

Robert K. Englund

TEXTS FROM THE LATE URUK PERIOD

1. PREFACE

Whoever has spent an afternoon wandering about an ancient tell in Iraq knows all too well the compulsion to search the ground for remains of a civilization long lost to us. Here a colorful glazed shard, there a small pebble with possible incisions, all these artifacts are inspected, mentally sorted and, dependent on the rigor of the archaeologist or Iraqi civil servant who might be in accompaniment, deposited in pockets for later appraisal. So did certainly stocks of intriguing objects first form in the dwellings of local Arabs in Iraq, and so did too the first Mesopotamian artifacts in the bags of visitors and trade agents leave Iraq for Europe in the 17th century, to be followed in the 18th by more, until beginning seriously in the 19th century a full-scale plundering of uninhabited Near Eastern settlements took place. In a sense, early European excavators worked hand in hand with Iraqi natives to strip the land of its ancient fruits. Workers in the Assyrian centers of Nineveh, Khorsabad and Nimrud filled raft after raft with stone colossi, reliefs and inscribed objects, destined for exhibition in the halls of the British Museum and the Louvre, while at the same time *local* robbers spent chilly nights and hot summer days helping to satisfy the same foreign calls for more objects from the distant past.

Colonial rule and impressionable Ottoman officials provided the opportunity for this plunder, and national rivalries among European states even stimulated a certain excitation among the early excavators to bring the largest and most impressive treasures home. Thus the few dusty shards drawn from the pockets of wives of Mercedes dealers during the dull return to Baghdad bear no resemblance to the ten-ton bull and lion, hewn from stone nearly three thousand years ago and set up in the palace of Ashurnasirpal, which now attract the awe of visitors in the British Museum. Still they represent manifestations of one and the same impulse: to

take possession and thus share in the essence of a history of civilization reaching back beyond the Renaissance, beyond the legions of Rome, and beyond the democratic stirrings in ancient Athens, into a pre-classical age marked in its earliest phases by the first development of cities and, toward the end of the fourth millennium B.C., the emergence of writing.

The Roman script we use today has been in existence for some two and a half millennia. By the 26th century A.D., this form of writing will eclipse in length of uninterrupted use the period of documented transmission of cuneiform in Mesopotamia. That is no mean accomplishment, but of course Roman, and Greek script derived from earlier models in the Near East, and these owe certainly the impulse to graphically represent language, if not the form of writing itself, to earlier scripts in the region, above all to hieroglyphics and to cuneiform, and of these two the development and use of the latter, in its earliest form generally known as 'proto-cuneiform', is much better documented.

The term 'archaic texts' refers generally to those documents inscribed on clay or stone tablets using the proto-cuneiform script, dating roughly to the final stages of the Late Uruk period, that is, Uruk IV and III, and including the first levels of the succeeding Early Dynastic period. The span of ca. 3200-2700 B.C. generally accepted for these archaeological levels covers an age in which the monumental center of Uruk in southern Babylonia seems to have been in decline, breaking into disarray about 2900 B.C., and following which new centers in the south began to form.

The first general introduction to the proto-cuneiform writing system and an overview of the text genres found in the archaic texts from Mesopotamia was offered in 1936 by the father of modern Sumerology in Germany, Adam Falkenstein. Since the appearance of that publication, the work of an ongoing research project directed by Hans J. Nissen, a student of the Heidelberg scholar and since 1971 professor of Near Eastern studies at the Free University of Berlin, has made substantial strides in the edition of the ca. 5000 archaic texts and text fragments uncovered by German excavators of Uruk, the largest settlement on earth at the end of the fourth millennium B.C. Situated on the southern stretch of the ancient course of the Euphrates river, this city achieved a size of some 40 hectares 5100 years ago, and, with the concomitant hierarchization of skilled labor and administrators, offered the most likely atmosphere at the time for the revolution in communication requisite to an expanding bureaucracy forming in the city that was a system of writing.

Some scholars, among them most forcefully Nissen, have in recent years relativized the importance of writing in our cultural development. Since the great mass of the earliest written documents were economic and administrative records, and since these documents had clear functional precursors in the form of cylinder seals, numerical tablets and, still earlier, clay and stone calculi, writing could be considered little more than an expansion and improvement of accounting mechanisms already in broad use. Yet the intellectual advance evident in the early use of symbols not only to quantify and qualify objects and measures and persons, but also to identify more involved transaction states, to designate probable phonetic approximations of elements of words and proper names which had hitherto not been signified in the early iconography, and possibly to represent spoken language, suggests an entirely new level of semiotic representation.

The publications of the Berlin research group, with which I have been associated since 1982, have begun to lay the basis for a comprehensive examination of the archaic writing system and the administrative forms it served. However, two recent developments in the decipherment of archaic writing in Mesopotamia – both only indirectly connected to research in Berlin – have had important consequences in the way we think about the exploitation of writing, and have implications for the contextual decipherment of archaic documents. The first is the work by Denise Schmandt-Besserat on the large numbers of small stone and clay objects almost invariably found in excavation levels of Near Eastern sites predating those of the earliest writing stages. Despite occasionally heavy-handed criticism of her methodology, there can be little doubt that her general proposition of the derivation of proto-cuneiform writing from these early discrete symbols, called by her tokens, is correct, and that the discussion which her work has provoked, not only of the role of these objects as object-qualifying counters but also of the sealed bullae which contained a large variety of 'tokens', and of the so-called numerical tablets found in levels immediately before those of developed writing, has formed a vital part of our current understanding of the intellectual developments which preceded the emergence of writing in the Near East. The second is the breakthrough in the analysis of the numerical systems, represented in quantitative notations in archaic administrative texts, achieved by the historians of science Jöran Friberg and Peter Damerow. Remembering that over 85% of all archaic texts are administrative documents recording above all quantitative data, it is not difficult to imagine the significance for decipherment of the texts a clear understanding of accounting notations can have, particularly for a period in which the diversity and complexity of counting and measuring systems was still great.

