The Early Development of the Cuneiform Writing System, and Its Regional Adaptation

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Abstract

In this paper, I examine the early development of cuneiform writing in Mesopotamia and its regional adaptation in Iran during the late 4th and early 3rd millennia BCE. I trace the invention of writing through three key stages: the use of tokens and bullae, the development of numerical tablets, and the invention of numero-ideographic tablets. I argue that the invention of writing may have been a response to economic pressures and resource scarcity rather than a product of ever-increasing bureaucracy in successful, expanding states. I compare proto-cuneiform and proto-Elamite writing systems, highlighting both similarities and innovations in the Iranian adaptation. I discuss the standardization process in Mesopotamia, contrasting it with the lack of a lexical tradition in Iran. I also explore theories on why proto-Elamite writing became obsolete while proto-cuneiform survived and evolved. By examining the structural and content differences between proto-cuneiform and early dynastic texts, I demonstrate that the development of writing was not a straightforward evolution from simple to complex forms. I conclude by reflecting on the nature of early writing systems and their relationship to spoken language, challenging traditional views on the linear development of writing in Western Asia.

Keywords: *proto-cuneiform; protoElamite; adaptation; phonetization*

1. Background to the invention of writing

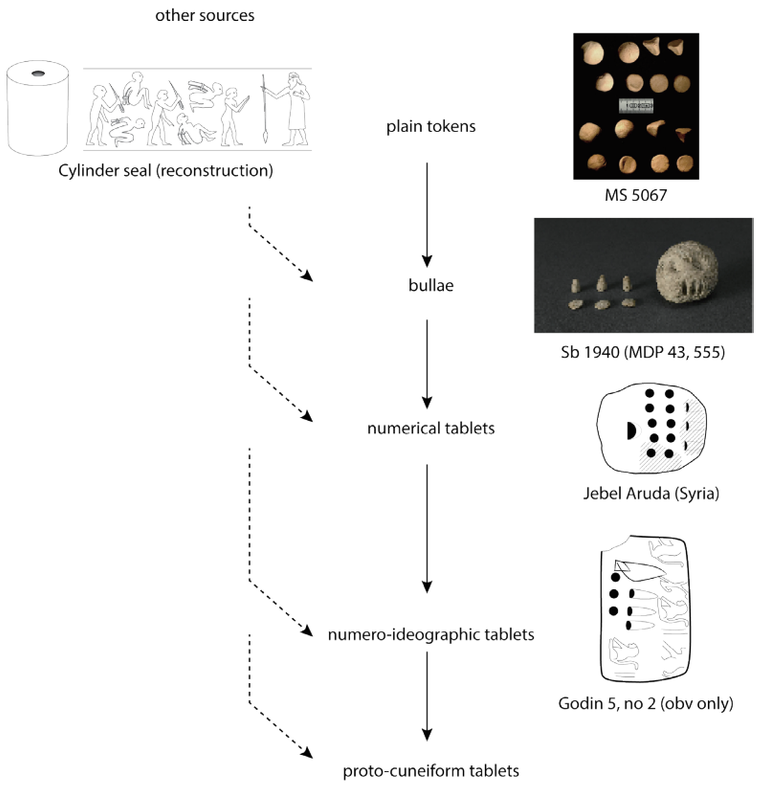
In the millennia leading up to the invention of writing, humans across Western Asia had domesticated most of the animals that remain, today, the herded animals and the animals of traction in Eurasia, and most of the plants that remains the staples of our Western diet today (Diamond (1997); Zohary, Hopf, and Weiss (2012)). However, as detailed by Graeber and Wengrow (2021), a constant process of adaptation and rejection meant that the transformation from hunter-gatherers to settled pastoralists or nomadic herdsmen was not linear or evolutionary. In the fourth millennium BCE, mega cities are attested in various parts of Eurasia, but there is a correlation between the emergence of complex cities and cultural technologies such as writing in only one of these areas, Southern Mesopotamia. The cities of the Cucuteni-Trypillia culture, on the Ukrainian steppe, for example, housed many thousands of people (but note the discussion whether these sites were seasonal or permanent (Gaydarska, Nebbia, and Chapman (2020)), filled with houses in an orderly layout and either devoid of larger buildings or with what appears to be communal buildings and subsequently no evidence of social stratification, in a stark contrast to the traditional picture of contemporary Uruk in southern Mesopotamia (Gannon (2020)). These steppe cities disappeared without leaving any lasting (physical) impact on Eurasian societies,[1] whereas the city of Uruk became the predecessor of a long tradition of urban centres with a complex written tradition.

Whereas there is then a correlation between the emergence of cities and the invention of writing in Southern Mesopotamia, the same cannot be observed in other regions of Eurasia, and we should therefore caution against arguing a causality between scale and complexity of human settlements and the emergence of writing (Wengrow (2015)).[2] In fact, the third and defining step in the invention of writing, that we shall discuss below (moving from tokens, bullae and numerical tablets to numero-ideographic tablets), is likely to have happened at a period of contraction, when resources at Uruk itself may have become scarce, and the invention of writing may therefore ultimately be connected to crisis and loss, and a need to account for increasingly scarce resources, rather than being part of a deterministic

1 I initially got interested in the Cucuteni-Trypillia culture after discussing its potential impact on deep myths of migrating Indo-Europeans with N.J. Allen, Wolfson College, Oxford.

2 I leave out of the discussion here the three Tărtăria tablets published by Vlassa (1963), compared to Late Uruk texts by Falkenstein (1965), a comparison Renfrew claimed could be accidental (cited in Zanotti (1983)), and that Qasim (2013) saw as evidence of modern forgeries.

Fig. 1
Stages of invention of writing in Mesopotamia



progression towards ever more complex and expansive societies (the only locations with numero-ideographic tablets outside of Uruk are Godin Tepe, Choga Mish, and Susa).

