, (caprinae?) sign sequences were also recorded in Tepe Ozbaki, Tepe Sofalin, Tepe Sialk and Tepe Yahya (see **Fig. 8**) where graphical variants of the Susian signs were probably used (M367g used in Tepe Sialk is thus probably a variant of M367 used in Susa and Tepe Sofalin), but above all, there where signs unknown in Susa were also used (such as M346m, which is very probably not a variant of M346; see Dahl et al. 2013: 373). If different graphical regional traditions may explain some of these discrepancies, it cannot nevertheless give any account of the differences between the final part of the Susa and Tepe Sialk sequences (see **Fig. 8**). This point remains to be clarified while the sign(s) standing for the cattle (*Bos Taurus*) is(are) still not identified.

4.6.b. Dairy products (?) signs sequence

A list of 7 object signs standing maybe for dairy products (such as cheese and butter) has been identified in three PE tablets from Susa (Dahl 2005b: 113–116; for more details, see below, section 10.5 and **Fig. 30**).

4.6.c. Human signs sequence

In several texts of Susa (notably, MDP 6 n° 390, MDP 17 n° 112, MDP 17 n° 193, MDP 17 n° 340, MDP 26 n° 218, MDP 26 n° 472, MDP 26S n° 5040, MDP 26S n° 5218 and SE 124) appears a sequence made of at least 7 signs recording probably humans according to unknown social/legal/honorary categories (see **Fig. 9**). Signs recording children (such as M370b + M388 or M370b + M72; see above section 4.5) are notably absent from this list, as well as M388 ( ) and M124 ( ) which very likely stood for specific human statuses (M388 probably standing for male low status worker/slave, from the comparison with the proto-cuneiform sign KUR).

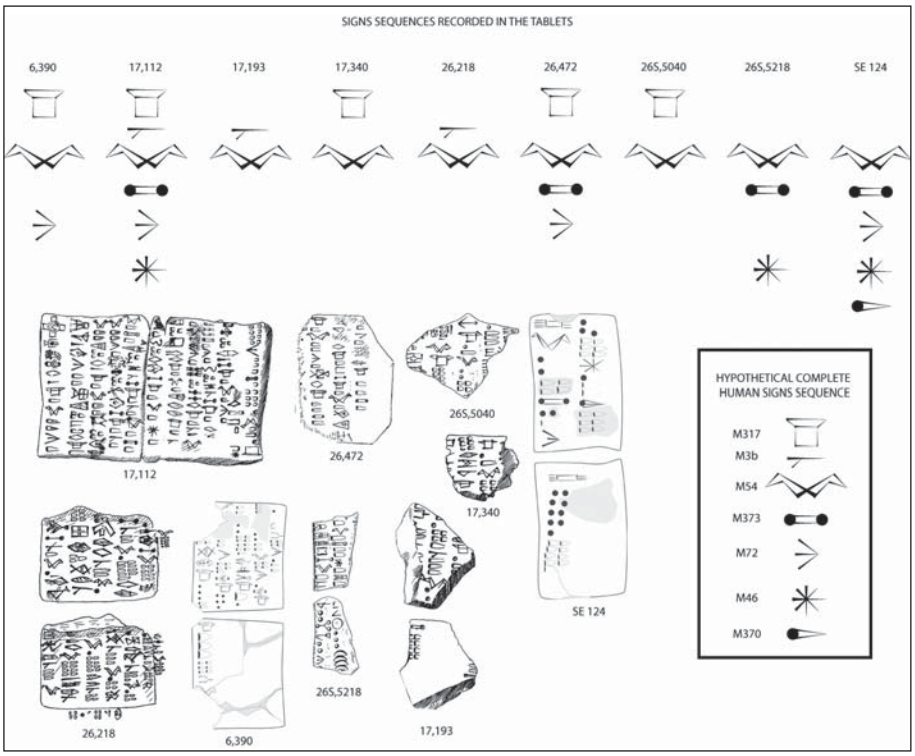


Fig. 9
Susa PE tablets where signs standing probably for humans were recorded in the same order and hypothetical complete signs sequence.

These 3 signs sequences (caprinae, dairy products and humans sequences) show that objects signs classification existed in PE tablets, reminding, in some way, of the contemporary proto-cuneiform lexical lists in their attempt to organize writing practices.

Numerical value signs and relations between them (numerical systems)[14]

As systems used to record quantity of objects, an important component of PE and proto-cuneiform writings are obviously the numerical notations based on the additive principle (and not on the positional one), written after the accounted objects in PE writing and before the accounted objects in proto-cuneiform texts. Contrary to other aspects of the PE writing, these numerical notations are currently well understood, thanks notably to the important contribution of Friberg (1978-1979). As stated above, the numerical value signs are transcribed by the letter N followed by the number attributed by Damerow & Englund (1987: 166) in their list.

The meaning of a numerical value sign depends on the numerical systems in which it is used, and consequently of the accounted object. According to the numerical system used, the same sign may indeed reflect different numerical values (for example N51 means 1000 unities in the decimal system, but only 120 unities according to the bisexagesimal one) or the relation between two signs may differ (in the decimal/bisexagesimal/sexagesimal systems, 10 N1 = 1 N14; in the capacity system, 6 N1 = 1 N14).

The numerical value signs and numerical systems used in PE and proto-cuneiform tablets are almost completely similar, except few differences (the decimal numerical system was used only in PE tablets while the EN, GAN_2 and U_4 systems only appeared in the proto-cuneiform texts). These strong similitudes stand in sharp contrast with the rest of these writing systems and may only be explained through a specific genetic relation. It is thus usually advocated that the PE numerical value signs and numerical systems were borrowed from the proto-cuneiform ones[15], while I proposed in 2012 (Desset 2012: 74–79) that these common PE and proto-cuneiform numerical value signs and numerical systems derived from a common ancestor: the numerical/numero-ideographic tablets (see below, section 10.4).

Several numerical systems have been identified in the PE tablets[16] (see **Fig. 10**):

– 3 systems used to account discrete objects: the decimal, bisexagesimal (+ 1 variant) and sexagesimal systems;

– 1 system used to account continuous objects (capacity system) such as liquids or cereals, which are accounted according to their weight or volume and not according to the number of grains (+ 2 variants and a regional variant for the 3 smallest signs attested only in Tepe Yahya[17]; about the regional variation phenomenon, see above, section 4.3).

Three systems were used in PE tablets to account discrete objects. Each of these systems was used to account different categories of discrete objects, each of them displaying consequently a specific semantic application field which may be guessed perhaps thanks to comparisons with the proto-cuneiform texts.

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14. See on that topic, Damerow & Englund 1989: 18–30; Englund 2004a: 106–119; 2004b: 42.

15. Damerow & Englund 1989: 28; Englund 1998: 328; Potts 1999: 75.

16. Englund (2004a: 118–119) also reported an area measure system attested on only one tablet from Susa (Scheil 1935 MDP 26 n° 5224). Several inner features of this document (notably the position of the numerical value signs and the final position of the non-numerical value sign) show that this is probably not a PE tablet but rather a numero-ideographic document.

17. Damerow & Englund 1989: 22 & 30.

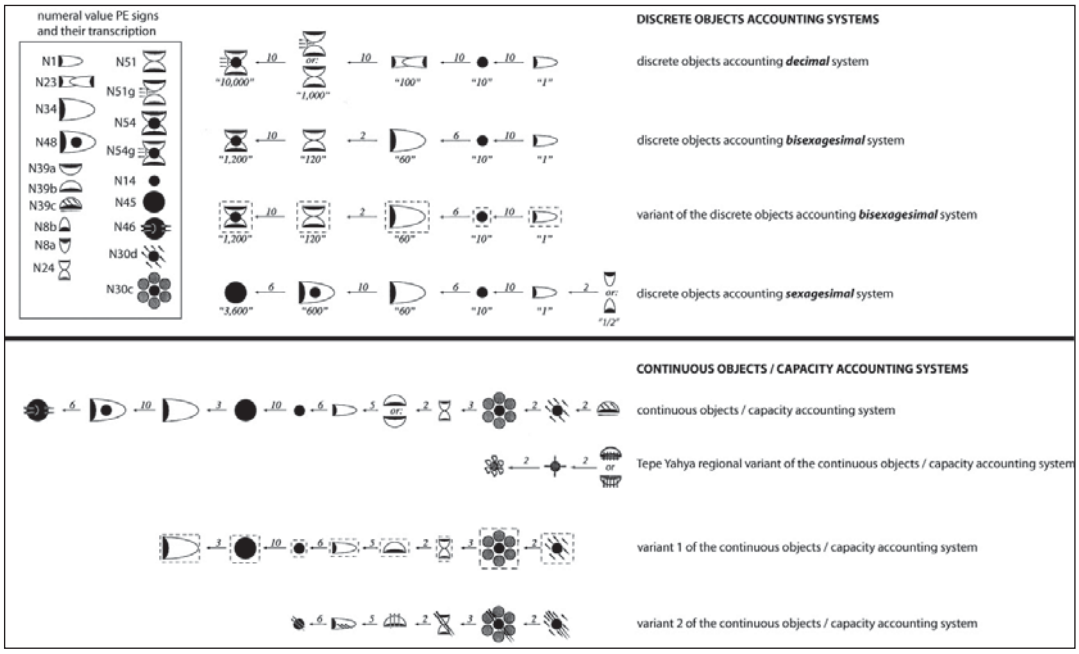


Fig. 10
PE numerical value signs and PE numerical value signs systems (numerical systems), (according to Damerow & Englund 1989: fig. 34; Englund 1996: fig. 14; 1998: fig. 4; 2004a: fig. 5.4; Dahl 2005b: 124; 2013: fig. 13.3). The numbers above the arrows are the factors indicating the number of signs necessary to reach the next sign while the numbers written under the signs used in the discrete objects accounting systems suggest their probable absolute value.

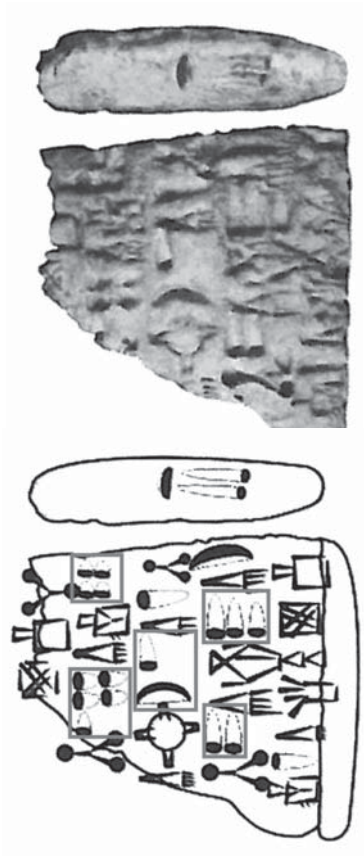
The sexagesimal system was used in the proto-cuneiform documents to account discrete objects (except the rations, accounted with the bisexagesimal system), such as animals, humans, dairy products, wooden or stone tools or standardized containers. But, as the decimal system was absent in the proto-cuneiform writing, this system used in the PE tablets probably restricted the semantic application field of the sexagesimal system as it is attested in the proto-cuneiform documents.

The decimal system, only present in the PE documents, was probably used to account discrete objects such as animals (notably the caprinae; see above, section 4.6.a) as well as low status humans, like M388 or M72 (see above, section 4.6.c). This specific semantic application field shows that these low status persons were accounted (and considered) as animals while the high status humans (such as M317) were perhaps accounted with the sexagesimal system.

The bisexagesimal system was used in the proto-cuneiform texts to account barley, fish or milk/cheese rations. A similar use in PE may be hypothesized. Specific categories of rations were probably accounted with the graphical variant of the bisexagesimal system.

Contrasting with these different discrete objects accounting systems, only one system was used to account continuous objects such as liquids or cereals (capacity system), to which should be added two graphical variants (while some signs were only used in Tepe Yahya). This system was used in a more developed way in the proto-cuneiform documents to account quantities of cereals (ŠE system). It was probably also the case in the PE writing where this system was usually used to account the sign M288 and its graphical variants (), indicating consequently the very probable logogrammatic value of this sign: cereals in general (and perhaps barley specifically). The association between this numerical system and this sign is so intricate that the scribes sometimes did not feel the need to write the sign M288, as though the capacity system implicated by itself that this sign was accounted. To explain the existence of two graphical variants for the capacity system, Englund (2004a: 117) proposed that they were perhaps used to account specific cereals. Finally, a tablet recently found in Tepe Sofalin (**Fig. 11**) probably displayed a regional

Fig. 11
Tepe Sofalin tablet (Hesari 2013: fig. 74); note the N1 signs written vertically.