The present paper represents an attempt to weave together some of the disparate material which Nissen, Damerow and I have published in the course of our cooperative efforts and which has not always been easily accessible to interested readers. It is a pleasure to acknowledge that without the professional assistance of the editors of this series, Pascal Attinger and Markus Wäfler, the present study would not have been written, and to thank them for their great patience.

2. EXCAVATIONS AND CHRONOLOGY¹

It is not surprising that the first antiquities to arouse the interest of visitors to ancient Mesopotamia were those most recently buried. They were closest to the surface, and above all the great stone remains of the neo-Assyrian period were in many cases visible in the shifting sands of northern Iraq, or at least known to local residents. These and other stone monuments which often bore inscriptions in cuneiform were retrieved and shipped back to European capitals in the mid-nineteenth century, together with the clay tablet archives of Ashurbanipal unearthed in Nineveh.

Below the archaeological strata which produced these finds were levels containing successively older artifacts, including earlier cuneiform archives. Beginning in the 1880's, British/American and French excavators opened the sites of Nippur and Girsu in the south of modern Iraq, ancient Babylonia. These two sites more than any others led archaeological, but above all philological research into the third millennium B.C. and into the developmental stages of early cuneiform.

The Nippur archives from the scribal school situated in the temple district of Enlil remain our most important source material for understanding the intellectual history of early Mesopotamia.

¹ The conventions of text transliteration used in this paper are those of the Berlin/Los Angeles research project *Archaische Texte aus Uruk* and have been spelled out in some detail in previous publications (see, for example, MSVO 1, 9-12, and note that the designations 'obverse' and 'reverse' of opposing inscribed tablet faces may be arbitrary; it is often not possible to determine where an account on a damaged fragment might have begun). Generally, texts are published here with as much attention paid to non-specialists as possible. The readings of the signs in individual transliterations are based on those presented in the Uruk signlist (ATU 2; 'unidentified' signs in this list are assigned the code ZATU+number), incorporating however the further-reaching sign differentiations presently employed in our work in Berlin and Los Angeles on the archaic corpus (see my remarks in ATU 2, p. 347, to language identification JESHO 31 [1988] 131-133⁹). Text copies in the following are published at 75% of original size unless otherwise noted, but are rotated 90° counter-clockwise of their position in ancient times, in accordance with standard Assyriological convention; cf. the reasoning and justification for this positioning in ATU 2, 148⁹; P. Damerow and R.K. Englund, *Tepe Yahya*, 11-12³⁰, with reference to the compelling work by F. Picchioni. There are very few exceptions and contradictions (for example, W. Orthmann, PKG 14 [1975], pl. XI; A. Archi, "Position of the Tablets of Ebla," *OrNS* 57 [1988] 67-69) to the rule adhered to here that the 90° shift occurred during or just before the Kassite period. The terms 'script' and 'writing system' are used here interchangeably. Finally, I have chosen to continue a convention adhered to previously in publications of our research project concerning the designation of proto-cuneiform signs. We have distinguished generally only numerical and ideographic signs (representing quantities and qualities, respectively), fully aware of the terminological imprecision both names imply; 'numerical signs' did not represent abstract numbers, and 'ideographic signs' in all likelihood were often not semographs but rather referred to specific words. Historians of writing categorize developmental (and usually diachronic) systems of graphic communication into iconography (usually prehistoric art), pictography (clear iconic referents in the earliest writing systems), logography (strict correspondence between a single sign and one word), ideography (correspondence between a single sign and one semantic field), syllabography (phonographic use of signs to represent syllables) and alphabetography (phonographic use of signs to represent phonemes), recognizing that no system excludes elements of systems preceding it chronologically. It will be obvious that many of the signs called here 'ideograms' are more precisely 'logograms', and some may be 'syllabograms', dependent on whether proto-cuneiform is a multivalent writing system. It is, in any case, a question of interpretation as to when such ambivalent signs as U₆, in ideographic meaning 'light', 'day', 'white', and so on, assume concrete, i.e., logographic roles in written language, remembering that even then cuneiform signs are often only partial representations of contextually implied grammatical forms of words.

Although dating to two centuries after the collapse of the last political state whose administration was conducted in the Sumerian language, the literary and lexical texts from Old Babylonian Nippur² certainly offer an on the whole genuine reflection of the writing system, the language and the literary culture of third millennium Mesopotamia, and these texts form the core of the Sumerian dictionary project now underway at the University of Pennsylvania.

Less impressive for literary history, but all the more so for the history of writing, of archaic administration and of political formations, were the French finds in Girsu, modern Telloh.³ The excavations were characterized by a feverish tempo, and despite the correspondingly slight attention paid to archaeological methodology and the agitated demand for antiquities, however they were acquired, felt from abroad, some 60,000 texts dating to the third millennium were apparently recovered from administrative contexts.⁴ A further 20,000 exemplars, including nearly all those deriving from the pre-Sargonic Lagash period,⁵ were plundered between regular seasons.⁶ These archives build the most complete and continuous record of administration, and necessarily of writing and means of accounting, available to us from the second half of the third millennium. Their importance compared to the literary archives from Nippur may be seen above all in their contemporaneity, in the fact that they contain tablets