For the purpose of this paper, we will discuss only the Middle and Late Uruk period, dated to Ca. 3800 to 3100 BCE and represented by the layers VII to III at the site of Uruk (with III being the youngest), the following Jemdat-Nasr period (which may overlap with Uruk III), and the corresponding proto-Elamite period in Iran, possibly extending till Ca. 2900 BCE. Bullae encapsulating tokens (a system of counters predating the invention of writing with many centuries) emerged sometime during the time associated with level V and the beginning of IV (IVb) in Uruk, (see also fig. 1)—whereas proto-writing is found in IVa and III. Very few administrative objects were found closely associated with specific layers at Uruk and the phases of the writing system have been associated with archaeological levels by conjecture (Englund (1998); Hans Jörg Nissen (2024)). Uruk 'colonies' are attested from the Middle Uruk period and the Late Uruk period, but no administrative objects associated with Uruk IVa and III levels have been found in the 'colonies', which much by then have either disappeared or lost contact to Uruk and Southern Mesopotamia.

Although Middle and Late Uruk contained central places, buildings erected on platforms that likely served both religious and communal purposes, none have been found that suggests a singular power-node, before perhaps in the Uruk III period (Butterlin (2018b, p. 13), Butterlin (2018a, chapter 8 & 9)). This contrasts with the texts that show a hierarchical power structure. For example the lexical list LU-A suggests such a structure, but with the top-echelon composed of titles never found in the administrative texts; the EN, by most scholars thought to be a ruler of Uruk, is never listed as the highest official in the lexical tradition, but seen in many administrative texts as such, most famously perhaps the text MSVO 1, 2 (Englund, Grégoire, and Matthews (1991) (P005069))[3] in the Ashmolean Museum, Oxford, dating to the terminal Uruk period/Jemdat-Nasr. Additionally, no Uruk texts lists the workers necessary for the construction of these buildings. Complicating matters even further, the situation at nearby Susa where both Uruk V and IV style material was found and a derived system developed matching the Uruk III texts (see below), is almost entirely the opposite: at Susa we do find longer lists of workers, but no monumental architecture has been uncovered. Although this is likely due to a lack of archaeological data from Susa, it remains remarkable that among the almost 5000 texts from ancient Uruk, none refers directly or indirectly to the building of the monumental structures for which the city has become famous, and which have aided the construction of theories of state formation. At the same time, new research on those monumental structures suggests that Uruk society was less focused on a single node of power, at least in the Middle and Early Late Uruk periods, whereas our texts, albeit perhaps slightly younger (Uruk III and Jemdat-Nasr) appears to represent exactly such a system.

In the Middle and Early Late Uruk period colonies complete with a suite of Uruk style material have been found as incursions into local settlements across an arc running from Syria and Southern Turkey, through the Zagros Mountains and across western Iran (Algaze (2005); Butterlin (2018b); and for example Stein et al. (1996)). Among the Uruk materials in many of these settlements we find early accounting tools such as tokens, bullae, numerical tablets, and cylinder

3 Here and elsewhere, I add a unique ID for cuneiform texts that refers to its page on the Cuneiform Digital Library Initiative (https://cdli.ucla.edu/Pnnnnnn viz https://cdli.mpiwg-berlin.mpg.de/Pnnnnnn).

seals, all (except perhaps the tokens) believed to have been invented in Uruk in the first and second step of the invention of writing (see below). What we have is therefore a period of rapid expansion during the Middle Uruk period, with colonies of either migrating elites or commercial outposts established in the entire periphery (and apparently without local resistance, Butterlin (2018b)), for whatever purpose, and aided by high status items (Wengrow (2008)) and a suite of administrative tools used for managing local affairs (Englund (2006)), followed by a period of loss of these colonies, or independence of the colonies, and rapid development of writing in Uruk (Englund (1998, 61 and fn 119)).

It is therefore possible that the dominant theory for the invention of writing in Western Asia is only partly correct. In Uruk writing was invented for managing resources,[4] however, since this control may have been a mitigating strategy against scarcity we can potentially decouple the invention of writing entirely from the emergence of cities, and free those cultures where cities were indeed created from the stigma of not having developed writing (*pace* Childe (1950))—those cities without writing may in fact have been the successful ones.

2. Brief history of invention of writing

Writing emerges in both Mesopotamia and Egypt at around the same time in the second half of the 4th millennium BCE, and although the absolute date for either invention is uncertain, the invention of writing in Mesopotamia is the best documented, of not only those two inventions, but all inventions of writing anywhere in the world.
Clearly outlined by the leading scholar of the Uruk texts, the late Robert Englund, the invention of writing in Mesopotamia was a process that underwent three step changes. In the first, administrators began to encapsulate tokens, used for millennia prior to compute transactions, into hollow clay balls, making the transactions permanent (see also Schmandt-Besserat (1992)). In the second step change, administrators made representations of the tokens on the outside of the same clay balls, or bullae, eventually discarding the tokens altogether and using only impressions or representations of the tokens, on flattened tablets creating what we call numerical tablets. The tokens stood for

4 See already Levi-Strauss, les lettres nouvelles 10 (1961) 23-24: "Writing was not a random intellectual venture. It was invented for a precise purpose: the control of goods by a state bureaucracy", cited in Schmandt-Besserat (1984).

quantities of objects through a one-to-one correspondence with the thing counted, and sometimes graphically representing these (but see the recent critique by Overmann (2018), suggesting that the numerical signs of the earliest texts could represent abstract numbers, see also McLaughlin and Schlaudt (2023) and Overmann (2024)). Up until this point we must assume that the nature of the counted objects was inferred from the token systems used and potentially storage location of the tokens (Englund (2006); Hans J. Nissen, Damerow, and Englund (1993)). In a third and final step change the nature of the objects became indicated by one or a few non-numerical signs. This last step, leading to the so-called numero-ideographic tablets, represents probably the biggest conceptual change until the introduction of phonetic values at a much later time. It is important to point out that each of these steps could, and most likely did, overlap, and that they could also follow quickly upon each other without being distinguishable in the archaeological record as belonging to distinct phases (Englund (2005)).

In this reconstruction, the remainder of the texts from the Uruk period text (Uruk IVa and III including Jemdat-Nasr) represents a further development and refinement of the numero-ideographic tablets, but not a fundamental change in the concept of writing. Uruk IVa and III tablets can be very complex (see below) but usually code information in very short strings of non-numerical signs, qualified by numerical notations. Subscripts can contain the only longer strings of non-numerical information but very little research on these have been conducted.