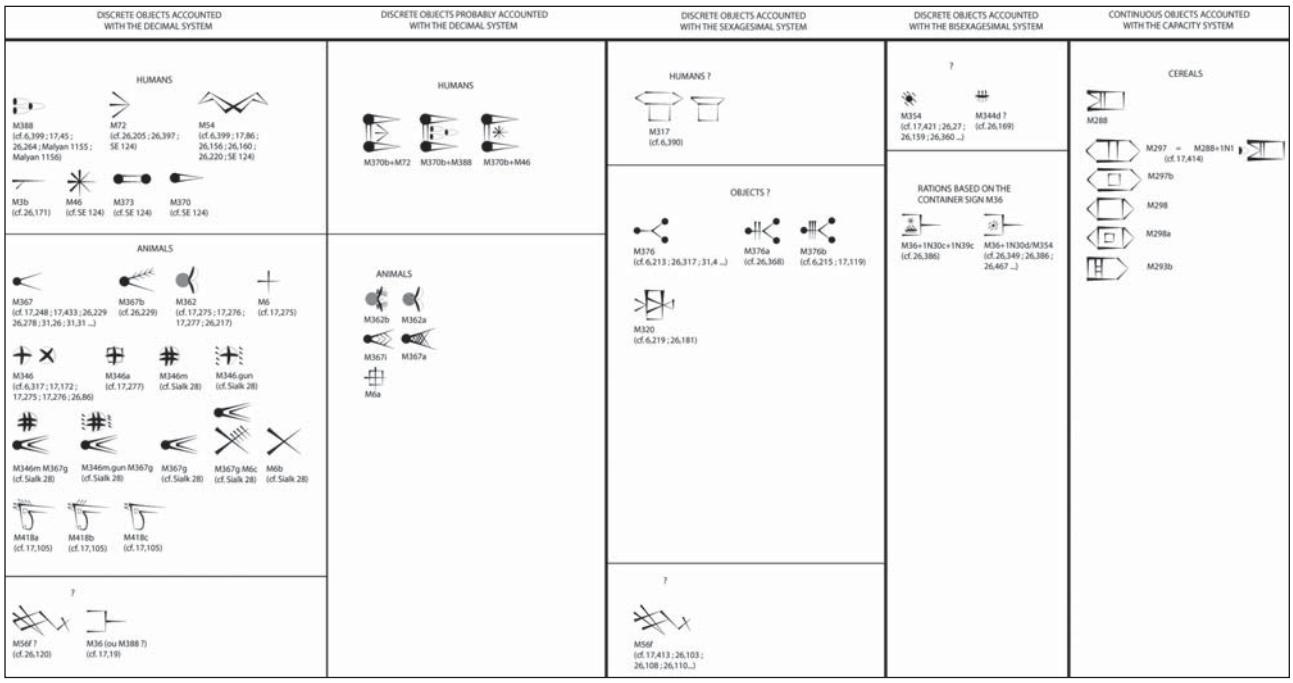


Fig. 12
Semantic application field of the PE numerical systems. Are only shown here the signs for which we know for sure what was the numerical system used to account them (the texts used to classify each sign are mentioned below them), with the exception of the signs in the column 'Discrete objects probably accounted with the decimal system'. Note that the sign M56f could be accounted with the sexagesimal and decimal systems, showing that this sign probably had different logogrammatic values.

variant of the capacity system (like in Tepe Yahya), with N1 signs inscribed vertically (while they are always written horizontally in other PE corpora).
The understanding of few PE signs through the comparison with proto-cuneiform signs (M388, M72, M6 and M346 for example; see above, section 4.5) and the knowledge of the semantic application field of the numerical systems in proto-cuneiform writing give us consequently a hint about the semantic application field of the numerical systems used in the PE tablets (see **Fig. 12**). In return, as we know vaguely the categories of objects accounted by each numerical system, this may help to guess the logogrammatic value of PE signs standing for objects according to the numerical system used to account them.

Reading direction and semantic structure[18]

From the comparison with proto-cuneiform signs (notably the numerical value signs), it has been proposed that the tablets were probably to be written and read vertically. Two rotation axes have been determined (Englund 1998; 2004a: 123), one horizontal to write on the reverse the total, one vertical to keep on adding entries on the reverse before turning the tablet 180° to record the total (see **Fig. 13**).

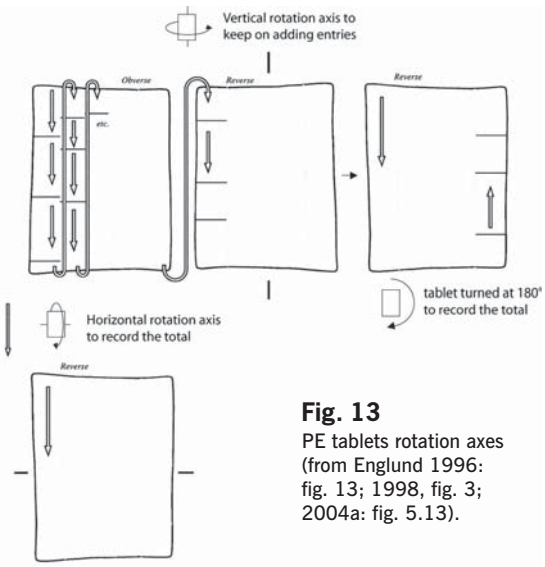


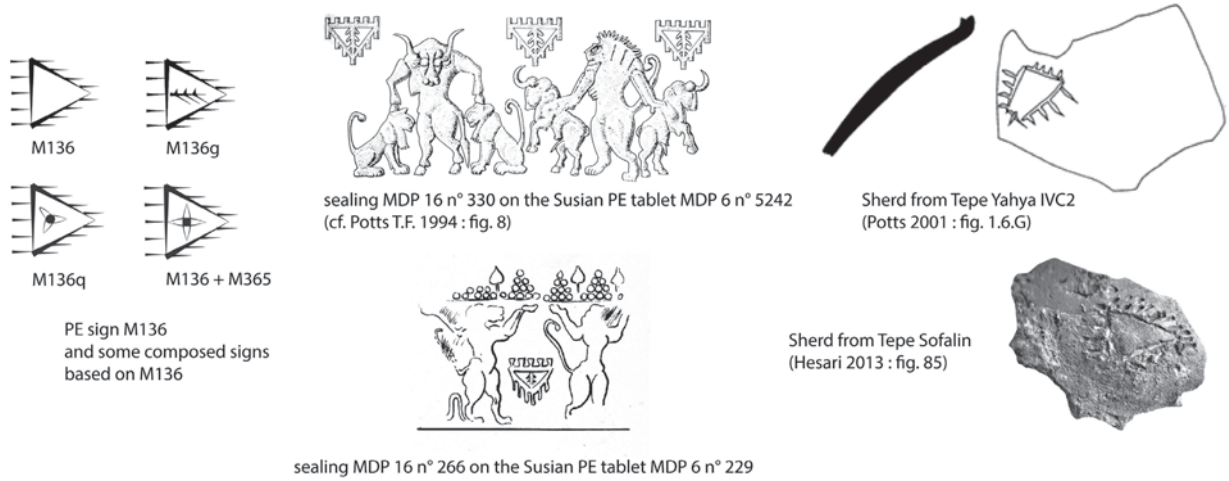
Fig. 13
PE tablets rotation axes (from Englund 1996: fig. 13; 1998, fig. 3; 2004a: fig. 5.13).

18. See Scheil 1923; Meriggi 1971; Damerow & Englund 1989: 13–17 & 38; Nissen et al. 1993: 75; Englund 1998; 2004a: 104–106 & 124.

Contrary to the spatial organisation within rectangular cases characterising the proto-cuneiform tablets, PE tablets display columns of signs written continuously without apparent break (except for the total). The semantic structure of the PE tablets is relatively well known. Most of them are structured in three parts: introduction/entries/total(s).

Some simple tablets may start without introduction. As it displayed no numerical information, the introduction is usually not really understood. It probably presents the topic and/or the persons/households/institutions implied in the tablet. Logogrammatic individual/household/institution value signs are usually written in the introductions, such as the 'hairy triangle' sign (M136; see **Fig. 14**). Frequently present in the introduction of the tablets of Susa, Tal-i Malyan and Tepe Yahya, this sign appears also in the Susa PE tablets sealings (in the so-called 'seal of the ruler of Susa', where the sign M136g is considered as 'the graphical representation of the ruler's standard with his mark drawn inside of it'[19]) as well as scratched on sherds from Tepe Yahya and Tepe Sofalin.

Fig. 14
The 'hairy triangle', as a PE sign (on the left), on cylinder sealings (in the middle) and as a sign scratched on ceramic sherds (on the right).



The main part of the tablets is made of several entries. Two types of entries may be distinguished: the simple ones and the complex ones. The simple accounting entry presents an object sign followed by a numerical notation accounting it: object/numerical notation. The complex accounting/attributing entry presents an accounted object to which is related/given/attributed another accounted object: first object/numerical notation (sometimes absent if the first object is only represented by one individual)/second object (sometimes not mentioned since implicitly known, in the case of cereals notably)/numerical notation. This is this kind of entry which is notably used in hypothetical wages tablets recording groups of workers and their (cereal?) salary/ration (see below, section 7). The different entries are written without any space or sign separating them and can be written on two columns or at the end of the obverse and the beginning of the reverse. This continuous stroke of signs in PE tablets imposed their users to read them in a strict chronological order, contrary to the more flexible structure of the proto-cuneiform boxes. In some cases (≈ 100 tablets), the last entry was followed by a postscript (1 to 6 non numerical value signs) with a still uncertain function (relation with the introduction?; anthroponomical sequence of the scribe?; Hawkins 2015: 9).

The total(s) of the numerical notation of all or some of the entries, when written, is always inscribed on the reverse of the tablet. It could be preceded

19. Dahl 2013: 249.

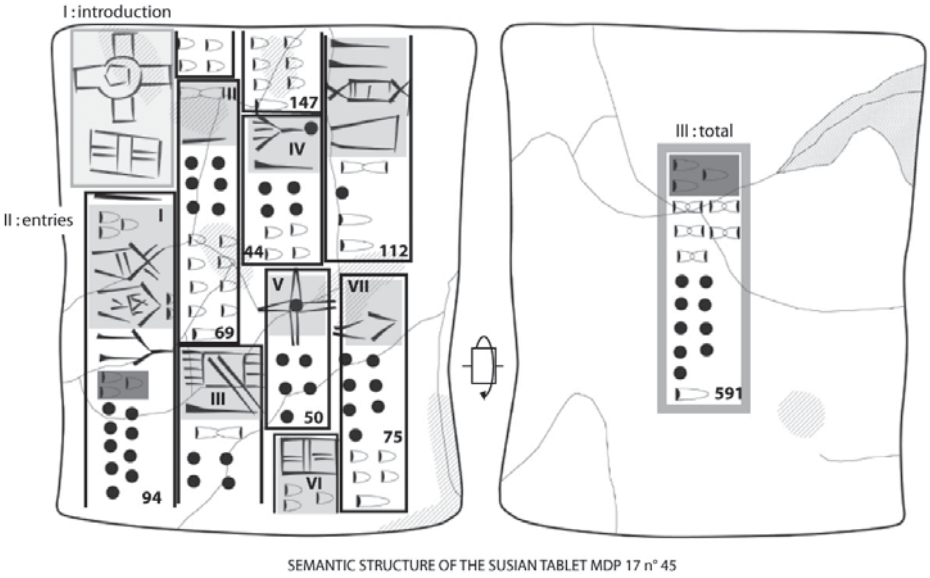


Fig. 15
Semantic structure of MDP 17 n° 45
I : Introduction (in light grey)
II : 7 complex entries composed of :
– a non(numerical notation (in grey) indicating probably the denomination of a team of male workers (sign M388) or its boss;
– a numerical decimal notation accounting quantities of M388 (the sign M388 was written only in the first entry of the tablet and it was probably considered as redundant to repeat it in each entry);
III: total, reminding the accounted object (M388; male low status worker) and its quantity (written with the decimal system)
After a poorly understood introduction, seven entries account respectively for 94, 69, 147, 44, 50, 112 and 75 male low status workers for a total of 591 individuals. As it can be seen with this example, the numerical information is well understood in the PE tablets, contrary to the non-numerical ones (in shades of grey in this tablet).

by non-numerical value signs reminding the implied persons/institutions and the accounted objects. In the cases where the various accounted objects belonged to the same semantic category (for example ewe, sheep, young ewe, lamb), the total of these objects could be placed under a sign used as a common denominator (*Ovis aries* in our example), indicating that these different objects belonged to a common semantic field (see for example MDP 17 n° 112, where M3b object sign is subsumed under M54 in the total; Hawkins 2015: 4).