² The massive site was situated about half-way between Baghdad and Uruk on what Steinkeller has referred to as the border between Sumerian south with a strong tradition of city-states, and a Semitic northern Mesopotamia marked more by regional polities. This location may have played a role in the 'special status' Nippur was apparently accorded throughout the third millennium. Even in the archaic periods, Uruk scribes included in the lexical list of city names the toponym EN₆.KID₆ (=NIBRU) in second place after that representing southern Ur (see R.J. Matthews, MSVO 2, 34-39), so that with high probability archaic levels in Nippur are merely still buried (for those remains recovered see K.L. Wilson, 'Nippur: the Definition of a Mesopotamian Gamdat Nasr Assemblage,' in: U. Finkbeiner and W. Röllig [eds.], *Gamdat Nasr*, 57-89). The unifying effect in Mesopotamia of the city god of Nippur, Enlil, as the chief administrator of the Sumerian pantheon, is a phenomenon well documented in texts from later third millennium archives, pointing to the strong political influence the priestly class in Nippur had on the south, without itself serving as residence of the ruling families. The blessing of the Enlil priests seemed no less critical to Babylonian monarchs than that of the Holy See to rulers in medieval Europe. Finally, the system of domestic trade (so-called 'bala') instituted by Shulgi toward the end of the third millennium, partly to service the Nippur cults, underscored the importance that city enjoyed even in times of great centralization of power. See generally W.W. Hallo, 'A Sumerian Amphictyony,' *JCS* 14 (1960) 88-114; P. Steinkeller, 'The Administrative and Economic Organization of the Ur III State: The Core and the Periphery,' in: McG. Gibson and R. D. Biggs (eds.), *The Organization of Power: Aspects of Bureaucracy in the Ancient Near East*, SAOC 46, Chicago 1987, 19-41 = ?1991, 15-33; Th. Jacobsen, 'Early Political Development in Mesopotamia,' *ZA* 52 (1957) 91-140.

³ See generally A. Parrot, *Tello. Vingt campagnes de fouilles (1877-1933)* (Paris 1948).

⁴ R.K. Englund, *Organisation und Verwaltung der Ur III-Fischerei*, BBVO 10 (Berlin 1990) 3²³; id., *AIO* 40-41 (1993-1994) 98-103.

⁵ Early Dynastic IIIb, documented administratively for the period ca. 2400-2350. See J. Bauer in this volume.

⁶ The rest were with few exceptions from the Ur III period. About half of these texts were acquired by the British Museum, the majority of which remain, like the majority of the texts from regular excavations in the Arkeoloji Müzeleri, Istanbul, unpubl. A start has been made to make both collections accessible to specialists, however; see most recently M. Sigrist, *Messenger Texts from the British Museum* (Potomac, MD 1990) and *Sumerian Archival Texts I: Texts from the British Museum* (Bethesda, 1993), for the BM tablets, B. Lafont, F. Yildiz, *Tablettes cuneiformes de Tello au Musée d'Istanbul. Datant de l'époque de la III^e Dynastie d'Ur*, I (ITT II/1, 617-1038), *Uitgaven van het Nederlands Historisch-Archaeologisch Instituut te Istanbul* 65 (Leiden 1989), and II (ITT II/1, 2544-2819, 3158-4342, 4708-4713), *Uitgaven van het Nederlands Historisch-Archaeologisch Instituut te Istanbul* 77, (Leiden 1996) for those in the Istanbul museum.



composed and written by scribes educated in active schools, who thus reflected the historical moment, and not the often legendary past, of the texts' contents. Indeed, beyond the immediate administrative history recorded in the many thousands of documents from Girsu, the best examples of Classical Sumerian were found on statues and clay cylinders from the period just prior to the Ur III dynasty, the Lagash II period with its temple-building records of Gudea. Some twenty years after commencement of excavations at Girsu, German archaeologists discovered an archive of texts in Fara, ancient Shuruppak, in the far south of Babylonia dating to the Early Dynastic IIIa Fara period.⁷ The semi-pictographic nature of the script employed in these texts allowed of a paleographic dating of the period to a time at least several generations before the earliest pre-Sargonic Lagash texts, the royal inscriptions of the founder king Ur-Nanshe from ca. 2500, and thus to about 2600 B.C. This is, then, the state of our knowledge of early cuneiform at the turn of the 20th century. And at just this time, finds not from Mesopotamia, but rather from Susa in western Persia, would enter the academic discussion with clear evidence of a stage of writing substantially earlier than anything then known from the Babylonian alluvium. The French Assyriologist V. Scheil commenced publication of the first such documents in 1900 which had been sent to join the collections of the Louvre, then published two hundred more in 1905.⁸ These so-called proto-Elamite accounts can now be dated with some security to ca. 3000-2900 B.C. Although the system of writing employed in the texts seems a script isolate, i.e., there were apparently no graphic precursors (with the reasonably argued exception of several proto-cuneiform signs)⁹, and no successors to the proto-Elamite writing system as was the case with the earliest stages of cuneiform, and although the language presumably represented by the script remains undeciphered,¹⁰ still the numerical systems employed in the texts and in

⁷ Summarized by H.P. Martin, *Fara: A Reconstruction of the Ancient Mesopotamian City of Shuruppak* (Birmingham 1988). See M. Krebernik in this volume.

⁸ V. Scheil, *Textes élamites-sémitiques. Première série, MDP 2* (Paris 1900) and *Textes élamites-sémitiques. Troisième Série, MDP 6* (Paris 1905). Some 1,450 proto-Elamite tablets from Susa have been published since. See W.C. Brice, "The Writing System of the Proto-Elamite Account Tablets of Susa," *Bulletin of the John Rylands Library* 45 (1962-1963) 15-39; P. Meriggi, "Altsumerische und proto-elamische Bilderschrift," *ZDMG* Spl. 1 (1969) 156-163; id., *La scrittura proto-elamica I-III* (Rome 1971-1974); A.A. Vajman, "A Comparative Study of the Proto-Elamite and Proto-Sumerian Scripts" (in Russian), *VDI* 1972/3, 124-133 (English summary p. 133; German translation in *BaM* 20 [1989] 101-114); J. Friberg, *The Early Roots of Babylonian Mathematics I-II* (Göteborg 1978-9); P. Damerow and R.K. Englund, *Tepe Yahya. Some 100 unedited proto-elamite fragments currently housed in the Louvre are being prepared for publication by M. Salvini; of the smaller collections, I currently count twenty more unpublished tablets in the Museum of Archaeology and Ethnology of the University of Sao Paulo (circumstances of acquisition unclear), seventeen from Tall-i Malyan (ancient Anshan; and possibly more from Susa) in the Teheran Museum, and nine in the École biblique, Jerusalem (presumably deposited by V. Scheil and therefore from Susa).*

⁹ See most recently P. Damerow and R.K. Englund, *Tepe Yahya*, pp. 4-7 and 53-60. We noted pp. 21-28 the clear evidence for a direct borrowing from Mesopotamia of numerical sign systems employed in the proto-Elamite accounts.