Whereas the very earliest phases of the Uruk writing, from IVa suggests little standardisation in the sign inventory, the explosion of the lexical genre in the late Uruk IVa and Uruk III periods, presumably aided a standardisation and reduction of the sign inventory. All lexical lists from the Uruk period are monolingual, and all count the objects (see below).

With the first syllabic signs, securely attested only with the Archaic texts from Ur (Ca. 2900-2700 BCE), we find the next step-change in the invention of writing in Mesopotamia, but at this time many of the complexities developed by the Uruk scribes had been lost (see below). Many attempts at reading Sumerian (or Akkadian) in the Uruk period tablets have been made, but none with any great success (for a review see Englund (2009) especially fn. 18). In the end, the presence of Sumerian speakers in southern Mesopotamia in the late Uruk period is almost a foregone conclusion, but there is no evidence that they were the inventors of the cuneiform writing system, nor that

they played any prominent role in its early development, and judging from the next 1000 years of Mesopotamian history they are unlikely to be the only people present in southern Mesopotamia at this time. In fact, one could argue with Englund (2009) that there is overwhelming evidence against Sumerian being the language of the earliest scribes, since no personal names, following patters of common Sumerian personal names, have been identified in the texts, and syntactical rules appear to be conflicting with what is known about later Sumerian (see also below).

As I will discuss below, scholars, including myself (Meriggi (1971, pp. 172-220), Dahl (2019), Desset et al. (2022)), have theorised that the native Iranian writing system, proto-Elamite, developed a syllabary earlier than in Mesopotamia. However, it is important to note that no proof of this has been found and serval points speaks against it (Englund (2004, fn. 9) Dahl (2023)).

3. Competing theories (lost manuscripts – omens etc — overlap of bullae and tablets)

It may be important to discuss some arguments which have been raised against this theory outlined above. Most persistent is perhaps the suggestion that signs concerning abstract concepts cannot have had a background in bookkeeping systems which would not, ever, touch on such topics. J.J. Glassner, the main proponent of this theory outlined this criticism in his book *The invention of cuneiform : writing in Sumer*, (Glassner (2003)) and suggested instead that the origin of writing was to be found in divination.[5] On one level Glassner is of course right, the Late Uruk texts are not writing, they do not convey language, however, there is no evidence that the invention of phonetic values had anything to do with divination, for example. R. Sproat has recently proposed a theory where phonetic writing was invented from the repeated dictation of administrative content within administrative quarters (see below), a much more plausible explanation for the introduction of syllabic value signs.

Another, and possibly connected, theory, revolves around the trope of lost manuscripts. The central idea of this theory is that the inventors of writing did not only write on clay, but also on other materials now lost to us. Although entirely devoid of any tangible

5 No divinatory texts are known before Ca. 1500 years after the Late Uruk texts. See also Englund (2005) (review of Glassner (2003))

evidence (much later Mesopotamian texts speak of writing boards, but primarily for very specific topics) the theory is not novel to this material and has been postulated for most other writing systems with unclear beginnings or gaps (Farmer, Henderson, and Witzel (2002), Farmer, Sproat, and Witzel (2004)).[6]

Another line of argument suggests that tokens and numerical tablets are unrelated to the invention of writing, of proto-cuneiform. The main proponent of this theory is again J.-J. Glassner, who relies on the work of L.E. Bennison-Chapman and J. MacGinnis. One of Bennison-Chapman's hypotheses is that the use of tokens continued throughout the ages following the invention of writing (Bennison-Chapman (2019) Bennison-Chapman (2023); see also Macginnis et al. (2014)), strengthening Glassner's theory that these artefacts were not the pre-cursors of writing, but rather that tokens and bullae belonged to a parallel system.

However, Bennison-Chapman and MacGinnis make the error of claiming that any small clay object, regardless of context can be a token, and all tokens must have been used in an intricate predecessor system to the pre-writing tokens that became encapsulated in the bullae in the Uruk V period, or a similarly consistent successor or parallel system. Even if small square pieces of clay are found in the debris of jars with tablets (Bennison-Chapman (2023)), we have no way of telling whether they were separators for the tablets when these were stacked, accidental game pieces left behind, or counters used in a system inherited from the earliest accountants.[7] However, we can say that it is of course likely that people across Western Asia used counters (both accidental, produced, and standardised ones) to perform simple operations between writing down accounts, but that this of course does not negate in any way the theory of dependency of the invention of writing on similar counters in the middle of the 4th millennium BCE.[8]

6 See Molina and Steinkeller (2023) for the suggestion that parchment was used as a writing support in the Third Millennium BCE.

7 Note that the shape of these tokens would be meaningless to accountants in the 2nd and 1st millennium BCE, when curvelinear signs (the signs created with the rounded end of a stylus and initially deriving from the shape of tokens at the dawn of writing) were long out of use (the last use of curvelinear signs is during the Third Dynasty of Ur (Ca. 2100-2000 BCE).

8 Note that all evidence for tokens and bullae in 2nd and 1st millennium BCE Mesopotamia is suspicious, and add that Bennison-Chapman's use of Lieberman for reading 'token man' for Sumerian lu_2 im ^{na4}na *viz*. Akkadian *ša abnē* in the Old Babylonian Lu-series (Bennison-Chapman (2023, 236)) is best passed over in silence and the texts left to specialists. The singular bullae with 'pebbles (which were lost) recovered from Nuzi and published by Oppenheim is often used as a bridge between pre-historic information storage systems and mid-2nd millennium ones. However, although Oppenheim's bullae may suggest a continuation of use of tokens and bullae, since no record of a) whether the stones were actually inside that bullae, and b) whether the number of stones represented the notation outside it fails to pass the test as useful data.

Although there is nothing strange in the continued use of counters in fringe settings, or in the periphery, dense literacy such at that in Mesopotamia tends to exclude use of para-textual tools apart from abacus and of course calculators. Although the proposed 1st millennium tokens could be just that, the archaeological context of the finds provides us with no proof of an accounting use of these objects.