Constant ratios[20]

Several PE tablets display constant ratios between two objects:
– between M388/M54 and M288 with the ratio of 1 N1 M388/M54 for 0,5 N1 M288 (see **Fig. 16**, above);
– between M56 and M288 with the ratio of 1 N1 M56 for 0,5 N1 M288 (see **Fig. 16**, below);
– and between M106a and M362 with the ratio of 1 N1 M362 for 0,03333… N1 M106a.
The constant ratio between M388/M54 (workers) and M288 (cereal), observed on 16 tablets from Susa[21], was considered as a standard salary/ration paid in cereals to low-status workers (Damerow and Englund 1989: 27 and 57) stating that 0,5 N1 of M288 is attributed to each worker (M388/M54). This hypothesis raises two questions: what is the exact volume/weight of cereals represented by 0,5 N1 of M288 and for how many working days was this salary attributed? In proto-cuneiform documents, 1 N1 of cereals represented the monthly (30 days) ration of an adult worker, perhaps 24/25 litres of grains. If this absolute value was the same in the PE tablets, as 0,5 N1 of cereals is attributed to each worker, it would show that the standard time unit in Susa, for the salary payment at least, was a bi-monthly one (15 days)[22].

20. Damerow & Englund 1989: 27, 34 & 56–58; Englund 2004a: 116–118; Dahl 2005b: 109–110. For a complete review of this topic, see Desset 2012: 42–46.
21. See notably the tablet MDP6 n° 4997, described in Nissen et al. 1993: 76–79; Desset 2012: 45–46.
22. About this last paragraph, see Damerow & Englund 1987: 153–154; 1989: 26–27 & 57–58, footnotes 158 & 159; Englund 1988: 149, 159–160 & 162–163; 2001: 8; 2004a: 117–118.

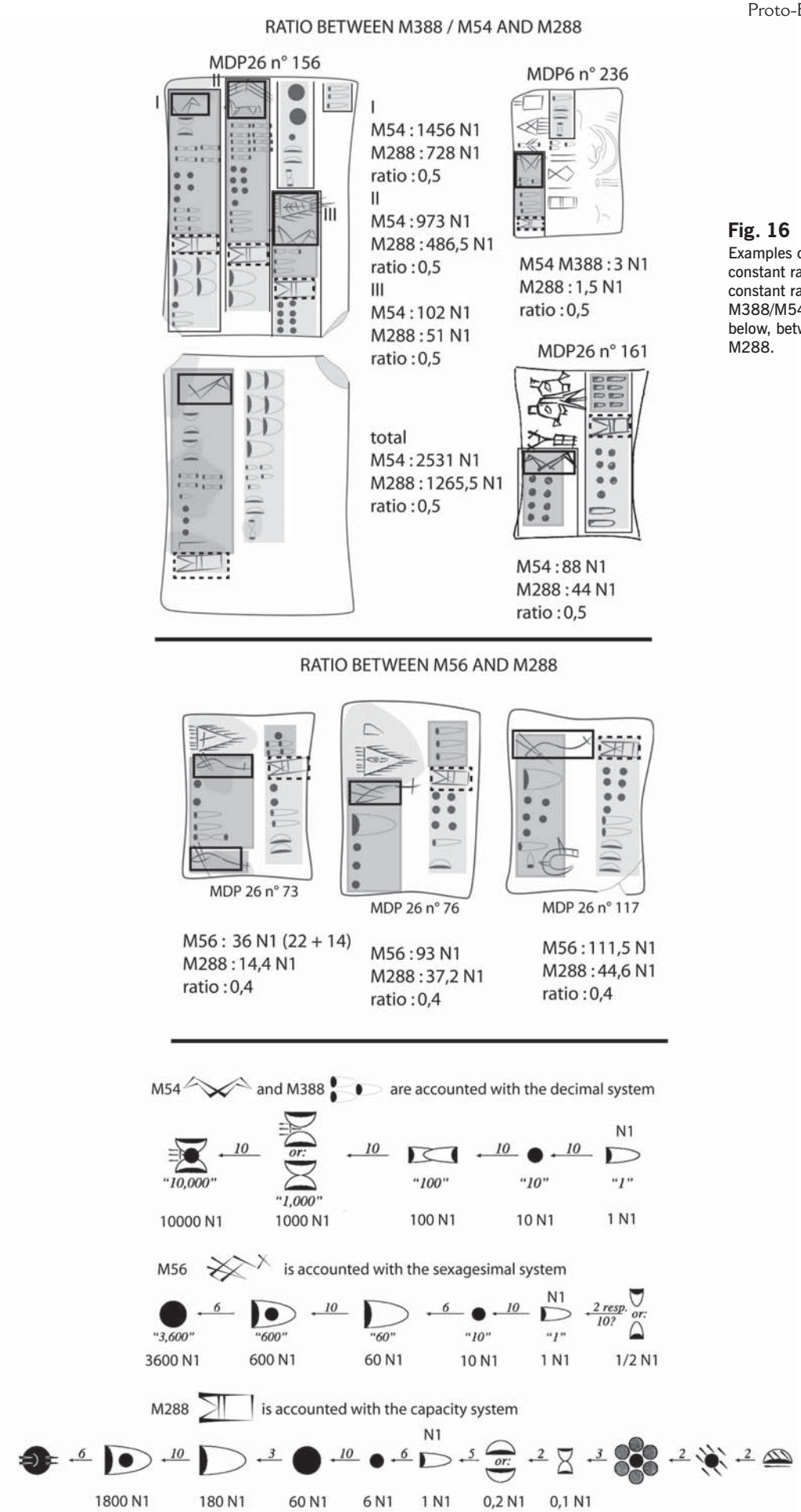


Fig. 16
Examples of texts with constant ratios. Above, constant ratios between M388/M54 and M288, below, between M56 and M288.

The constant ratio observed in several texts of Susa between M56 (the plough sign) and M288 (cereal) has been interpreted as a standard sowing rate relating a surface area (written with the sign M56) to a specific cereals quantity to be used to sow it (Damerow & Englund 1989: 57–58, note 159). It could also express the expected rate of return in cereals of a specific area (for which period?). If this hypothesis is correct, the exact surface of 1 N1 M56 and the exact quantity of 0,4 N1 M288 still remain to be determined.
Finally, Dahl (2005b: 110 and 114) could observe a third specific ratio in several tablets of Susa, between M362 (perhaps the nanny goat sign; see above, section 4.6.a) and M106a, a sign perhaps used to refer to a specific dairy product. This ratio would indicate either an expected rate of production for the goats (for which period?) or an expected rental payment from the shepherd to the owner of the animals (for which period?) or an expected salary payment from the owner to the shepherd (for which period?).
As time notation seemed to be absent in all the PE texts, contrary to the proto-cuneiform tablets (U_4 system), the PE scribes probably did not feel the need to record this information because it was considered as obvious and implicit (perhaps a monthly account period was marked with N34 on the edges of some PE tablets).

Anthroponomical sequences

Some long sequences of non-numerical value signs appear in the PE tablets, reaching sometimes 10 to 12 signs (see MDP 6 n° 314, MDP 17 n° 18, MDP 17 n° 414 or MDP 26S n° 4758 for example). They have long been interpreted (see for example Scheil 1923 : 3-4 and 8) as anthroponyms written with specific phonetic value signs (syllabograms)[23]. If some anthroponyms were phonetically recorded in PE tablets, it would give us then access to the most ancient linguistic data in the world, some 5000 years ago! In this regard, PE tablets probably recorded more phonetic/linguistic information than contemporary proto-cuneiform documents where long non-numerical value signs sequences were comparatively less frequent (Englund 2004a: 127).
The language usually hypothesised for the anthroponyms that may be recorded in the PE tablets is an early form of the Elamite / Hatamtite language[24] as known in the second half of the 2nd millennium BC. This hypothesis is however far from proven and, considering the surprising huge extension of the PE writing in the late 4th millennium BC (1256 km between Susa and Shahr-i Sokhta, 1038 km between Tepe Ozbaki and Tepe Yahya, as the crow flies), it seems very reasonable to consider that the anthroponyms recorded in Susa, Tepe Yahya or Tepe Ozbaki were related to different languages, such as Elamite/Hatamtite, but also Sumerian, Akkadian, Hurrian or any other still unknown language. In a previously published study (Desset 2012: 46–62), were gathered from the ≈ 1700 PE tablets currently known, some 515 complete anthroponomical sequences. As an example, the tablet MDP 6 n° 5002 (see **Fig. 17**)

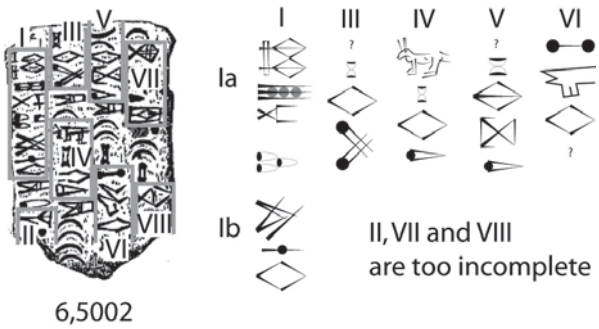


Fig. 17
MDP 6 n° 5002 tablet and its anthroponomical sequences.

23. 'The need for adequate representation of proper names finally led to the development of phonetization' (Gelb 1963: 66).

24. Scheil 1923: III; Ghirshman 1938/1939, vol. 1: 86; Meriggi 1971; Stolper 1984: 9; Stève 1991: 3; Amiet 1986: 117; 1992: 80–81, Potts 1994: 74; Quenet 2008: 106.

displayed 8 sequences, among which only the 1st, 3rd, 4th, 5th and 6th could be used. Among them, only the 1st and the 4th were complete while the 1st sequence was probably a composite anthroponym, X M388 (slave, dependent, descendant?) of Y. If the 1st sequence is understood as two different anthroponyms, then out of the 515 complete anthroponomical sequences recorded among the PE tablets (obviously the shortest sequences are the most well preserved…), 250 (48,5 %) were made of 3 signs, 118 (22,9 %) of 4 signs, 83 (16,1 %) of 2 signs, 38 (7,3 %) of 5 signs, 15 (2,9 %) of 6 signs, 8 (1,5 %) of 7 signs and 3 (0,5 %) of 8 signs. These numbers and percentages are of course to be considered as a general indicator only: half of the anthroponyms were made of 3 signs while the 3, 2 or 4 signs anthroponomical sequences represented more than 90 % of the corpus. It is there interesting to note that the anthroponyms recorded on the tablets of Tepe Yahya (on the tablets 11 and 13) were predominantly made of 2 signs (17 sequences out of 23 recorded). This discrepancy with the Susian norm is perhaps due to linguistic differences or different scribal practices.
These sequences were written with approximately 200 different signs (see **Fig. 18**) among which M4, M9, M66, M96, M218 and M371 must be noticed for their high frequency.

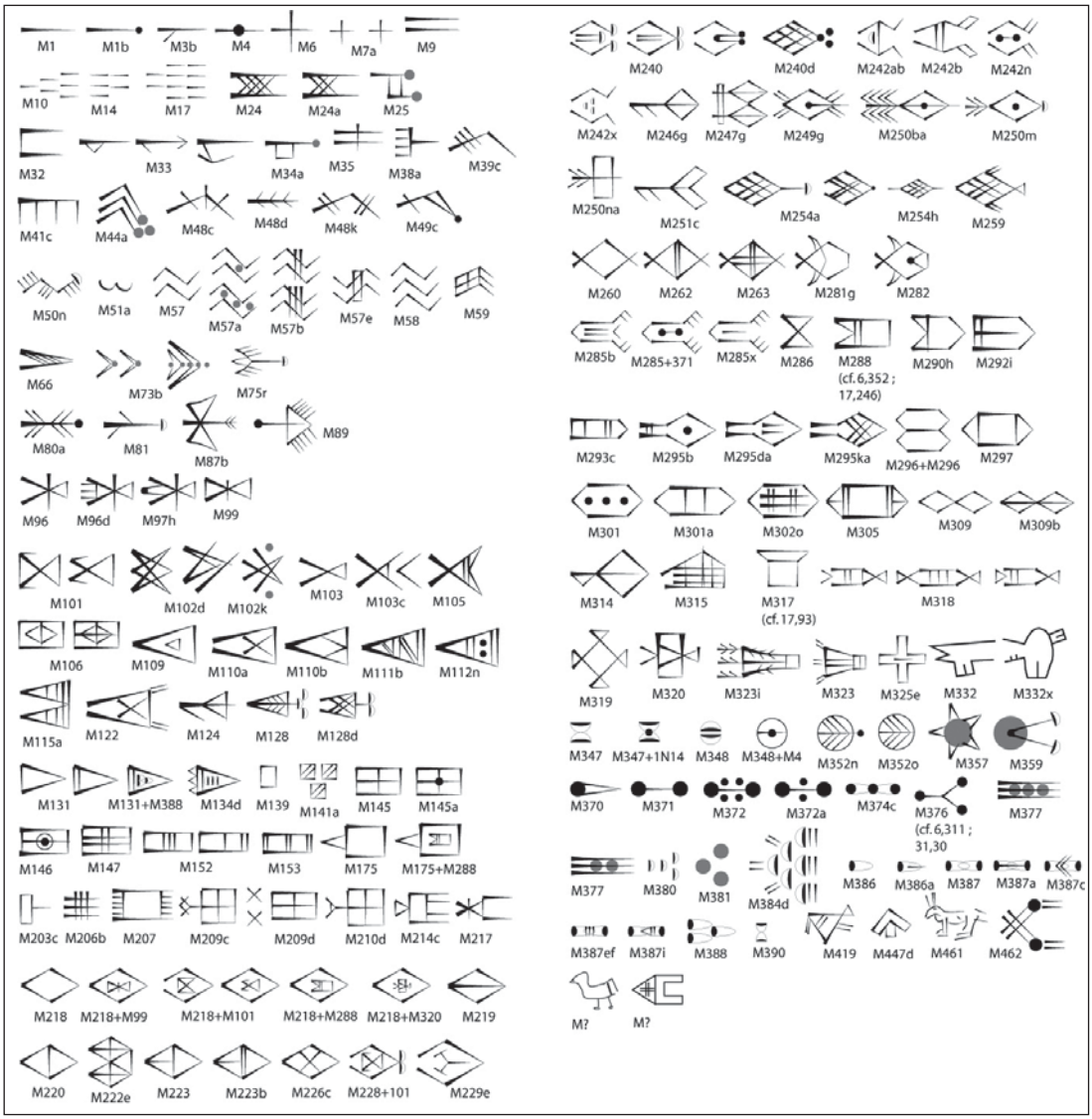
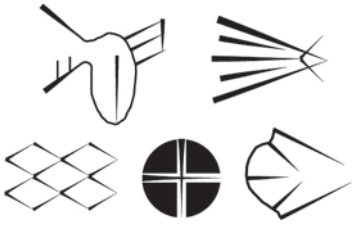


Fig. 18
List of the main signs used in the PE anthroponomical sequences.