¹⁰ P. Meriggi, "Der Stand der Erforschung des Proto-Elamischen," *JRAS* 1975, 105, and *La scrittura proto-elamica I* (Rome 1971-1974) 172-184, isolated, and attempted to analyze as to frequency of initial or final position the signs most commonly used in presumable personal names in proto-Elamite texts. P. Damerow and I have noted in *Tepe Yahya*, 4-5¹⁴, the reasons for skepticism in considering his results, including the

Period	Writing Phase	Historical Developments
3400		
3300	Clay bullae and numerical tablets	Beginning of large-scale settlement of Babylonia
3200	Archaic texts from Uruk: Writing Phase Uruk IV, Writing Phase Uruk III	First urban centers
3100		Age of early civilization
3000	Jemdet Nasr	
2900	Early Dynastic I	
2800		Archaic texts from Ur
2700	Early Dynastic II	Formation of large irrigation networks
2600		Texts from Fara
2500	Early Dynastic III	Rival city-states
2400		Old Sumerian texts
2300	Dynasty of Akkad	First regional state
2200		
2100	Gudea of Lagash Ur III	Centralized state of the 3rd Dynasty of Ur
2000		Neo-Sumerian texts

Figure 2: Third millennium chronology

several cases apparent pictograms of animals and in particular vessels, aided in the correct description of the texts as the oldest then known from the Near East.

The first Mesopotamian tablets dating to the period generally called Uruk III/Jemdet Nasr (ca. 3100-3000 B. C.,¹¹ and so roughly contemporaneous with or shortly before the proto-Elamite texts unearthed in Susa) were believed to have been excavated by illicit diggers of the north Babylonian mound Jemdet Nasr¹² and sold in Baghdad in a large lot to the

rather numerous exceptions to his implied rule of standardized sign sequence and his unsupported assumptions that personal names were written syllabically and that "proto-elamite" was a precursor of Old Elamite dating to the late Old Akkadian period, some 700 years after the period of the proto-Elamite archives. I.J. Gelb, "Methods of Decipherment," *JRAS* 1975, 95-104, offers a sobering view of the prospects for further decipherment, based on conventional cryptanalytical methods, of such scripts as the proto-Elamite.

¹¹ The chronology of these early texts is based primarily on a sometimes uncertain connection of tablet finds to the late Uruk archaeological levels found in the excavations of Uruk, specifically Uruk IV and III. See below for details.

¹² The small mound ca. 30 km to the northeast of Kish derives its name from the Iraqi Arabic 'hillock of [Sheik] Nasr'.

German excavators of Fara in 1903, and in a smaller lot sometime before 1915.¹³ The former 'archaic,' or 'proto-cuneiform'¹⁴ tablets, 35 in number and at the time the oldest written documents available for study on earth,¹⁵ inexplicably disappeared in the collections of the Berliner Staatsmuseen, to be recovered only thirty years later and published as an interesting appendix to the volume containing the first mass of archaic texts found in Uruk in the late 1920's.

Somewhat better treatment was afforded the second lot. The Parisian dealer J. E. Géjou purchased these two dozen tablets sometime after 1915, and sold them in smaller groups, the first before 1920 to the Parisian antiquities dealers Dumani Frères, the second and third in 1924 to representatives of the British Museum and the Louvre, respectively. Nearly all were published in the years 1927-1929.¹⁶

2.1. JEMDET NASR

In the March of 1925, a Hilla dealer offered among other antiquities a number of archaic tablets from Jemdet Nasr to the excavators of the large mound Kish, E. Mackay and S. Langdon, after himself traveling to Jemdet Nasr to confirm the existence of more tablets.¹⁷ procured the necessary funding and undertook to excavate the site's largest mound (Mound B). The first campaign began in early January and ran through mid March of 1926. This season proved to be by far the most successful, since within an archaeological level resulting from an apparent ancient conflagration, Langdon with his troop of between 12 and

¹³ Cf. V. Scheil, RA 26 (1929) 15.

¹⁴ The designation proto-cuneiform has been chosen to replace the misleading "proto-Sumerian" still encountered in some publications, since it is at present not possible to identify the creators of the earliest Mesopotamian system of writing; see my remarks in JESHO 31 (1988) 131-133⁹.

¹⁵ Some few stone inscriptions in earlier circulation have been ascribed to the archaic period. Despite the late Uruk appearance of the iconography on the noted Blau tablets of shale, their inscriptions are probably to be dated to the ED I period (cf. P. Damerow and R.K. Englund, BaM 20 (1989) 137, and my remarks in ATU 5, 12⁴⁷, against the most recent Uruk III dating by I. J. Gelb, P. Steinkeller and R.M. Whiting, Earliest Land Tenure Systems in the Near East: Ancient Kudurrus, Text, OIP 104 (Chicago 1991) 39-43; indeed, the apparently conventional dating by the authors of all of their kudurrus 1-11 to the Uruk III period is in each case questionable, for which see my remarks loc.cit.).