4. Writing vs proto-writing

A general linguistic definition of what constitutes a writing system was formulated by G. Sampson (1985). Sampson suggested that a writing system is a symbol system capable of representing any and all speech.[9] With 'symbol' is implied a certain level of structure, and with 'representing speech' is meant the ability to write down anything that can be spoken. It does not imply that the system had to be a phonetic system (apart from Hangeul, no broadly used writing system can claim to be even close to being a phonetic system). Early, that is 3rd millennium BCE, cuneiform was broadly speaking a mixed logographic and syllabic writing system, with the syllabic signs initially primarily serving to disambiguate logographic signs and occasionally to indicate necessary grammatical elements not easily written logographically (a plural form is easily indicated logographically through duplication, for example). Given the paucity of phonetic writing systems, at least in the ancient Middle East, we naturally need to consider the second part of the definition of writing system, the structure. It is obvious to students of writing that scrambling the letters or signs in a text will disturb the meaning, similarly continuous introduction of new signs, or modifications to the shape of signs, will render a writing system incomprehensible to its users (we shall return to this latter part later when discussing proto-cuneiform and proto-Elamite). Perhaps then, we can suggest that structure is a key element of what makes a writing system, and conversely that structure can be used to identify what is writing. We can propose that a symbol system with structure is likely to be a writing system. However, as clearly formulated by R. Sproat in his new book, *Symbols: An Evolutionary History from the Stone Age to the Future*, not only writing systems have structure, but so does some non-writing symbol systems (Sproat (2023)).

An additional fact complicates the suggestion that all writing systems must be capable of representing any and all speech: the further back in time we go, the weaker the link between writing and language becomes (Damerow (2006)), and there is almost no linguistic information in most texts from the first half of the 3rd millennium BCE, and perhaps none, apart from the linguistic information inherent in some types of structure, in the texts from the Late Uruk period (in the second half of the 4th Millennium BCE). This is of course partly a result of well-developed short-hands used in administrations across the millennia when cuneiform was used, and the moment when writing went from being a proto-writing system to a true writing system is therefore difficult to establish.

It is therefore useful to divide early Mesopotamian writing into three phases: the symbol systems used in neolithic 'administrations' that developed into writing systems should be defined as **pre-writing** systems; proto-cuneiform, or the texts from Uruk IV and III which are clearly earlier stages of the cuneiform script,[10] and proto-Elamite, are systems that code little or no speech and should be defined as **proto-writing** systems since they have what Damerow termed non-linguistic structures of syntax (Damerow (2006, § 11.2)), and evolve into writing systems that are capable of representing speech;[11] and cuneiform, when even the slightest phonetic coding can be established beyond doubt, has become a **true writing** system capable of representing any and all speech (epics, hymns to gods, letters with private affairs and so forth). The greatest difficulty remains in defining the boundaries between these three phases.

5. Spread of pre- and proto-writing

The earliest stages of pre-writing from Mesopotamia, bullae with tokens and numerical tablets, spread over a wide area, from southern Turkey to western Iran. The slightly younger numero-ideographic tablets are found in a much-reduced area from Southern Mesopotamia through the Zagros and across Khuzestan. The wide spread of

9 Of course, Sampson's definition was more complex, and he distinguishes between two major kinds of writing systems: semasiographic and glottographic systems. With Semasiographic Systems Sampson understood systems that use images with conventions for reading and interpretation, and which are not directly tied to any spoken language and can convey meaning without being read aloud (including visual illustrations and mathematical notations). For Glottographic Systems Sampson understood systems that represent elements of a spoken language.

10 See already Thureau-Dangin (1898) and Falkenstein (1936) who both showed the linear evolution from the earliest examples of writing in Mesopotamia to later cuneiform.

11 That proto-Elamite did not, as we shall see, is irrelevant as it could have, had the people in Iran not rejected writing.

pre-writing technologies has given rise to the suggestion that these systems were language independent. Although, that is true in the sense of how much language they encoded, it is not to say that they could immediately be adapted and used by disparate groups without any knowledge of the symbols and customs of the parent society where the symbol systems originated.

Whereas these pre-writing tools spread widely across Mesopotamia, Southern and Eastern Turkey, and Western Iran, use of the later proto-cuneiform of the Uruk IV and III periods was restricted to southern Babylonia and Western Iran. In Iran, numero-ideographic tablets have been found particularly in Khuzestan (Susa and Chogha Mish) and the Zagros mountains (Godin Tepe), with finds reported from elsewhere, but not verified.

All examples of pre-writing artefacts, tokens, bullae, and numerical tablets evidence only a local economy, and are devoid of any mention of the objects usually believed to have led to the establishment of the Uruk 'colonies', the raw materials lacking in Southern Mesopotamia (timber, metal and stone) (Englund (2006)). The subsequent proto-Elamite texts from across Iran also lack any evidence of the raw materials that are often seen as Iran's main export to Mesopotamia. Proto-Elamite texts too document local agrarian economies (although of a larger scale than the earlier Uruk V period bookkeeping objects). New evidence from the seals (Paladre (forthcoming)), and chemical analysis of tablets and sealings, from Iran (Yeganeh et al. (forthcoming)), suggests a movement of objects and, most likely, people, previously unknown.

6. Iranian adaptation of proto-writing

Contrary to suggestions recently proposed by the archaeologist F. Desset (Desset (2016, 88ff), and elsewhere), there is ample evidence to prove that proto-Elamite is a derived writing system, borrowing not only its basic tools, the majority of its numerical signs and systems, but also a number of core signs, from the older Mesopotamian writing system, proto-cuneiform. There is also no doubt about the direction of the loan, or the nature of the adaptation: the Uruk writing system is older, and the proto-Elamite writing system loans and adapts signs and systems in ways that shows clear dependency.

The structure of proto-Elamite is linear, but otherwise identical to that of proto-cuneiform (Englund (2004); Dahl (2019)); proto-Elamite loans all of its numerical signs and most of its numerical systems from proto-cuneiform, but not all of them (Englund (2004) Dahl (2019)), and in certain instances proto-Elamite scribes modified the Uruk systems in ways that suggests dependency (Friberg (1978) Damerow & Englund in Green and Nissen (1987), but see Dahl (2019, 73-79) on possibility of convergent evolution in production of derived systems); proto-Elamite borrows a set of basic signs (Englund (2004, 122ff.)), two of which appears to lose their iconicity following the creation of proto-Elamite; and finally, proto-Elamite borrows the material and the tools of writing developed at Uruk.