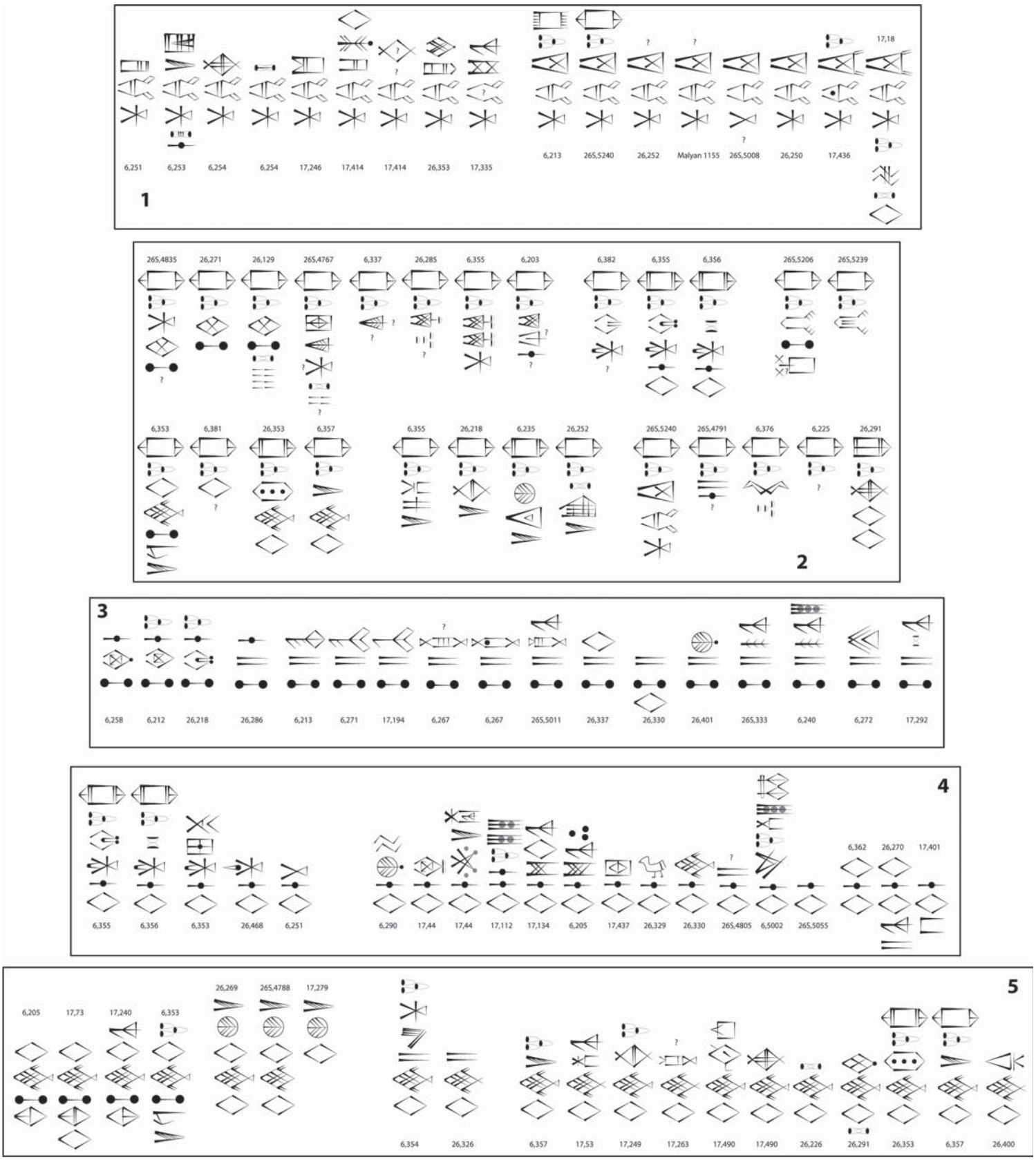
This relatively high number of signs used in the anthroponomical sequences probably shows that among them, besides phonetic value signs, logogrammatic value were also used since a pure syllabary usually works with only 50 to 100 signs. Consequently, the PE anthroponyms were probably written with a mixt system using both logogrammatic and syllabic value signs (logograms and syllabograms)[25]. Some logogrammatic value signs might even have been used in a phonetic way (rebus principle), like probably the sign M288, usually standing for the accounted cereal object but surprisingly used also in some anthroponomical sequences (see **Fig. 19**, box 1, sequence in the tablet MDP 17 n° 246 for example).
Among the points worth being considered after gathering these PE anthroponomical sequences[26], it should be mentioned that one of the sequences found in Tal-i Malyan tablets (in tablet 1155) is similar to sequences regularly found in Susa (see fig Fig 19, box 1). It would seem that at least one person in Tal-i Malyan had a name which was then common in Susa, betraying perhaps a linguistic community between these two sites.
Standing in contrast with this Susa/Tal-i Malyan community, the sequences found in the tablets of Tepe Yahya (tablets 11 & 13), usually composed of two signs only, displayed furthermore 5 specific signs which only appeared here (see **Fig. 20**). It seems consequently that from the point of view of the anthroponomical sequences (and maybe linguistics), there was a boundary between Susa/Tal-i Malyan and Tepe Yahya.
Finally, among the Susian anthroponomical sequences, some of them (see **Fig. 21**) were characterized by doubled signs (M4, M23b, M33, M49c-e, M58, M66, M99, M101, M128db, M218, M218+M101c, M219, M223b, M250ba, M254h, M262, M318a, M318i, M320n, M377, M377e M386a, M387, M387c and M387i) whose phonetic value is highly probable in such a context.
The repeated syllable anthroponyms of the persons living in Susa around 3100 BC may be compared to some of the anthroponyms of the inhabitants of Susa during the Old Akkadian period (≈ 2250 BC). In this last period, thanks to 91 published cuneiform Akkadian tablets, some 320 different anthroponyms are known (Legrain 1913: 127–130). It is relevant here to observe that 154 anthroponyms (48,1 %) were then written with 3 cuneiform signs, 81 (25,3 %) with two signs, 66 (20,6 %) with 4 signs, 17 (5,3 %) with 5 signs and 2 (0,6 %) with 6 signs. The numbers pattern of cuneiforms signs used to record the anthroponyms of the inhabitants of Susa around 2250 BC is rather similar to the numbers pattern of PE signs used to record their names around 3100 BC (see above).
If the ethno-linguistic situation attested in Susa around 2250 BC (Akkadian majority and Elamite/Hatamtite minority[27]) was already the same some 800 years before, at the time when the PE tablets were used, the anthroponyms used around 2250 BC could have then been used around 3100 BC (maybe in an 'archaic' form). Among the anthroponyms attested around 2250 BC, several[28] were characterized by a repeated syllable (*ba*, *bi*, *bu*, *da*, *du*, *ga*, *gu*, *hu*,

Fig. 20
PE signs only used in Tepe Yahya anthroponomical sequences.



25. Dahl (2005b: 95; 2009: 24; 2013: 250) states however that the number of signs used to record the anthroponyms in the PE tablets does not exceed 100 signs 'and does therefore conform to what is commonly believed to be the prerequisite for a true syllabary'.
26. See Englund 2004a: 129–139, Dahl 2009: 25, fig. 1; 2013: fig. 13.4; Desset 2012: 53–56.
27. Vallat 1980: 3; 1985: 49; Stolper 1984: 14; Stève et al. 2002: col. 427.
28. A-ba-ba, A-bu-bu, Ag-ga-ga, A-hu-hu, A-li-li, Ba-ba, Ba-zu-zu, Bi-bi, Da-da, Ga-ga, Gu-gu, Ir-ra-ra, Ku-ku, La-la, Ma-ma, Ma-ma um-mi, Ma-ma-tum, Me-me, Muk-du-du, Mu-mu, Na-na, Ni-na-na, Ri-ib bi-bi, Sa-sa-ag, Si-da-da, Su-nu-nu, Šeš-šeš, Ši-ši-ši, Tu(?)-li-li, U-da-da, Zal-la-la, Zal-lu-lu, Zu-zu and Zu-zu-ki.

Fig. 19 • Selection of PE anthroponomical sequences (from Desset 2012: 57–61). For each sequence, its provenience tablet is mentioned.



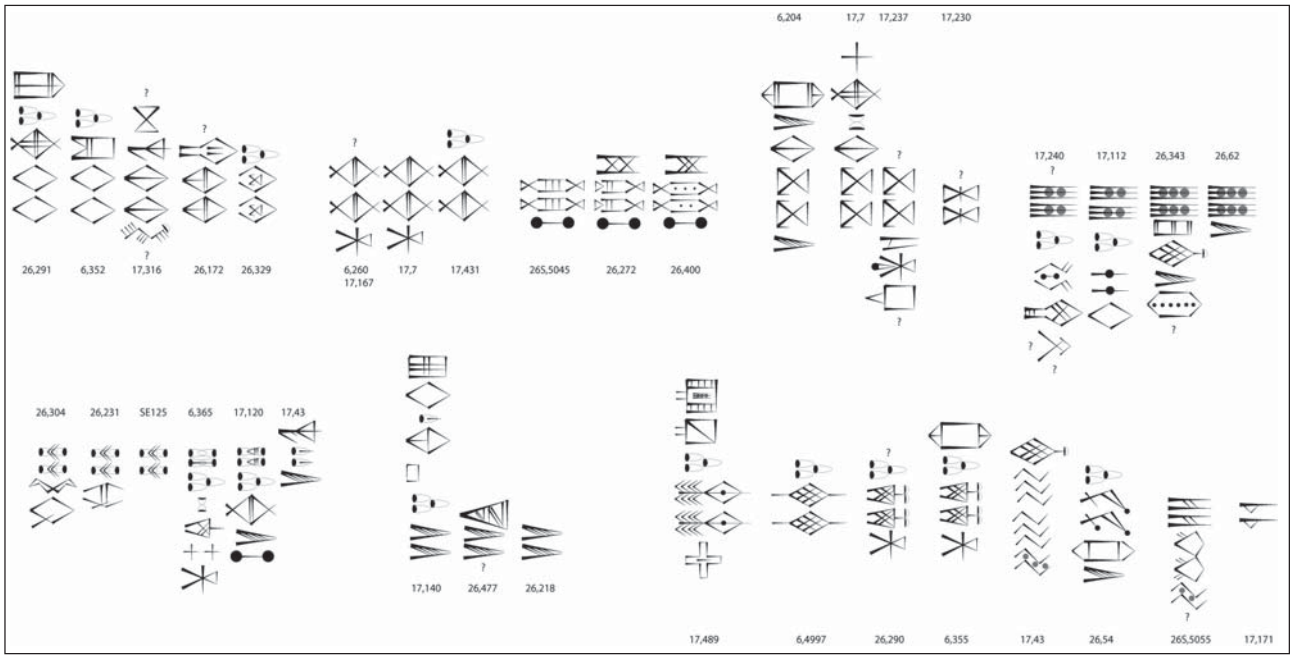


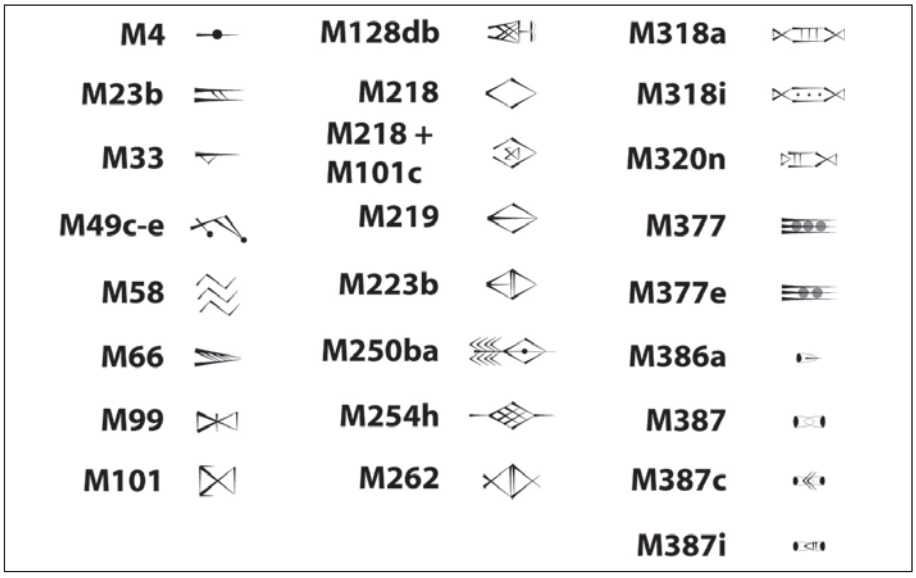
Fig. 21
Susian PE anthroponomical sequences with doubled signs.

ku, *la*, *li*, *lu*, *ma*, *me*, *mu*, *na*, *nu*, *ra*, *sa*, *šeš*, *ši* and *zu*) and could then be related to the PE doubled signs anthroponomical sequences which probably corresponded to anthroponyms with a repeated syllable.