¹⁶ The 12 Louvre tablets were copied and published with limited commentary by F. Thureau-Dangin in RA 24 (1927) 26-29. Five of the seven tablets bought by the British Museum were later included in the 1928 publication of the texts excavated at Jemdet Nasr by S. Langdon, The Herbert Weld Collection in the Ashmolean Museum: Pictographic Inscriptions from Jemdet Nasr [...], OECT 7 (Oxford 1928). All published and unpublished texts from the site have now been edited by R.K. Englund and J.-P. Grégoire, MSVO 1 (Berlin 1991). All the British Museum and Louvre tablets together with five tablets at Dumani Frères, finally, seem to have been inspected and copied by V. Scheil some time before they were distributed in Paris and London. The five tablets from the original lot which came into the possession of Dumani Frères were bought by James Breasted of the Oriental Institute, Chicago, in 1920 (see MSVO 1, 74). Scheil published his copies of these latter tablets in RA 26 (1929) 15-17, including the tablet RA 26, 16, no. 3, which seems to have been lost in or on its way to Chicago. See now MSVO 1, pp. 34-35, to the tablets accessioned with the sigla A (Oriental Institute, University of Chicago), AO (Louvre) and BM, (re-)edited there.

¹⁷ E. Mackay, Report on Excavations at Jemdet Nasr, Iraq, Field Museum of Natural History, Anthropology, Memoirs 1/3 (Chicago 1931) 225.

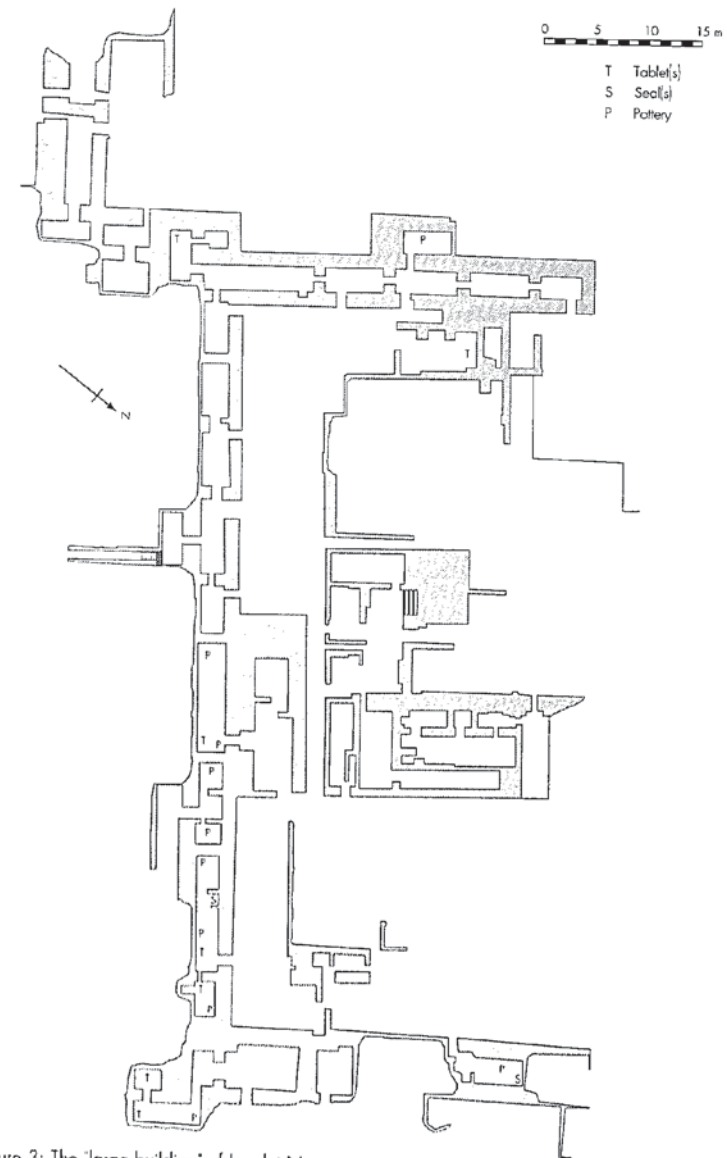


Figure 3: The 'large building' of Jemdet Nasr

60 workmen discovered among other artifacts over 150 and possibly as many as 180 proto-cuneiform tablets¹⁸ in various rooms of a large building situated in the northeast section of Mound B and described by him and others as the oldest palace known from the ancient Near East (see figure 3¹⁹). Many of these tablets bore seal impressions.²⁰ Unfortunately, the find spots of the individual tablets in the rooms of the large building were not recorded; the excavators merely marked with a 'T' those areas in which tablets were found. Earlier work in Kish led by Mackay resulted in the discovery there of a small number of proto-cuneiform texts.²¹ All texts and seal impressions from Jemdet Nasr and Kish have in the meantime been re-edited by J.-P. Grégoire and the author, in collaboration with R.J. Matthews.²²

Langdon became gravely ill at the end of the first Jemdet Nasr campaign and was unable to continue work there the following year. L.Ch. Watelin as Kish field director in 1928 led the excavation at Jemdet Nasr in March of the same year and was able with some 120 workmen over a period of 10 days to recover but very few tablets, of which most appear to have been from post-archaic periods.²³

The archaic tablets from Jemdet Nasr date without apparent exception²⁴ to the Uruk III period and are remarkable for the breadth of topics they cover, including accounts of field

¹⁸ 165 tablets were first published in OECT 7. All texts from the site have now appeared in R.K. Englund and J.-P. Grégoire, *MSVO 1*. The discrepancy between the number 165 and the 194 publication numbers in OECT 7 is explained there, pp. 11-12; see also p. 7.