Of course, proto-Elamite was not a stale takeover of an existing system, in fact the number of novelties introduced by the scribes is truly staggering. First and foremost is the lineraisation of the script (see more below), transforming the script of the Uruk IV period into an in-line script, but preserving the basic structure was transformative and has been seen as a potential for the eventual development of phonetic writing (see below). However, with this lineraisation there is also a level of loss of complexity, with Uruk III texts capable of having four or more layers of information, and the highest number of sub-entries in a proto-Elamite texts is three.

The sign inventory too is dramatically changed in proto-Elamite. Although a basic set of signs were imported, and among them two that represented humans through a pars-pro-toto principle, these lost that iconicity and no other signs for humans or human body parts were ever used in proto-Elamite. The proto-Elamite writing system has been argued to have a high number of abstract signs, but this is partly a result of our lack of understanding of the graphical referents of the signs since the system remains largely undeciphered.

Finally, it has been argued (including by the present author) that proto-Elamite developed a syllabary in particular to write personal names (see below).

The proto-Elamite writing system spreads across all of Iran from its likely place of inception in the west (Susa). Although much smaller numbers of tablets have been found in other places (with Malyan being having both the most, and also the most complex texts), the structure of the texts and formation of derived signs suggests some form of contact (Dahl, Petrie, and Potts (2013)). Recent chemical analysis of the clay of these texts suggests the transportation of tablets between some sites (Yeganeh et al. (forthcoming)).

7. Structure and content of proto-cuneiform texts

Following P. Damerow we can describe the structure of the texts from the Late Uruk period as being laid out in visible hierarchies. Proto-cuneiform texts start directly with the first entry, listed in the upper left corner (upper right corner according to the original direction of writing). The list of entries, covering all of the obverse of the tablet, can be divided into columns with sub-columns. Each entry occupies one box. Columns and boxes remain staples of the cuneiform tradition until the end of the Early Dynastic period Ca 1000 years after the invention of writing, when boxes are replaced by lines. The idea of one semantic unit per box or line persists, almost throughout the entirety of the cuneiform culture, but it is only in Uruk texts that we find sub-columns that can divide the information of one box in the primary column into its constituents in two or more boxes. Tablets are rotated on their horizontal axis when writing the total on the reverse. Totals that consists of sub-totals can be divided into multiple columns, usually with the left one with only one box/information, whereas columns on the right can have more boxes reflecting the constituent parts of the grand total (Englund (1988)). fig. 17

Usually, information about the institutional setting or about the nature of the account or the people or institutions involved in it is found on the reverse at the end of the text. This information is not necessarily separated from the main body of the text with rulings or otherwise. Such colophons, if we can call them that, have the longest strings of information in proto-cuneiform texts. Simple graphotactical analysis suggests that the order of the signs within these strings is random or follows principles we do not understand.

Individual entries in a proto-cuneiform account are always structured with the numerical notation preceding the object being qualified (i.e. placed to the left of it). This is mirrored in the lexical lists where each entry is counted by a 1 sign (and often totalled). If we were to think of these texts representing the language of the scribes we would be left in the curious situation where the basic syntax of the earliest texts does not match the syntax of Sumerian, where adjectives, including numbers, always follow the objects they qualify. The syntax of Late Uruk administrative texts carries on into all third millennium BCE texts where, even when we know the language of the scribes to be Sumerian, numerals always precede the objects they qualify. However, in those periods, adjectives, including numbers, are always found following adjectives in historical or literary texts. One solution would be to posit that administrative texts have their own syntax, which is independent of language, but the fact that the contemporary proto-Elamite tablets from Iran display the direct opposite order, numerals follow the objects they qualify, may ambiguate this proposal. We are therefore left with accepting Peter Damerow's suggestion "that it is necessary to pay special attention to non-linguistic structures of syntax" when examining early writing systems (Damerow (2006, §11.2)).

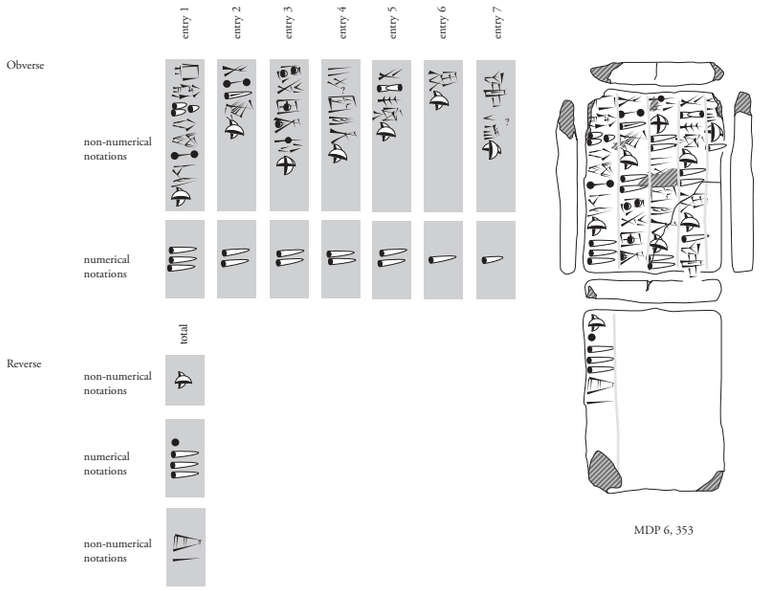
The content of proto-cuneiform texts is overwhelmingly related to the procurement and distribution of foodstuff, with manufactured goods and luxury objects playing a much smaller role. Lexical lists include both everyday objects and luxury objects, as well as imagined objects, apparently following the same schema found in much later lexical and scholarly texts of expanding to all potential, if even impossible, variants of an object, which we may identify as a "paradigmatic expansion" technique (see Veldhuis (2014, p. 138), who used "paradigmatic sequence").