The phonetic value of the 25 repeated signs in PE anthroponyms (M4, M23b, M33, M49c-e, M58, M66, M99, M101, M128db, M218, M218+M101c, M219, M223b, M250ba, M254h, M262, M318a, M318i, M320n, M377, M377e M386a, M387, M387c and M387i; see **Fig. 22**) probably matched, more or less, the 22 repeated syllables in Old Akkadian anthroponyms (*ba*, *bi*, *bu*, *da*, *du*, *ga*, *gu*, *hu*, *ku*, *la*, *li*, *lu*, *ma*, *me*, *mu*, *na*, *nu*, *ra*, *sa*, *šeš*, *ši* and *zu*). It is unfortunately currently impossible to push forward the identification but here remains probably the best track leading to the decipherment of the PE anthroponyms.

From a linguistic point of view, names based on different languages were probably used in the PE writing sphere, as it is probably proven by the differences

Fig. 22
List of the PE signs doubled in the Susian anthroponomical sequences.



between Susa/Tal-i Malyan and Tepe Yahya names (unfortunately, anthroponomical sequences have not been found yet for the inhabitants of Shahr-i Sokhta or Tepe Ozbaki). And if the linguistic division Akkadian majority/'Elamite' minority already existed in Susa around 3000 BC, then it means that most of the names written in the Susian PE tablets are likely Akkadian based and might then be related to the very probable Akkadian (and Sumerian) based names recorded at the same time in Mesopotamian proto-cuneiform texts.
To sum up, the same writing (PE writing) was probably recording various languages (Akkadian, 'Elamite' and other unknown languages) while the same language (Akkadian) was probably recorded by different writing systems (the PE and proto-cuneiform writing systems ; the proto-cuneiform tablets recorded also probably some Sumerian elements). The linguistic boundaries did not correspond to the writing ones.

Sealings and scribal marks

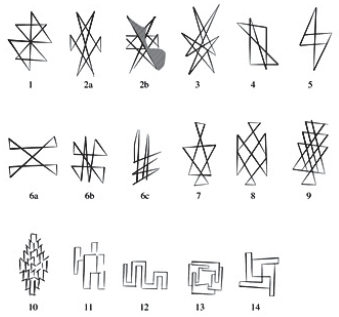
PE tablets were sometimes sealed (**Fig. 23**). Out of 1551 examined tablets, 245 (15,7%) were sealed (see notably Pittman 1997). Among the 5 different glyptic styles used at that time to seal various supports such as tablets, bullae, door sealings and jar sealings and determined by Pittman (1997: 139–140; 'classic', glazed steatite, wheelcut and incised cylinder seals and stamp seals), it appears that 'classic' style cylinder seals were very predominantly used to seal tablets (236 cases out of 245: 96%; Pittman 1997: 148; 2006: 29 & 33). 'Classic' cylinder seals were figurative seals showing in a naturalistic style predominantly animals, sometimes acting as humans (Pittman 1997: 139; Roach 2008: 352–364; see also **Fig. 14**).
These tablets sealings raise several question concerning their function:
– were the tablets sealed before their redaction or after?
– if the tablets were sealed after their redaction, then the sealings probably worked as a signature, validating the written content.
– if the tablets were sealed before their redaction, then the sealings could be considered as a kind of letterhead designating an authority (Pittman 1997: 137

Fig. 23
Sealed tablets in each site and types of seals used (notably from the data gathered by Pittman 1997).

			Cylinder seal			Stamp seal
			Figurative	Geometric		
	Tablets	Sealed tablets and percentage	Classic seal	Glazed steatite seal	Wheelcut seal	
Susa	1468 (examined by Pittman 1997)	231 (15,7%)	225 (97,4%)	3 (1,3%)	3 (1,3%)	0
Tal-i Malyan	32	9 (28%)	6 (66,6%)	1 (11,1%)	0	2 (22,2%)
Tepe Yahya	27	2 (7,5%)	2 (100%)	0	0	0
Shahr-i Sokhta	1	1 (100%)	1 (100%)	0	0	0
Tepe Ozbaki	1	0 (0%)	0	0	0	0
Tepe Sialk	5	0 (0%)	0	0	0	0
Tal-i Ghazir	1	0 (0%)	0	0	0	0
Tepe Sofalin	16 tablets published (137?)	2 (12,5%)	2 (100%)	0	0	0
TOTAL	1551	245 (15,7%)	236 (96,3%)	4 (1,6%)	3 (1,2%)	2 (0,8%)

and Matthews 2013: 344). Against this second hypothesis, Hawkins (2015: 4) noticed that the specific logogrammatic individual/household/institution value sign M327 + M342 was written in the introduction of 35 PE tablets. 4 of these tablets were sealed, each time with a different seal. So, from this example, it seems there was no specific relation between the individual/household/institution sign implied in the tablet and the sealing.
– if we consider the hypothesis of the sealing as a signature, what is the relation between the sealer and the scribe? Are they the same person? Or was it the seal of another person charged to check and validate the text written by the scribe?

Fig. 24
linear marks used in the PE tablets (Dahl 2012: fig. 2).



Furthermore, because most of the tablets come from imprecise stratigraphic contexts, contradictory views have been expressed concerning the evolution of the PE tablets sealings:
– Matthews (2013: 349) argued that there was a diminution in the use of the sealings, because writing got able to express what the seals expressed (thanks to the growing phonetization and the anthroponomical sequences);
– according to Dahl (2012: 5; 2013: 246), the growing complexity of the PE tablets (i.e. the development of the anthroponomical sequences) did not seem to exclude progressively the sealings on PE tablets.
On some (recent?) tablets, in the place of the sealing was drawn a specific linear design (Dahl 2012: 5–7; 2013: 246; see **Fig. 24**). According to Dahl, this design played the same role as the sealing and acted as a scribe signature ('scribal design'). It is interesting here to relate these linear designs to the linear pattern decorating the only stamp used to seal PE tablets found up to now, on the two most recent tablets from Tal-i Malyan TUV (phase IIB; tablets 1155 and 1156; see **Fig. 25** for the stamp seal and **Fig. 29** for the tablets). This stamp seal was probably used to imitate a handmade linear design, showing an interesting evolution, from the sealings (1) through the linear handmade signature replacing them (2) to the sealings showing a linear handmade signature in the Tal-i Malyan TUV IIB case (3).

Fig. 25
Stamp seal used on the Tal-i Malyan TUV IIB PE tablets 1155 and 1156 (Stolper 1985: fig. 3).

Dating of the PE writing and genetic relation with the proto-cuneiform writing

10.1. The genetic relation between PE and proto-cuneiform writings

As PE and proto-cuneiform writings display important similarities (1: most of the numerical systems; 2: the numerical value signs; 3: few logogrammatic object value signs such as KUR/M388 or SAL/M72; see above) which cannot be due to pure coincidence, a genetic relation is usually supposed between these two systems. As the PE writing is usually dated between 3100/3050 and 2800 BC, during the Uruk III/Jemdet Nasr/ED I Mesopotamian periods, the proto-cuneiform system is supposed to be more ancient (Uruk IV proto-cuneiform texts dated around 3300 BC) than the PE tablets[29] and consequently the

29. Dittmann 1986: 347; Amiet 1986: 62–63 ('*Uruk accuse une avance sensible dans le domaine de l'écriture*'); Potts 1994: 74–75; Potts 1999: 60–61 & 74–75. See notably Damerow & Englund 1989: 1 & 15; Nissen et al. 1993: 75; Englund 1996: 160; 1998: 657; 2004a: 124; 2004b: 28; 2006: 2; Dahl 2013: 233. Englund, after the paper published by Lawler (2001: 2419) seemed to make the PE writing older, dating it between 3300/3200 and 3000/2800 BC (Englund 2004a: 104 & 143, footnote 5; 2006: 2; Dahl 2009: 24), but it still remained more recent than the proto-cuneiform writing since PE tablets can only be related to Uruk III proto-cuneiform texts (Englund 2004a: 124).

PE writing is always considered as the daughter of the proto-cuneiform writing (notion of *secondary script origin*)[30].
The situation between PE and proto-cuneiform writings is however paradoxical. Aside the numerical systems, the numerical value signs and few logogrammatic value signs, these writing systems are completely different. The huge majority of the non-numerical value signs are different, their structure is different (linear reading in PE tablets/boxes reading in proto-cuneiform tablets), there are numerical systems only used in PE (the decimal system) and some only used in proto-cuneiform texts (system GAN_2/surface area measurement, system U_4/time measurement, system EN and system DUG) and the PE scribes did not write any lexical list. PE and proto-cuneiform writings display simultaneously both important similarities and dissimilarities and the only hypothesis which might explain logically this situation would be to consider these writings as sisters, with common features inherited from a common ancestor from which they would have been developed independently (as Scheil 1905: 61 proposed it).

10.2. Dating of the proto-cuneiform tablets

Concretely speaking, there is also currently no proof of the anteriority of the proto-cuneiform writing (Uruk IV type tablets) over the PE writing. Up to now, the only proto-cuneiform Uruk IV type tablets discovered in regular contexts were excavated in the 1930s in Uruk[31], consequently before the development of the ^{14}C dating method by W. Libby in the late 1940s.
In Uruk, the only proto-cuneiform texts which might be attributed to the architectural layer Eanna IV come from the filling of the temple C and of the red temple, preparing the architectural layer Eanna III[32]. Seven proto-cuneiform tablets were notably found on the floor of the central room of the temple C, under the collapse layer of the cedar beams roof, which has been dated by three ^{14}C dates showing that the trees used had been cut between 3500 and 3370 BC[33] (as the cedar is a rot-resistant tree which can live several hundreds of years, the 'old-wood' effect should be also taken into consideration). The temple C was built after the cut of the trees used for the roof and the seven tablets found on its floor were probably written just before the final collapse and abandonment of this building (cut of the trees < building of temple C < writing of the tablets < collapse of temple C).
Based on this lack of evidence, the most ancient proto-cuneiform tablets (Uruk IV type) are usually dated *instinctively* between 3350/3200 and 3100 BC (Late Uruk phase)[34].

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30. See for example Englund (2004a: 122–127 & 139): 'Clearly, proto-Elamite must be reckoned among those cases of *secondary script origin* known from many non-literate regions in contact with literate cultures'; Dahl (2009: 24): the PE scribes 'had inherited certain bookkeeping techniques, in particular the content-specific numerical systems, from their western neighbours in Mesopotamia'; (Dahl et al. 2013: 366): 'most of the numerical systems used and almost all of the numerical signs were borrowed from the slightly older proto-cuneiform writing system' or (Dahl 2013: 246) M72/SAL and M388/KUR were 'part of the package of early signs borrowed from Mesopotamia'.

31. Some proto-cuneiform Uruk IV type documents come also from illegal excavations in Umma and Adab (Englund 2004a: 100; 2004b: 28).