¹⁹ See the report by Langdon, 'Ausgrabungen in Babylonien seit 1918,' *Der Alte Orient* 26 [1927] 3-75. A new excavation of the mound was begun in 1988 by the director of the British Archaeological Expedition to Iraq, R.J. Matthews, with an eye to recovering the rest of Mound B, re-examining the confusing architecture of the building, and to researching the poorly understood transition from Uruk III to Early Dynastic I. The Iraqi invasion of Kuwait, however, cut these efforts short. Cf. R.J. Matthews, 'Excavations at Jemdet Nasr, 1988,' *Iraq* 51 [1989] 225-248 + pls. 33-34 [especially pp. 228-231 with reference to J. Margueron, *Recherches sur les palais mésopotamiens de l'âge du Bronze* [Paris 1982] 32]; id., 'Excavations at Jemdet Nasr, 1989,' *Iraq* 52 [1990] 25-39; id., 'Jemdet Nasr: the Site and the Period,' *Biblical Archaeologist* 55 [1992] 196-203; id., *MSVO 2*. Matthews is more cautious in his identification of the function of this structure, referring simply to 'Langdon's large building'.

²⁰ R.J. Matthews, *MSVO 2*.

²¹ Definitely identified as from Kish are only the tablets *MSVO 1*, 205 (fragment of a damaged tablet with an account of small cattle; from mound Z, possibly not archaic); *MSVO 1*, 207 (fragment with a grain account); *MSVO 1*, 224 (nearly complete but damaged tablet with an account of sexagesimally counted objects, from the palace; cf. OECT 7 to sign no. 128); *MSVO 1*, 241 (fragment with an account of sexagesimally counted objects; probably not archaic, see L. Watelin and S. Langdon, *Excavations at Kish IV 1925-1930* [Paris 1934] p. 37 [W 1929] found unnumbered 24.8.1912); *MSVO 4*, 74 (a polished limestone tablet, first published by S. Langdon, *Excavations at Kish I* [Paris 1924] 99; this tablet has mistakenly been identified as an example of Uruk IV script found outside of Uruk, cf. my remarks in *MSVO 4*, p. 28).

²² *MSVO 1-2* (Berlin 1991 and 1993, respectively).

²³ H. Field, *The Track of Man* [...] (Garden City, NY, 1953) 177. According to extant Ashmolean museum records, at least two (*MSVO 1*, nos. 66 and 150) of the tablets published by S. Langdon in *JRAS* 1931, 837-841, and represented by him as having come from the Watelin excavation were in fact accessioned in the year 1924 and may have been part of the Parisian Géjou group discussed above. The only extant reference to the find spots of the Watelin tablets is to be found in a sketch in a letter from the excavator to Langdon; see P.R.S. Moorey, *Kish Excavations 1923-1933* (Oxford 1978) 149-150.

²⁴ There were four questionable finds in this regard. The two texts *MSVO 1*, 236-7 were apparent examples of what is generally called 'numerical tablets'; however, neither text had been impressed with a cylinder

management, grain harvest, storage and distribution, mixed records of different kinds of commodities, lists of personnel, but very few documents from the management of domestic animals, in contrast to the very numerous records of small and large cattle farming known from Uruk. The size of the fields recorded in the texts *MSVO 1*, 1-6, is such that their theoretical grain harvest could feed a population of 3000+, that is, a household larger than one would imagine the size of the tell itself could have supported. One, and possibly two school texts were unearthed in Jemdet Nasr, bearing evidence of the teaching of proto-cuneiform there.

2.2. UGAR

As stated above, nearly a quarter of a century before the first archaic tablets from Mesopotamia were unearthed during the 1926 excavations of Jemdet Nasr, some 35 archaic texts and text fragments from Babylonia found their way via the antiquities market into the possession of the Berliner Staatsmuseen. These for the most part fully preserved tablets were forgotten²⁵ until A. Falkenstein began work in 1931 on the over 700 archaic documents uncovered in the three German campaigns at Uruk conducted between 1928 and 1931²⁶ and was made aware of their existence by P. Jensen.²⁷

Primarily due to the appearance on one of the purchased tablets of a seal impression well attested on tablets recovered at Jemdet Nasr, Falkenstein assigned these texts to the same

seal, as was common practice with the many other numerical tablets found in Uruk and elsewhere. All of these texts would appear to derive from archaeological strata either without further written issuance, or, in the case of Uruk and Susa, immediately preceding those levels containing ideographic tablets. Lack of excavation records makes a judgment of the meaning of such unsealed texts at Jemdet Nasr impossible; they may represent idle practice of a student. In like fashion, the two texts *MSVO 1*, 238-9, are both tags with holes through their long axis indicating that they had been hung on string. Although the signs impressed on these small lozenge-shaped tablets could date from both the Uruk IV and the Uruk III periods, the seeming numerical strokes impressed on both contrast to the practice of similar tags known from the Uruk IV period in Uruk, which were in the form of a pillow and contained only ideograms (see *ATU 5*, p. 33 to *W 6759*, and fig. 18 below; the only exception, *W 14330*, appears to be of Uruk III date).

²⁵ The editor of the Fara texts in the same museum, A. Deimel, was unaware of the existence of the archaic texts during his study of the Fara material in 1920-1921. He included in the first volume of this Fara work, *Liste der archaischen Keilschriftzeichen*, *WDOG 40* [Leipzig 1922] pp. 73-75, copies of all archaic inscriptions known to him, including the only other proto-cuneiform text (now *MSVO 4*, 72) in the Berlin collection besides the 1903 archive which entered the museum prior to the influx of Uruk tablets after 1928.

²⁶ See below to *ATU 1* published in 1936.