8. Structure and content of proto-Elamite texts

When looking at a proto-cuneiform text, next to a proto-Elamite text it may come as a surprise that the structure of the two is largely identical (Englund (2004, 104ff. and figure 5.3b)). The same information which in a proto-cuneiform text is arranged, in what Damerow termed visual hierarchies, is in a proto-Elamite text strung along on lines. Proto-cuneiform texts exhibit greater complexity than the proto-Elamite texts, with up to four layers of information coded in sub-columns, whereas the maximum number of layers in a proto-Elamite account is three (very rare). Whether the linearity of proto-Elamite texts placed a natural limit to the complexity expressed in the structure of the texts, or whether the bookkeeping at Susa was less mature, requiring less complex accounting remain unclear. The information usually found at the end of a proto-cuneiform text is structurally similar to the headers of proto-Elamite texts. Apart from the earliest texts, all proto-Elamite texts begin with a header of usually one sign and occasionally a set of signs functioning like a complex grapheme (Dahl (2005), see also Born et al. (2022) for the possibility that many late proto-Elamite texts contain much more complex headers).

Following the header, we find one or more entries arranged on lines running from the top to the bottom and from left to right. A minimal entry consists of an object and a qualifying numerical no-

Fig. 4
A proto-Elamite text (MDP 6, 353 (P008135))
Susa, Ca.3100-2900 BCE
Clay, Musée du Louvre (Sb03046)
©Louvre Museum, Paris, France



MDP 6, 353

tation. Particularly in later texts, the object can be further described with several additional signs that are likely to indicate the owner or recipient of the object in a complex way (see also fig. 4). Occasionally the object is not written and is inferred from the structure of the text, i.e. from the first entry. Proto-Elamite uses no dividers between the entries (except for a strange system at Yahya where two numerical notations could be separated by a stroke if not otherwise distinguishable, Damerow and Englund (1989, pp. 34-35)) but the beginning of a new entry is usually easily spotted, since all entries are separated by the numerical notations qualifying the objects. It should however be noted that several of the numerical signs can double as non-numerical signs, some probably for containers of a standardised capacity, see also Englund (2001) for Uruk, some for titles, and others with unclear meaning.[12]

The content of all proto-Elamite texts, except for two, possibly three, is administrative. Two metro-mathematical texts were first identified by Friberg (1978, pp. 33-43), see also Damerow and Englund (1989, 18 and fn 51). More recently K. Kelley proposed that

12 This polyvalency occasionally leads students astray, most recently Hessari and Rohollah (2023) and Desset (2016), who both understood the notations found in the illusive Sofalin text TS 13 as belonging to the capacity system, a conclusion they most likely reached because of the appearance of the numerical sign N_{39B}, although Hessari and Yousefi correctly transliterated it as $M344_e$.

MDP 26, 71 (P008759) is a possible lexical text (Kelley (forthcoming)). The internal structure of that text aligns poorly with the general administrative texts, since almost all of the entries consist of signs that are not repeated elsewhere in the text, and all lines are counted with one (N_1). All other proto-Elamite texts deal with the procurement, production, and distribution of foodstuff. Among the animals found in the texts, we can so far only identify sheep and goats. Pigs are poorly attested in the archaeological record and non-existent in the glyptic record of the period; cows are abundantly represented in both but so-far not in the texts; fish are found occasionally in the glyptic record but not identified as counted objects in the texts (Dahl (2015)).

The absence of raw materials such as timber, stone or metals, long seen as Iran's primary export, lends credence to the understanding that these texts represent internal administrative workings of household economies, and not traders or states (Dahl (2019, p. 86), for Uruk see Englund (2006)).

9. Standardisation and knowledge production

When Falkenstein published the first texts from the Late Uruk period in his ATU 1, very few fragments of lexical texts had so far been excavated (Falkenstein (1936)). There can be little doubt that the lack of literary, historical or lexical texts drove Assyriologists to neglect these texts for the next quarter of a century; even Falkenstein moved to other topics, while excavators in Uruk uncovered 1000s of fragments of more administrative texts, as well as large quantities of lexical texts that were mostly shipped to Heidelberg (Germany) and then left in boxes in a garage (Nissen (2024)). This unhealthy focus on literary and scholarly texts has often led scholars to write the wrong history of ancient Mesopotamia, one based on fairy tales without the methodology of folkloristics, or one based on pious frauds, without the textual criticism of historians — it remained common until recently to recount the earliest history of Mesopotamia using text such as *Gilgamesh and Aka* (for an excellent edition of the text see Katz (1993)), rather than the rich archaeology and the complex administrative texts.

Falkenstein's AUT 1 texts were mostly from the earlier layers of Uruk (Uruk IV), whereas later excavations brought forth large numbers of texts associated primarily with the archaeological period III (see fig. 2 for the periods of Uruk), and therefore often vastly more complex than the earlier Uruk IV texts (see Englund (1998, 18ff.) for

the archaeological context of the texts).

This significant increase in lexical production during the Uruk III period dramatically contributed to a standardisation of the writing system. In the earliest phases of the proto-cuneiform tradition, new signs were readily invented and there appear to have been no process of standardisation. However, for the Uruk III period we can observe a decrease in the number of signs used, and a change in the statistical distribution. Looking at Uruk's eastern neighbour, the same cannot be observed, and we must consider whether the lack of a lexical tradition in proto-Elamite Iran was the direct cause of this lack of standardisation. Proto-Elamite texts, may also exhibit a higher number of errors than proto-cuneiform, although this is almost impossible to prove (see Hawkins (2015), and add the notation of 11 N_1 twice in the total in MDP 06, 246 + 269+ 302 + 332 (P008043), see Dahl (2012), add perhaps also many variants of simple signs such as M66).