32. Nissen 1986b: 319; Glassner 2000: 56; Butterlin 2003: 48.

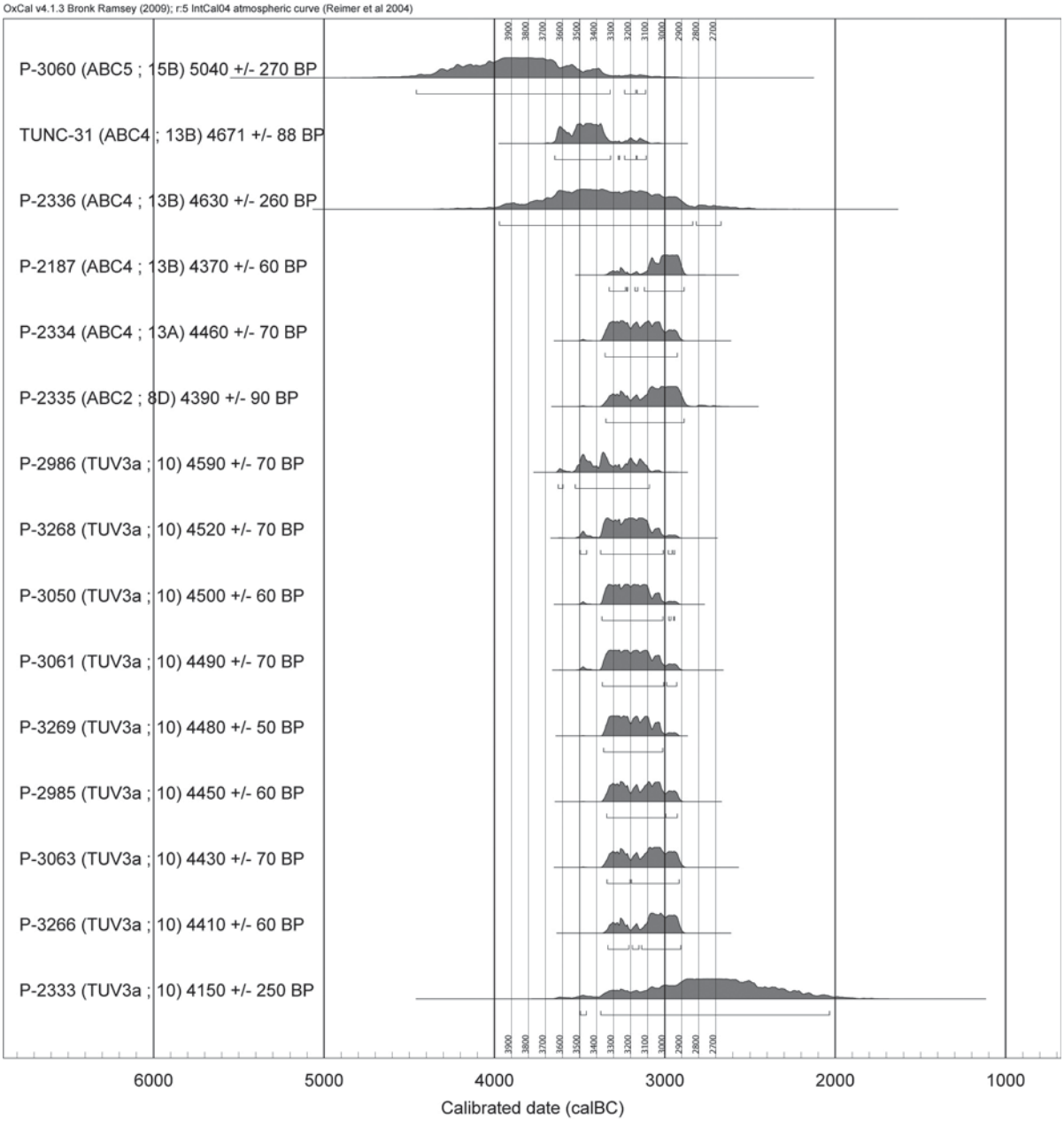
33. Nissen 1986a: 319–320; 1986b: 317; Glassner 2000: 58; Wright & Rupley 2001: 91–92; Butterlin 2003: 294.

34. Englund dated in 2001 (Englund 2001: 1) the Uruk IV tablets (Eanna IVa level) around 3200/3100 BC, in 2006 (Englund 2006: 2 & 15) around 3350/3200 BC. See also Algaze 2005b: 22.

10.3. Dating of the PE tablets

Standing in sharp contrast, the 32 PE tablets discovered in the 1970s in Tal-i Malyan gives important data about the dating of the PE writing. They were all found in regular excavations, in clear stratigraphic contexts belonging to the Middle Banesh phase which has been dated by 15 coherent ^{14}C dates between 3300 and 3050 BC (three radio-carbon dated samples, P2335, P2333 and P3061, even come from the same contexts as 12 PE tablets; see **Fig. 26**)[35]. From these data, this conclusion cannot be avoided: PE and proto-cuneiform writings appeared contemporaneously around 3300-3100 BC[36]. In Susa, according

Fig. 26
^{14}C dates of the Middle Banesh phase in Tal-i Malyan (from the data of Nicholas 1990: table 1; Sumner 2003: 55–56, table 13; Voigt & Dyson 1992: vol. 2, 131 & 138; Wright & Rupley 2001: 97).



35. C. Petrie pointed out the presence of a plateau in the radiocarbon calibration curve for the late 4th/early 3rd millennium BC, preventing any precision in the dating of samples belonging to that period (Dahl et al. 2013: 363–364).

36. See Pittman 2013: 322 for a similar conclusion.

to Amiet (1972: 171), the PE tablets bore no sealing whose style can be posterior to the Early Dynastic I period, suggesting that this writing was used until 2900/2750 BC.
Concerning the exact place of invention for PE writing, Susa[37] or Tal-i Malyan[38] are usually proposed. But, considering the still lacunar and probably non representative state of our knowledge, this point still cannot be currently determined and awaits further research.

10.4. A common heritage and a common ancestor

The numerical and numero-ideographic tablets (tablets with only numerical information and sometimes one or two logogrammatic object value signs) may be considered as a common ancestor for PE and proto-cuneiform writings. These tablets were found from Syria to Iran (see **Fig. 1**)[39] and are documented by several ^{14}C dates (notably in Godin Tepe, Habuba Kabira, Jebel Aruda, Tell Brak and Tepe Hissar[40]) between ca. 3500 and 3000 BC.
The numerical and numero-ideographic tablets are slightly earlier than the proto-cuneiform and PE texts and disappeared completely few centuries after the apparition of these two writing systems. There is consequently a short overlap period, between approximately 3300 and 3000 BC, when numerical/numero-ideographic tablets were used simultaneously with the proto-cuneiform and PE writings. Tepe Sialk is probably the only site currently known where this overlapping phenomenon may be clearly observed[41]. 17 numerical, numero-ideographic and PE tablets (from inventory number S-1617 to S-1632) were indeed found all together in the rooms 1, 2, 3 and 5 of the phase IV.1 building (south mound, trench III)[42].
The PE writing used three numerical systems to account discrete objects, the decimal one, the bisexagesimal one (+ 1 variant) and the sexagesimal one, as well as the capacity system (+ 2 variants) to account continuous objects. So, in total, 4 systems (see **Fig. 27**).
The proto-cuneiform writing used two numerical systems to account discrete objects, the bisexagesimal one (+ 1 variant) and the sexagesimal one (+ 1 variant), as well as the capacity system (+ 3 variants) to account continuous objects. It also used three specific systems (systems GAN_2, EN and U_4) to measure time and area notably[43]. So, in total, 6 systems (see **Fig. 27**).
Three systems are common both in PE and proto-cuneiform tablets: the bisexagesimal system, the sexagesimal system and the capacity system. These three systems are also the only one attested in numerical and numero-ideographic documents (although distinguishing the bisexagesimal system from the sexa-

37. Alden 1982: 622; Stève 1992: 3; Potts 1994: 74; Potts 1999: 83; Pittman 2013: 332–334.
38. Stolper 1984: 9; Tallon 1987: 51; Abdi 2003: 150; Vallat 2003b: 90; Helwing 2004: 47; 2005a: 177; Quenet 2008: 113.
39. In Habuba Kabira, Jebel Aruda, Tell Brak, Niniveh, Mari, Khafajeh, Jemdet Nasr, Nippur, Uruk, Umma (?), Susa, Chogha Mish, Tepe Sharafabad (?), Godin Tepe, Tepe Sialk, Tepe Sofalin, Qoli Darvish and Tepe Hissar (?).
40. See Desset 2012: 70–71 for all the references.
41. It seems that both numerical documents and proto-cuneiform tablets (type Uruk IV) were also found in the same architectural layer (Eanna IV) in Uruk (Nissen 1986b: 325–326; Potts 1999: 61).
42. Ghirshman 1934; 1938/1939: vol. 1, 65–68, pl. XXXI, XCII & XCIII. See also Amiet 1985: 296 & 304–306; 1986: 66–69 & 110–111 on the discovery contexts of the tablets. See Glassner 1998; Desset 2012: 16–17 on the PE tablets found in the phase IV.1 at Tepe Sialk.
43. On proto-cuneiform numerical systems, see Englund 2001: fig.1; 2004b: fig. 4a & 4b.

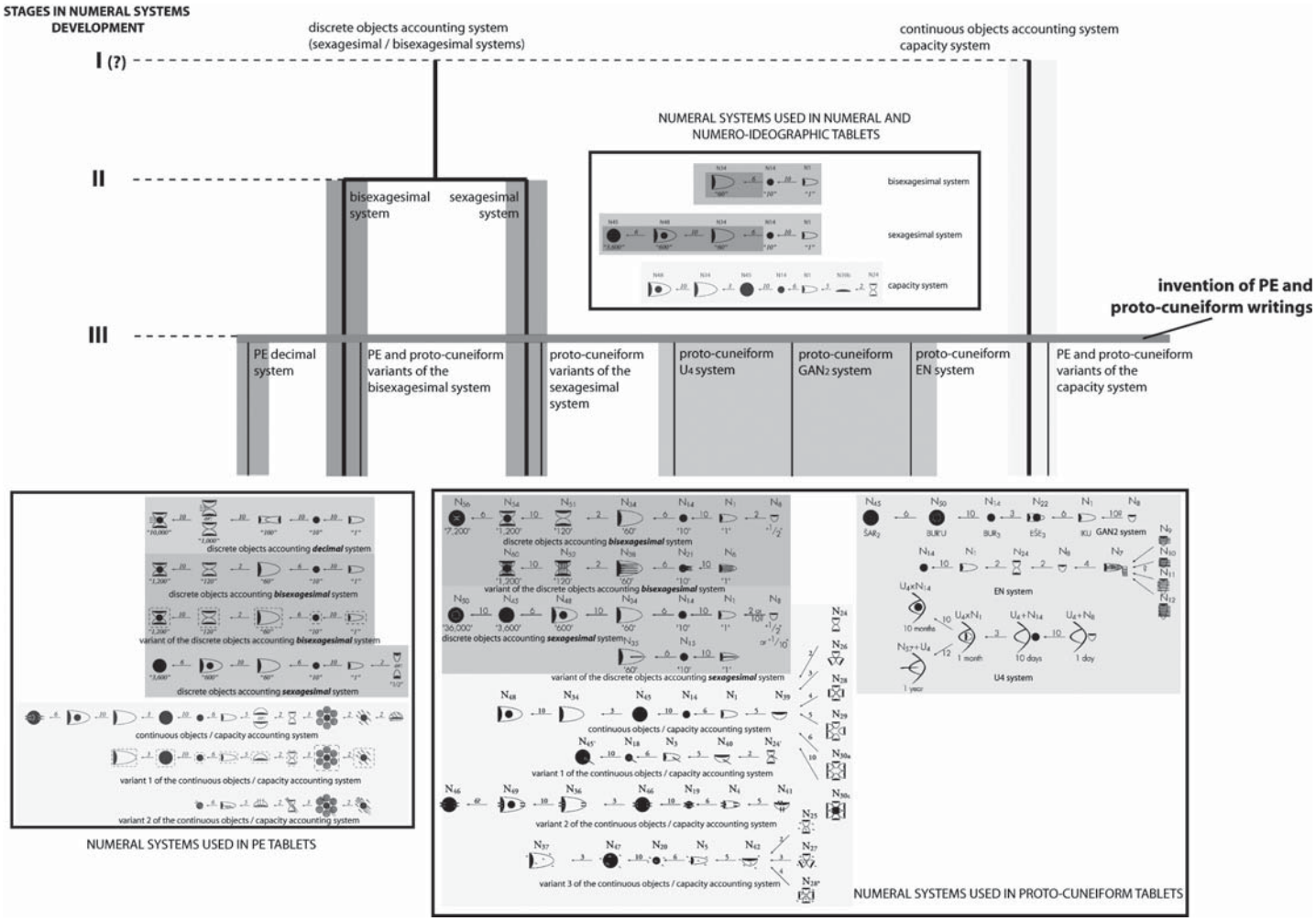
gesimal one is not really easy because of the small quantities usually recorded; see **Fig. 27**)[44].