²⁷ Presumably, the news of the Uruk finds reminded Jensen of the existence of the archive of originally 36 pieces purchased in 1903 [two fragments published under the numbers *ATU 1*, 651 and 653, were suspected by Falkenstein p. 43 of joining 'ohne Anschluß'; further inspection of the two pieces resulted in a physical join, reducing the collection to 35], which the emeritus professor from Marburg had likely inspected as a former student of E. Schröder and close friend of A. Nöldcke in Berlin. Jensen brought this text corpus to Falkenstein's attention, who decided to include photographs of the texts in his planned publication of the Uruk texts. See the photos *ATU 1*, nos. 621-656, now copied and re-edited as *MSVO 4*, nos. 1-35.

site.²⁸ Written evidence suggests, however, that the tablets in fact derive from the site of Uqair some 30 miles south of Baghdad, to the northwest of Jemdet Nasr (see figure 1).²⁹ This site, excavated in the war years 1940-41 by S. Lloyd and F. Safar, consisted also of two main mounds, of which Mound A contained a Late Uruk settlement surrounding a temple complex, the 'Painted Temple'. A sounding cut to the east of this temple opened a structure identified by the excavators as a chapel (figure 4), in the debris of which three, and inside of which one tablet of Uruk III date were found.³⁰ These accounts shared with the 1903 texts in Berlin the sign combination $KU_{6a} RAD_0 UR_2$, presumably representing the ancient settlement Urum.³¹

The modest number of texts which can be ascribed to 'Uqair' do not offer a secure basis for a judgment of the economic nature of the archaic settlement.³² Accounts dealt with grain administration, small cattle, fresh and dried fish, dried fruits and products from animal husbandry, metal objects and textiles, laborers or slaves, and fields. All accounts record amounts of goods which seem consonant with the mixed economy of a single modest, self-sufficient household.

²⁸ ATU 1, p. 4, referring to no. 656 (now MSVO 4, 15).

²⁹ J. Friberg, ERBM II, 10-11, tentatively ascribed the texts to Uqair on the basis of script and format, a view repeated and expanded upon by M.V.V. Green in 'Urum and Uqair,' ASJ 8 (1986) 77-83, based on sign combinations, in particular $KU_{6a} RAD_0 UR_2$, contained in the texts which were common with notations on tablets deriving from regular excavations at Uqair. R.J. Matthews has most recently in MSVO 2, 30-31, reviewed this issue, which is complicated by the fact that on one of the tablets the same seal impression is found as that of a large number of tablets from Jemdet Nasr, as had been noted earlier by Falkenstein (preceding n.), and I have noted (ATU 5, 119) that the occurrence of tablets which had been sealed in a city other than that in which they were found is extremely rare in third millennium Mesopotamia. It thus remains to be shown that the 'Uqair' texts are not in fact from Jemdet Nasr, as Falkenstein suspected, specifically from an administrative unit in that city associated through the putative city league to Uqair; moreover, since no further information about the provenience or circumstances of purchase of the 1903 texts is at present available, it is important to remember that in the year of their acquisition only the excavations at ancient Shuruppak (and possibly those of Girsu following the death of E. de Sarzec in 1902) would have offered ready archaic levels for tablet theft.

³⁰ See S. Lloyd and F. Safar, "Tell Uqair. Excavations by the Iraq Government Directorate of Antiquities in 1940 and 1941," JNES 2 (1943) 131-58, in particular pp. 155-158 + pls. 30-31. Incidentally, Lloyd *op.cit.* p. 135 wrote diplomatically that work at Uqair, resumed on April 13, 1941, "was interrupted by political events in May of that year, but was again continued in June ...". The political events referred to were the British-Iraqi hostilities in May resulting from the attempt by the Rashid Ali government to modify, in favor of the Axis powers, the Anglo-Iraqi Treaty terms of 1930 governing wartime conditions. In the short course of this period of unrest, A. Falkenstein in June participated in the only German landing of the war in Iraq, which was designed to aid in a general uprising against British presence in the country by nationalists and fascist sympathizers; the Orient expert was able to escape British capture by furtively returning overland to Syria (see W. Kohlhaas, *Hitler-Abenteuer im Irak* [Freiburg 1989]), while at the same time Lloyd was on his way back to Uqair from Baghdad - openly.

³¹ P. Steinkeller, "On the Reading and Location of the Toponyms UR-U.KI and A.HA.KI," JCS 32 (1980) 23-25.

³² The texts have now been collected and republished as MSVO 4, nos. 1-40.

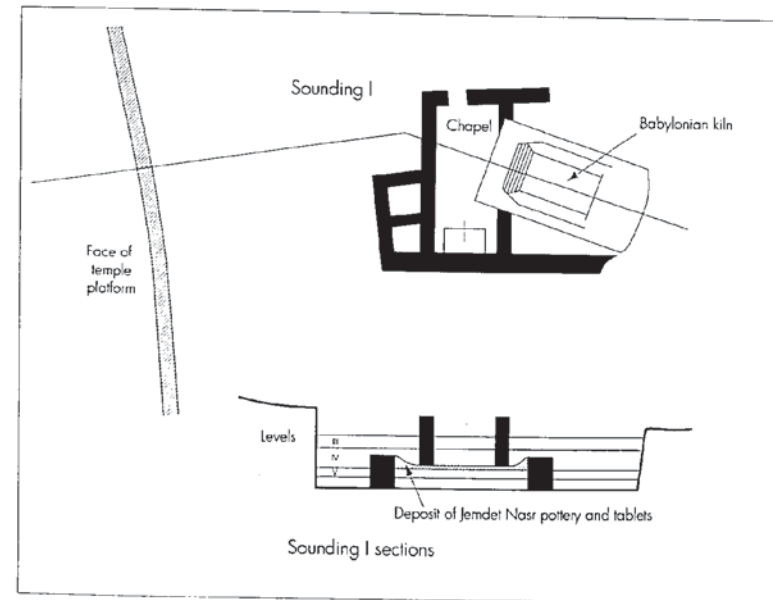


Figure 4: Tablet loci at Uqair
Plan of the presumable chapel ca. 15 meters east of the Painted Temple of Uqair, below which were found pottery and tablets of Uruk III date (after S. Lloyd and F. Safar, JNES 2 [1943] pls. IV and VI).