Fig. 2
Uruk chronology
Englund (1998, fig. 2)

	Period	Writing Phase
3400		
3300	Late Uruk	Clay bullae and numerical tablets
3200		Archaic texts from Uruk: Writing Phase Uruk IV,
3100		Writing Phase Uruk III
3000	Jemdet Nasr	
2900	Early Dynastic I	
2800		Archaic texts from Ur
2700	Early Dynastic II	
2600		Texts from Fara
2500	Early Dynastic III	
2400		Old Sumerian texts
2300	Dynasty of Akkad	Old Akkadian texts
2200		
2100	Gudea of Lagash Ur III	Neo-Sumerian texts
2000		

10. Death of proto-Elamite

When the early excavators of Susa found the proto-Elamite tablets, they also discovered a few handfulls of inscriptions, mostly on different supports (stone and terra cotta), that they initially grouped with the proto-Elamite tablets, but which were later split out from these and designated a separate script, called linear-Elamite. Early scholars working on Linear Elamite generally believed that Linear Elamite was a later development of proto-Elamite, and that deciphering one would lead to the decipherment of the other. Scholars could be hopeful for a break-through since one Linear Elamite inscription (Sb 17, see Mecquenem (1949) (P009390)) was found adjacent to an Old Akkadian inscription, and believed to copy the information, if not the text. This position was maintained even when the chronological gap between the two systems was shown to be significant, following an improved understanding of early Iranian archaeology. Today we know that the gap between the last known proto-Elamite text and the first Linear Elamite text is about 700 to 800 years. It was only with the publication of the Tepe Yahya texts (proto-Elamite) by Damerow and Englund (1989) that the link between the two scripts was successfully challenged. Damerow and Englund believed that no amount of insight into the linear Elamite script would help the decipherment of proto-Elamite due to the extensive time gap between the two, although they did not rule out a relationship. In a recent study I proposed that the seemingly close graphical relationship between some signs in both systems masks a re-invention of writing in Iran using retrieved artefacts, rather than a continuation of an old system (Dahl (2023) *pace* Desset et al. (2022)). In that theory, the king of Shimashki, a political entity originally centred in the highland north-east of Susa, Puzur-Inshushinak, demanded the creation of an independent script, and in an act of schismogenesis his scribes used retrieved ancient proto-Elamite texts found at the capital city Susa to create a new script, but adapting the values from the Old Akkadian syllabary nestled within the cuneiform writing system, with which they were very familiar (for Puzur-Inshushinak see Álvarez-Mon (2020, pp. 142-162)). In addition to consisting only of CV and VC signs, [13] uniquely similar to the Old Akkadian syllabary, Linear Elamite is almost always used in a parallel visual set-up with Akkadian supporting this argument.

Since current knowledge suggests that proto-Elamite was used for a very short period before it died out, notwithstanding that recovered examples of proto-Elamite may have served as a model for the

13 Note how Desset et al. (2022) did not accept VC values, and instead reconstructed a mixed syllabic alphabetic script, in a world-first, matching too closely the proposed grammatical reconstruction of Elamite. Adding VC signs, in particular an *aḫ/eḫ/iḫ/uḫ*-series of signs greatly helps the reconstruction of Linear Elamite proposed by Desset et al. (2022), but makes the dependency on Old Akkadian total.

graphical shapes of signs in Linear Elamite but not the phonetic or logographic values of those signs, we are justified in asking the question of why proto-Elamite became obsolete. Apart from suggesting social collapse, for which we have little information, only two theories have been suggested. In the first, the lack of scholarly texts in proto-Elamite, abundant in proto-cuneiform, are suggested as the core reason for the collapse of proto-Elamite (Dahl, Petrie, and Potts (2013, 375). Without the knowledge system of the lexical texts the writing system became difficult to maintain — the high number of variants and outright errors, difficult as they are to establish in an undeciphered writing system, supports this interpretation (Hawkins (2015)). In the second theory, a native choice of rejecting writing is seen as the core reason for the obsolescence of proto-Elamite (Daneshmand (2025)).

11. Survival and transformation of proto-cuneiform

I hinted in the introduction of this paper at the possibility that the invention of writing was the result of economic pressure, loss of access to trade, and the subsequent need for improved bookkeeping to manage resources. This is an assertion that is difficult to prove. When we look at the historical periods from later 3rd and 2nd Millennia Southern Mesopotamia, we do see, inevitably, an increase in administrative production towards the end of each dynasty, for which we have large quantities of writing. This may, of course, be the result of archival cycles more than anything else — we only find the archives of the last decade or so from any state, as previous archives would have been recycled. Although this is perhaps true, it is nevertheless interesting that we have hardly any texts from, for example, the early years of the Third Dynasty of Ur (c 2100 – 2000 BCE), exactly the years when their empire under Ur-Nammu and Shulgi was expanding, but that the great masses of texts from the Dynasty date to the periods when the empire had been stabilised and even when it was contracting, with an extreme situation at Ur in the final years, where recycling of precious materials are documented as never before (Van De Mieroop (1999-2000)). A similar picture emerges from Early Dynastic Lagash/Girsu, where the scribes of the much-diminished state increased their production in the final years, and from the final years of the Old Babylonian Dynasty of Hammurapi with its expanding bureaucracy reacting to increased external pressure (Yoffee (1977, pp. 148-149)). Of course, this is not a universal picture, nor do we have enough data to make any general observations, but it is perhaps enough to suggest that bookkeeping is a byproduct of societal and economic stress more than of success.

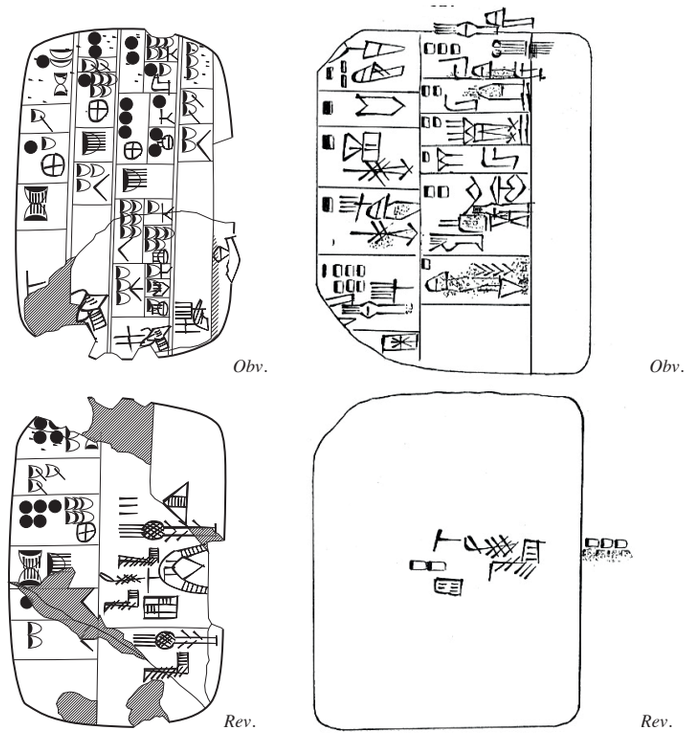
Archaeology serves us poorly to answer these kinds of questions. How rich was Uruk V compared to Uruk IV and III? The archaeology of the archaic levels at Uruk is confusing, and likely partly due to a number of fieldwork errors during the excavations, [14] but Mesopotamian sites are also usually fairly free of small finds, making any judgement of wealth difficult. At the end of the archaeological phase, Uruk IV, buildings in the central Eanna precinct of Uruk were razed, and in the next archaeological phase, Uruk III, new structures were built, perhaps with a redirection of the focus from assemblies towards temples and proto-palaces (Butterlin (2012, p. 198)). Unfortunately, it is not clear how this aligns with the writing phases Uruk IV and III: almost all Uruk IV tablets are assigned to that archaeological level using palaeographic arguments (Englund (1998, 32ff.)), but could, theoretically all date to after the levelling of the Uruk V and IV buildings. If so, we could argue that all of the complex tablets from Uruk originate after the loss of the colonies and to after a significant restructuring of the central precinct of Uruk.