Considering Fig. 27, this is how the genealogy of the Near Eastern numerical systems could be understood. In a hypothetical first stage, only two numerical systems might have existed, the continuous objects accounting (capacity) system and a discrete objects accounting one. In a second stage, attested in numerical and numero-ideographic tablets, the discrete objects accounting system would have been split into two systems: the bisexagesimal and sexagesimal ones. In the final third stage, the PE and proto-cuneiform writings both inherited the three numerical systems attested in the second stage, to which they added variants while were apparently created specific new systems: the PE decimal system (probably stemming from the bisexagesimal system) and the proto-cuneiform GAN_2, EN and U_4 systems[45].

In conclusion, considering:

– that PE and proto-cuneiform writings appeared contemporaneously around 3300-3100 BC (see above, sections 10.2 and 10.3),

Fig. 27
Numerical/numero-ideographic (above), PE (below, on the left) and proto-cuneiform (below, on the right) numerical systems and numerical systems family tree (in the center).



44. See Potts 1999: 60; Englund 2006: 29; Desset 2012: 75–79.

45. Considering 'weird' numerical notations attested in some numerical/numero-ideographic tablets, it is not impossible that more than three numerical systems existed during the second development stage (notably a system working with many N14 signs; see Glassner 2000: 62–63, Englund 2006: 25; Desset 2012: 78–79), but it seems they were dropped very soon and got no offspring.

– that from a logical point of view, the only hypothesis which might explain both the strong similarities and huge difference between them would be to consider these writing systems as sisters, with common features inherited from a common ancestor from which they would have been developed independently (see above, section 10.1)
– and that common numerical systems (bisexagesimal, sexagesimal and capacity systems) and numerical value signs, as well as few logogrammatic value signs (see Englund 2004a: table 5.19), were inherited from the numero/numero-ideographic tablets (section 10.4).
It can be concluded *that PE and proto-cuneiform writings are* ***sisters****. They appeared contemporaneously on the Iranian Plateau and in southern Mesopotamia around 3300-3100 BC and inherited their common features from the more ancient numero/numero-ideographic tablets from which they both evolved independently.*

10.5. Evolution of the PE writing

As said above, the PE writing was used for several centuries, between 3300/3100 and 2900/2750 BC. It is then rather likely that this writing evolved between its beginning and its end. Unfortunately, due to the lack of precise stratigraphic information (which are the only acceptable data in that matter) for the ≈ 1500 PE tablets found in the old excavations of Susa (≈ 85 % of the corpus), to cope with the evolution of the PE writing seems a rather hazardous topic.
Currently, the only stratigraphic contexts which could document the evolution of the PE writing are the Acropole I trench in Susa (**Fig. 28**) and the ABC and TUV trenches in Tal-i Malyan (**Fig. 29**; most of the tablets found by Ghirshman in the trenches 1 an 3 of Tepe Sialk south mound are fragmentary and are of no help here; the Tepe Yahya tablets were

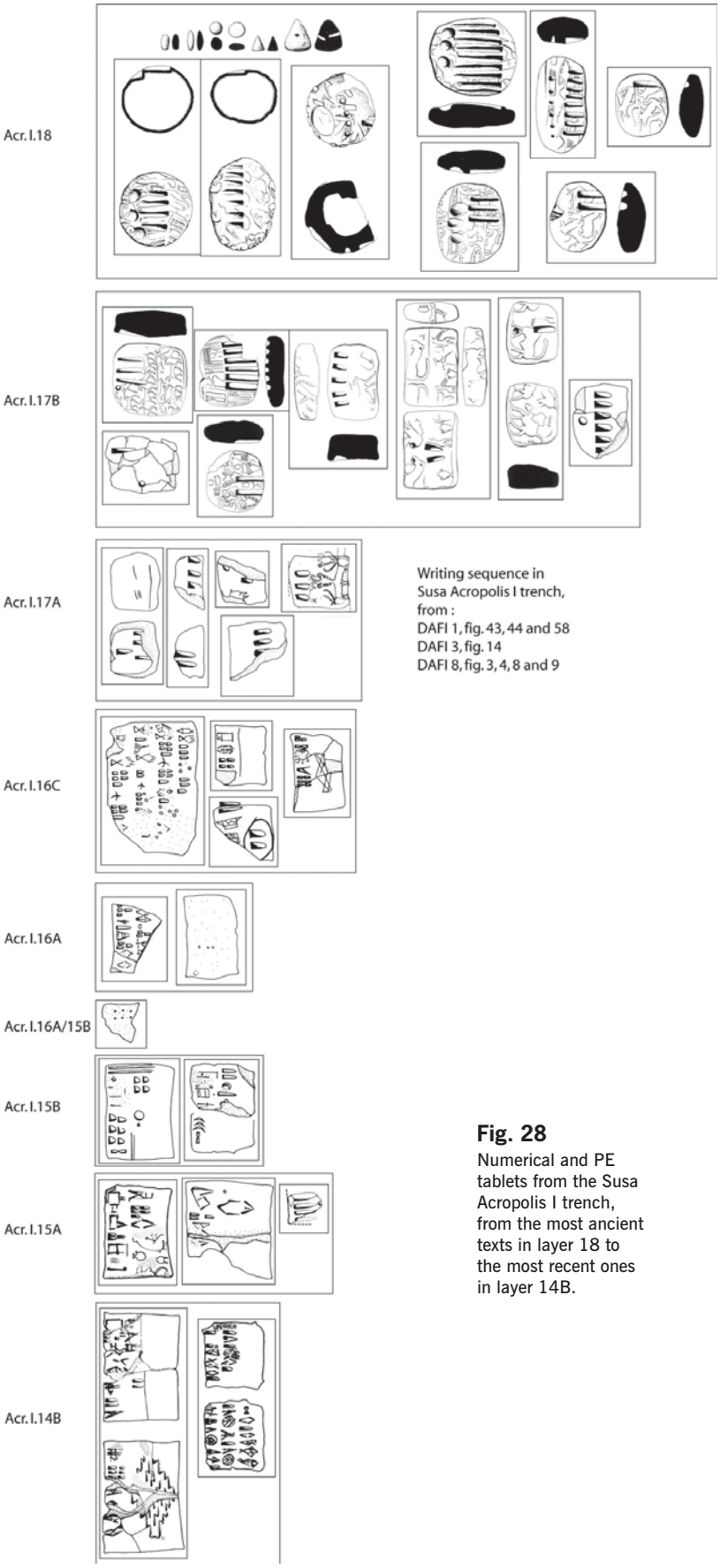


Fig. 28
Numerical and PE tablets from the Susa Acropolis I trench, from the most ancient texts in layer 18 to the most recent ones in layer 14B.

Fig. 29
PE tablets from Tal-i Malyan ABC and TUV trenches, from the most ancient texts above to the most recent ones below (from Stolper 1976: pictures 1 & 2; 1985: figs. 2, 3 & 4 and the CDLI internet site).

all found in the same building and are consequently contemporaneous; the excavation data of the PE tablets from Tepe Sofalin are still unpublished).
With these precise stratigraphic contexts, it may be pointed out that:
– one of the two tablets found in Susa Acr. I.14B is characterized by non-numerical value signs sequences (anthroponomical notations) longer than in the more ancient texts (see also Dahl 2012: 4);
– the two tablets of the phase TUV IIB (texts 1155 and 1156), probably written by the same scribe, display non-numerical value signs sequences (anthroponomical notations) longer than in the other tablets found in Tal-i Malyan.
On this stratigraphic base, the lengthening of the anthroponomical sequences seems to be a valid criterion and reflects perhaps a growing phonetization phenomenon in the PE writing[46].
Several authors tried also to create a kind of typo-chronology for the PE texts, considering notably the most regular and complex tablets as the most recent ones. Although this evolutionist approach seems reliable, it must be reminded that only stratigraphic evidences can be accepted as certain proofs in that matter.
Some typological criteria were proposed to build a relative chronology for the PE tablets:
– the tablets shape (oblong/rectangular);

46. Scheil (1923: II) was already observing that each numerical notation was separated from the next one 'par un ou deux signes dans les exemplaires plus archaïques, par un plus grand nombre dans les pièces postérieures'.

– the tablets width (thick/slim; pillow-shaped/flat);
– the writing skill (clumsy signs/well drawn and regular ones);
– the text structure (only one entry on each side/several entries on each side);
– the semantic structure of the entries (simple/complex; the apparition of long non-numerical signs-strings perhaps reflected a growing phonetization to express exactly anthroponyms and prevent confusion);
– the signs used (vast/restricted and standardized);
– the use of the sealing (frequent/rare);
– and the shape of the signs.

From these criteria, Amiet (1986: 93–97) distinguished two main phases in the PE tablets (ancient/recent) while Dahl (Dahl et al. 2013: 365–375; see also Dahl 2005b: 84, 86 & 116–117; 2009: 24), based on well-considered arguments, carefully identified four different phases (see Dahl et al. 2013: fig. 18.17):
– an early phase (Susa Acr. I.17AX; the PE tablets of Tepe Sialk IV.1; the Tal-i Ghazir tablet; some documents from Tepe Sofalin)
– a middle phase (Susa Acr. I.16C/16B/16A; the Tepe Sialk IV.2 tablet, S.28; the Tepe Ozbaki tablet; some tablets from Tepe Sofalin)
– a late phase (Susa Acr. I.15B/15A; Tal-i Malyan ABC IV/III and TUV IIIB/IIIA; the tablet of Shahr-i Sokhta; the tablets of Tepe Yahya; some documents from Tepe Sofalin)
– a terminal phase (Susa Acr. I.14B; Tal-i Malyan ABC II and TUV IIB).

Concerning the criterion of the signs shape (Dahl 2005b: 116–117), three Susian tablets (MDP 17 n° 85, 97 and 151) were perhaps illustrating an interesting phenomenon. These three tablets displayed lists of seven objects (dairy products?; see Dahl 2013: fig. 13.6) always written in the same order. But the shape of the signs in MDP 17 n° 151 was slightly different from the signs in MDP 17 n° 85 and 97 (see **Fig. 30**), which could show an evolution of the signs between MDP 17 n° 85 and 97 and MDP 17 n° 151.

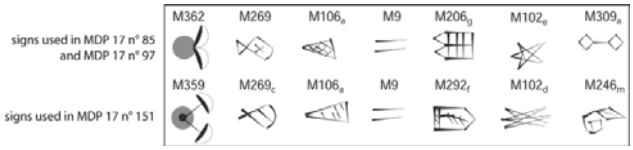


Fig. 30
Shape differences in the seven objects signs attested in MDP 17 n° 85 and 97 (above) and MDP 17 n° 151 (below).

As MDP 17 n° 85 and 97 generally used only one sign (included in the sign M362; see above, section 4.4 about the composite signs) to record the owners while the two owners of the tablet MDP 17 n° 151 were recorded with 2 and 3 signs respectively, this last tablet, because of its longer non-numerical signs sequences, may be considered as more recent than MDP 17 n° 85 and 97. The differences in the shape of the signs between MDP 17 n° 85 and 97 and MDP 17 n° 151 could then be considered as an evolution of these signs. The chronological hypothesis is however not the only explanation possible to give account of the differences in shape signs between MDP 17 n° 85 and 97 and MDP 17 n° 151: these differences could also be explained as reflecting just two different ducti/hand writing styles.

10.6. The end of PE writing

For some unknown reasons, the PE tablets apparently disappeared at the beginning of the 3rd millennium BC and the hypothesis of a continuity of this

writing system on wood, leather or any other perishable supports is far from proven. This period corresponded to a restricted urban collapse in some areas of the Iranian plateau, such as the Ram Hormuz plain (Tal-i Ghazir) and the Kur River basin (Tal-i Malyan) where settlements only reappeared at the end of the 3rd/beginning of the 2nd millennium BC (Kaftari period; the exact situation at Tal-i Malyan during the 3rd millennium is still uncertain) as well as the Central North plateau where sites such as Tepe Sialk, Tepe Sofalin and Tepe Ozbaki were all abandoned at the beginning of the 3rd millennium BC.
However, Susiana (Susa), Kerman (although there is a gap of several centuries between the phases IVC2 and IVB6 in Tepe Yahya, the area was not abandoned since the Jiroft valley was for example inhabited during the first half of the 3rd millennium BC) and Sistan (Shahr-i Sokhta) were still occupied in the first half of the 3rd millennium BC and consequently the partial de-urbanization attested on some parts of the Iranian plateau cannot be held responsible for the PE tablets disappearance.
According to the current data, the Iranian Plateau was consequently illiterate from 2800 BC until the apparition of the Linear Elamite and Geometric writing systems in the 2nd half of the 3rd millennium BC[47]. This break in the scribal tradition, different from the Mesopotamian trajectory characterized by the continuous use of the proto-cuneiform/cuneiform writing system from 3300 BC to 75 AD, is the main reason of our current inability to decipher the PE writing. The Mesopotamian cuneiform would ultimately prevail in the south-western part of the Iranian Plateau with the Akkadian annexation of Susa around 2250 BC, opening the series of the western-derived writing systems used in the Iranian territory since then: cuneiform, Greek alphabet, Aramaic derived alphabets (Parthian, Pehlevi, Avestan), Arabic derived alphabet and Latin alphabet (Fingilish current phenomenon).