The most notable change, however, happened at the end of Uruk III/Jemdat-Nasr period when we can speak of a significant amount of disruption and change, at least to knowledge systems. Based on the continuity of some archaeological types, and the continuity of cities, a general view in archaeology is one of continuity between the Late Uruk period and the Early Dynastic period (for example Matthews and Richardson (2019)), notwithstanding the gradual thinning in numbers of mid-size cities from the Late Uruk to Early Dynastic period. However, looking at the textual records there is little doubt that serious and fundamental disruption happened between the two periods including a significant knowledge loss. Early Dynastic I-II texts (in particular the so-called archaic texts from Ur, see Burrows (1935)) are significantly simpler in their layout and structure than their predecessors of the Uruk III/Jemdat-Nasr period. This simplicity resulted in a significant loss of information coded in layout and structure. [Fig. 3] We must assume that the information coded in layout and structure was now, in the Early Dynastic I-II period, conveyed in different ways, perhaps through storage location, or it may have moved to oral communication.

14. Hans Jörg Nissen (2024), for example, outlined that no quantitative studies of potsherds were attempted during the excavations of Uruk.

Fig. 3
L: Uruk III/Jemdat-Nasr text (MSVO 1, 95 (P005162))
Jemdet Nasar, Uruk III, Ca.3200-3000 BCE
National Museum of Iraq (IM055578)

R: Early Dynastic I-II text (UET 2, 281 (P005871))
Ur, Tell Muqayyar, Ca.2900-2700 BCE
Clay, National Museum of Iraq, Baghdad, Iraq (IM049681)
Burrows, Eric R, *Ur Excavation Texts II: Archaic Texts* (1935)



MSVO* 1, 95** ***UET 2, 281

While the texts get structurally simpler, we also see the initial use of phonetic coding, as far as we can tell only for writing personal names, and therefore not replacing the complex structure of Uruk III/Jemdat-Nasr texts. Early Dynastic I-II texts are still not written in an inline format, rather the system of writing one semantic unit in one box continues in this period. Escaping any systematic analysis, scholars have suggested that the order of the signs within these boxes is arbitrary or random (but see Johnson and Johnson (2012)). This is of course not likely, but the system used is unclear, although it appears to be that boxes are read in a lying down U shape, from upper left corner, and with determinatives (if that is what they are in this period) in the lower right corner (according to our direction of the texts). This lack of linearisation is interesting, since scholars have suggested that the linearisation of the proto-Elamite script may have aided the beginnings of phonetic writing (Englund (2004, 104)). In Mesopotamia, the script is not linearised before the Old Akkadian period some 700-800 years after the Uruk IVa and III period when complex texts were

first written.

Although we can see nascent phonetization of cuneiform in the Early Dynastic I-II period, no letters or literature were written before much later, and most of the literary texts perhaps had a dependency on lexical lists (Sonik and Shehata (2024)); the first royal inscriptions do not appear before much later as well and are at first simply names and titles, and occasionally genealogies.

Recently, Richard Sproat has used powerful modelling to suggest how writing evolved from being a non-linguistic symbol system to one that could represent sound. Sproat (2023) suggested that in the institutional setting where writing was invented and used, for administrative purposes, the content of the texts was dictated by administrators and written down by scribes, and that it was exactly this repeated process of connecting spoken words with written signs that led to the phonetization of writing. Sproat used computer simulation to model this process and was successful in showing how this theory was possible.

12. Conclusions

The invention of writing in Western Asia was not a linear process, nor did it progress from simple to complex. Instead, the history of the invention of writing in Western Asia is one of trial and error, of adaptation, loss and rejection, and of chance. As such the history of writing in Western Asia mirrors the transformation from hunter gatherers to settled agriculturalists as outlined by Graeber and Wengrow (2021), when some groups farmed, while others rejected farming, and the progression that eventually led to farming being the dominant form of sustenance across Western Asia followed a complex and still poorly understood trajectory. It is therefore no surprise that some forms of proto-writing may have overlapped, archaeologically, with others, and that some steps lasted longer than others. It is also not surprising to find that the Uruk III period texts are vastly more complex than the subsequent Archaic Texts from Ur. Nor perhaps, that elites in Iran simply rejected writing at some point. In fact, the history of writing in ancient Iran is one of constant rejection of Mesopotamian influences and the creation of alternative and different ways of writing, if at all (Daneshmand (2025)). Taking a very technical view of writing, both proto-Elamite and proto-cuneiform should perhaps be classed with proto-writing systems since there is little or no evidence that either of these writing systems had developed phonetic coding. On the other

hand, proto-cuneiform clearly developed into such a system, and linear-Elamite had the potential of doing so, and we can therefore classify them as writing systems. The way the scribes in Iran modified the writing system they had borrowed from their colleagues in Iraq is remarkable and testifies to a certain ingenuity rarely experienced in ancient societies, usually recovered from much more 'silent' evidence.

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