Writing and State

11.1. The late fourth millennium BC in Middle Asia

The evolution of the material culture in late fourth millennium BC Middle Asia is considered in terms of a process of discontinuous *interregional standardisation* that affected in different phases and to different scales ceramics, glyptic, architecture and writing. This material standardisation has been notably understood up to now through Algaze's Uruk expansion concept (Algaze 2005a; 2005b), according to which Southern Mesopotamia would have influenced among others the Iranian Plateau, giving birth there to the Proto-Elamite *horizon* (Abdi 2003: 150), *veneer* (Petrie 2013: 401) or phenomenon. This Proto-Elamite phenomenon would have corresponded to the emergence of a political centre in Fars (or in Susiana), surrounded by a series of peripheral outposts (like Tepe Sialk or Tepe Yahya) distinguished in terms of culture and language from the hosting communities, and devoted to intercepting and controlling the flows of strategic base materials[48]. It is also commonly accepted that the material expression of this phenomenon included a specialized writ-

47. About these 'Iranian' writing systems, see Desset 2012: 93–127, 2014a; forthcoming.

48. Potts 1977: 29–30; Alden 1982: 621–624 ('Proto-Elamite polity'); Amiet 1986: 117–119 & 210–211; Lamberg-Karlovsky 1989: XI-XII; Potts 1994: 64–86; Helwing 2004: 45–48; 2005b: 50; Quenet 2008: 113.

ing system (the PE writing), a distinctive glyptic style with animals acting or performing like humans and a peculiar ceramic style[49].
This position may however be challenged[50]. While it cannot be contested than urban growth and social complexity developed first in Mesopotamia in the 4th millennium BC (Algaze 2005b), the supposed chronological anteriority of the proto-cuneiform writing to PE is far from proven (see above, section 10) and nothing shows unambiguously any Mesopotamian influence on the Iranian Plateau. To consider the late 4th millennium BC through two similar phenomena (Uruk expansion followed by the Proto-Elamite phenomenon), distinct because of their writing systems, seems then to be a deadlock. These writing systems were contemporary, excluding each other, and the Uruk expansion and Proto-Elamite phenomenon actually belonged to the same historical period characterized by this still unexplained material (ceramics) standardization, the common use in Mesopotamia and Iran of the numerical/numero-logographic tablets giving birth in these two areas at the same time to two writings sisters (the Proto-cuneiform and PE systems) and the use of a specific architectural pattern in western Iran (in Susa, Godin Tepe, Tal-i Malyan and Qoli Darvish at least; see Desset 2014b) clearly distinct from the Mesopotamian ones.
Furthermore, the material aspects of a society's daily life (such as ceramic production, glyptic, architecture or writing) were not necessarily intertwined in a monolithic structure. Many, or perhaps even most, may have evolved independently with different speeds. The invention of the proto-cuneiform and PE writings is then an autonomous phenomenon, more related to an evolution among granaries/warehouses/flocks managers and scribes than among (itinerant?) potters[51]. The proto-cuneiform and PE tablets have thus, for example, no specific relation with the bevelled rim bowls other than having been produced roughly at the same time.

11.2. Writing and State: is there any specific relation?

If the invention of writing can be precisely dated, around 3300-3100 BC, it is not the case of the emergence of the State. First of all, the State notion is very vague and hundreds of definitions have been proposed for it, among which the classical proposition formulated by M. Weber (in *Politics as a vocation/Politik als Beruf* in 1919), considering the State as an organized group of persons ruling a territory and its population through its authority and the monopoly of legitimate use of constraint/physical violence, associating the functions of police and justice for the inner social order to the military role of the army to defend the territory against external aggressions, and supported and financed by a population through taxes, tributes or *corvées*.
The emergence of the State, the development of the authority and legitimacy of a group of persons in relation with the submission of the rest of the society, was not a necessary or automatic development as societies without State or against the State/concentration of any authority may remind us[52]. This process was not characterized by any specific stage or precise beginning since, in nature and

49. See for example Carter 1984: 115; 1998; Amiet 1992: 81; Sumner 2003: 1; Helwing 2004: 46 & 53; 2013: 97; Quenet 2008: 106.
50. Desset et al. 2013: 46–51; Desset 2014b: 13–16.
51. See Alden & Minc, forthcoming.
52. About the notion of society against the State, see Clastres 1974: 161–162.

quality, there is no difference between the authority of a small tribe leader, of a 3rd/2nd millennium BC Near Eastern king or of the president of one of our current State apparatuses. The only difference between these situations is just in the scale/quantity of the authority and submission; consequently, to assert that a human group is politically hierarchized means nothing if the scale of this hierarchisation is not specified.

Furthermore, the immaterial human relations of authority and submission are difficultly documented only by archaeology, without any written records, but they do not depend specifically on writing to exist. Indeed, numerous States without writing occurred and would have remained unknown in the prehistoric night (notion of 'invisible State') if they had not been documented by literate neighbouring societies. Belonging to these States without writing are for example:

– several African cases in the first half of the 2nd millennium AD, such as the Wagadou kingdom/Ghana empire, the Mali empire or the kingdom of Zimbabwe, documented by Arabic and European travellers,

– the Inca Empire (the quipu system cannot be considered as a written system) documented by Spanish writers,

– the Gallic policies/tribes perceived in the 2nd and 1st centuries BC only through the texts written by classical authors such as Poseidonios or Caesar (*Commentarii de bello Gallico*)

– or some 3rd millennium BC Iranian policies such as Marhashi, which did not leave any deciphered texts and was first mentioned in Mesopotamian documents at the time of Sargon of Akkad (around 2300 BC), while it probably existed (as an invisible State) well before the extension of the Mesopotamian awareness sphere in the Old-Akkadian period.

Although writing is sometimes considered as associated to the emergence of the State since it is supposed to make possible the centralization of vital information, this assertion does not seem to be proven through the example of these States without writing. If the main role of the writing is more in the perception of the State than in its emergence, maybe it had some influence on the growing authority/submission process, notably in a better management of goods enabling to improve the support and maintenance of the State and its staff.

11.3. What does writing really imply?

The PE writing reflects the social and legal inequalities in late 4th millennium BC Iran more precisely than any other material remains. It proves the existence of slavery (or at least low-class workers) and of the categorisation of the inhabitants of Susa according to 7 honorary/social/legal classes (see above, section 4.6.c) while some signs, such as the hairy triangle, probably referred to some paramount institutions/households/individuals. This social and legal organisation was not specifically related to the PE writing and probably preexisted the invention of this system besides, which only influenced the small society of the granaries/warehouses/flocks managers, turning them into a specialized socio-professional group able to handle signs on clay. Here lies the birth of the scribes.

People in general and granaries/warehouses/flocks managers in particular probably did not wait for the PE writing invention to have a firm control on the goods they were responsible for. While numerical and numero-ideographic tablets were recording numerical information and sometimes the accounted

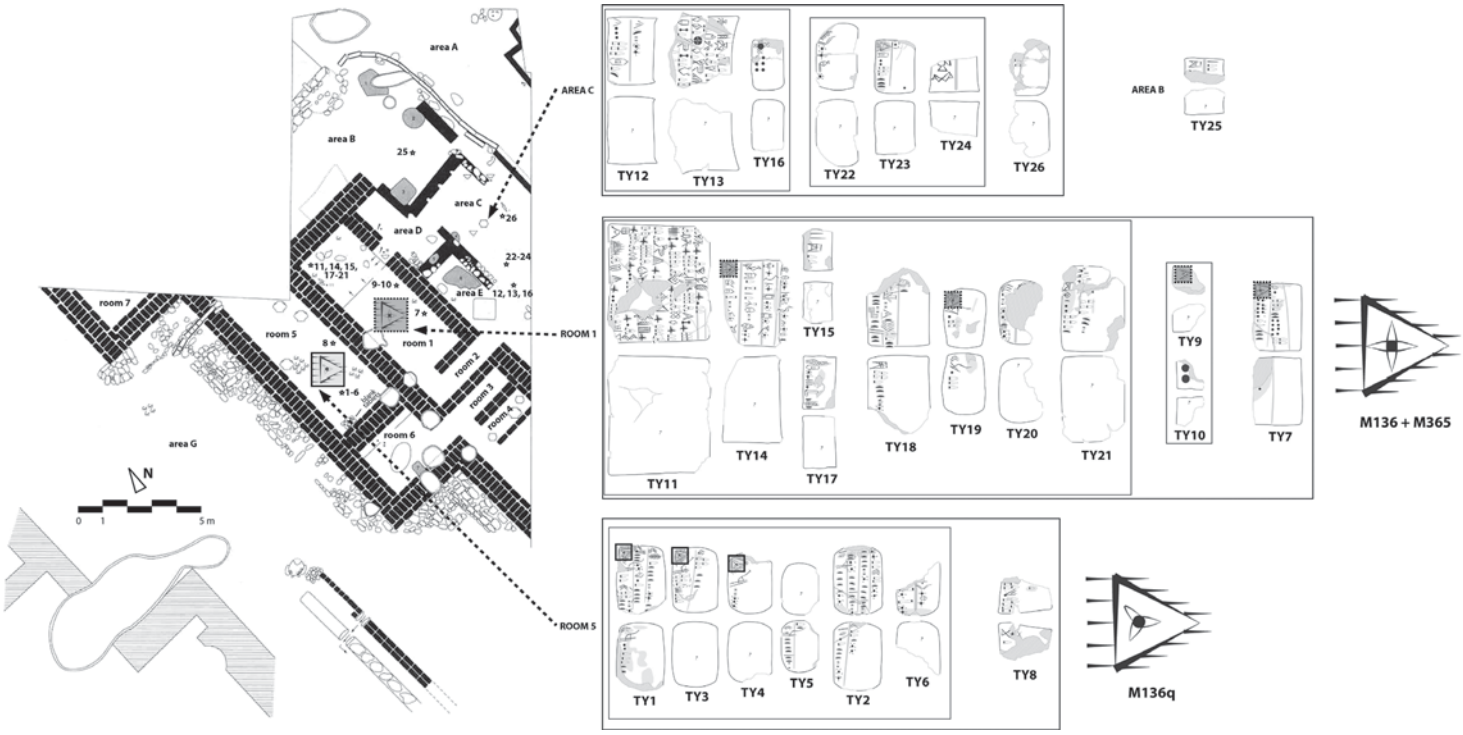


Fig. 31
Location of the PE tablets in the Tepe Yahya IVC2 phase building (from Lamberg-Karlovsky 1989: fig. 1; Damerow & Englund 1989) and PE signs M136q and M136 + M365.

objects, the invention of PE writing simply made even more explicit what was implicit up to then, recording systematically the accounted objects, the households/institutions and the names of the persons involved. The explicitation of this information on perennial supports enabled to store them and to make them permanently available through the creation of archives. The PE writing is consequently highly related to time management, to check afterwards what was given/received, maybe to establish accounts and finally to rationalize the economic activity[53]. In this regard, the tablets were probably kept in the household/institution making the decision recorded or in the place where the goods were given/received rather than accompanying the transacted goods.

This archival dimension is unfortunately only documented in the Tepe Yahya IVC2 building excavation, where 26 PE tablets were discovered on the floor of different rooms. Among them, four tablets found in room 1 (TY 7, TY 10, TY 14 and TY 19) recorded in their introduction the logogrammatic individual/household/institution value sign of the hairy triangle M136 + M365 while three tablets of room 5 (TY 1, TY 3 and TY 4) were involving the hairy triangle M136q (see **Fig. 31**). This clear distinction between room 1/M136 + M365 and room 5/M136q probably reflected that either two institutions or offices belonging to the same institution or households were occupying different rooms of the same building, proving that, at least in Tepe Yahya, the tablets were stored in the place where they were produced for a local and restricted use (although TY 19 and TY 20, found in room 1, seemed to be more related by their shape and content to room 5).

53. According to Algaze (2005b: 23), 'these tablets allowed early […] decision makers, and the urban institutions they worked for, to deploy available labor and resources so as to maximize their future revenues and power'.

The invention of PE writing in the late 4th millennium BC Iranian Plateau is independent from any other material phenomenon and not specifically related to a specific political hierarchisation. Reflecting the pre-existent social/legal organisation of the (Susian) population, the PE tablets implied the explicitation of bookkeeping information, a probable better management of goods, perhaps a rationalisation of the economic activity and the transformation of the goods managers into a more specialised scribal group. This was finally a rather restricted development in information technologies.

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