2.3. LARSA?

The provenience of a group of 27³³ exceptionally well preserved tablets, all bought from antiquities dealers, can only be conjectured. P.E. van der Meer purchased 17 of the tablets in this group while inspecting oriental collections in the vicinity during his work at the excavations of Kish in 1935.³⁴ In his publication of the texts the following year,³⁵ van der Meer stated that the tablets in all likelihood came from a site close to Kish, probably Jemdet Nasr. The common underwriting officials $PA_0 AN MAR_0$ and $NAM_2 BU_0 PAP_0$ attested in these tablets and in texts from two other small collections, one bought by the Iraq Museum,

³³ Now collected and republished as MSVO 4, nos. 41-67.

³⁴ From a paper read by W. Delsman, Katholieke Universiteit, Nijmegen, delivered at the occasion of the presentation of the van der Meer collection as a permanent loan to the Vrije Universiteit, Amsterdam, on 21 February 1989, p. 2.

³⁵ "Dix-sept tablettes semi-pictographiques," RA 33 (1936) 185-190. Of the 17 texts published by van der Meer, his no. 13 (p. 190) apparently never entered the Nijmegen, and so is not in the present Vrije Universiteit collection; see F.A.M. Wiggermann, *Aan de wieg van het schrift: Mesopotamische spijkerschrifttabletten uit 2900-400 v.C.* (Exhibition catalogue, Vrije Universiteit Amsterdam, 24.4.-9.6.1992).

Baghdad, in 1933,³⁶ the second by the Yale Babylonian Collection in 1934,³⁷ suggest they were found together. The only information available from any of the individuals involved in the sale of these tablets was given officials of the Iraq Museum at the time of their 1933 purchase by a dealer in Baghdad, who stated that the tablets derived from (illicit) excavations at Senkere, ancient Larsa. Falkenstein discounted this information, however, and proposed instead that these texts as well as those published by P.E. van der Meer had been stolen during regular excavations of Uruk, with which he was associated.³⁸ Indeed, Uruk would at the time have been a likely target for thieves interested in ready access to tablet levels and A. Falkenstein may have been privy to information he was for professional reasons unable to divulge – and dealers are notorious sources of bad information –, yet the reticence of Falkenstein and others to ascribe tablet finds to sites which had otherwise produced no comparable material may have been overdone. We know from the archaic list of Babylonian toponyms³⁹ that Larsa assumed third place behind Ur and Nippur and before Uruk and so must have been a major center in the archaic period,⁴⁰ we know that the sign combination U₂ AB/ARARMA₂ (=Larsa) is also attested in seven archaic administrative texts from Uruk, in at least two of which the geographical nature of the combination is clear,⁴¹ and we know that the plundering of the site Senkere in the early 1930s was so annoying to its excavator A. Parrot that he was relieved to terminate his work there⁴². Larsa, specifically a temple household within the settlement designated AN MAR₆,⁴³ can thus not be dismissed as a possible source of this archive, which deals almost exclusively with the administration of grain, in particular by the two officials named above and a small number of other officials apparently active in AN MAR₆. The accounts in this group of rather substantial

³⁶ A. Falkenstein, "Archaïsche Texte des Iraq-Museums in Bagdad," *OLZ* 40 (1937) 401-410. The purchase was presumably made by the Uruk excavator J. Jordan, at the time director general of the Iraqi antiquities department.

³⁷ F.J. Stephens in G.G. Hackman, *Sumerian and Akkadian Administrative Texts from Predynastic Times to the End of the Akkad Dynasty*, BIN 8 (New Haven 1958) p. 4. The accession of the first three archaic texts published in BIN 8 (nos. 3, 4 and 5) in the Collection of James B. Nies (=NBC), of the last (no. 9) in the Yale Babylonian Collection (YBC), implies they did not enter the United States in the same lot. The different subject matter (small cattle) and subscribing official [EN₆ KU_{6a} RAD₆] suggest that this tablet probably does not derive from the same archive and is possibly not from the same site as the other 'Larsa' texts.

³⁸ *OLZ* 40 (1937) 401.

³⁹ See below, figs. 25-27.

⁴⁰ The version of this list contained in the Jemdet Nasr 'city seal' places Larsa before Nippur; see R.J. Matthews, *MSVO* 2, 36-38 (to ARARMA₂).

⁴¹ *ATU* 5, pl. 13, W 6705, g obv. i 1 [?; the identification of the sign is not certain]; W 17729, g obv. i 1 (unpublished), W 17729, o obv. i 2 (see *ATU* 3, pl. 88), W 20327, 5 obv. i 2 (see *ATU* 2, pl. 32), W 20511, 2 obv. v 2a5 and 4a (unpublished), W 24033, 1 obv. i 3 (see A. Cavigneaux, *BaM* 22 [1991] 117), and W 24004, 3b i 2 [1N₁ ARARMA₂ / 2N₁ SAL, following 1N₁ UR₁ / 1N₁ SAL and before [col. ii] 1N₁ BU₆+BU₆+NA_{2a} / [SAL], a list of female slaves donated to Uruk cults by major Babylonian towns?; see A. Cavigneaux, *BaM* 22, 78).

⁴² A. Parrot, *RA* 30 (1933) 175. See also the comments of L. Goldstein and K. Kintigh, *American Antiquity* 55 (1990) 585-591; C. Wilcke, *FS Sjöberg* 557-571.

⁴³ Although the most common personal designation in the archive is the sign combination PA, AN MAR₆, AN MAR₆ is attested in isolated contexts suggestive of a sponsoring institution; see *MSVO* 4, pp. 14-19.

grain quantities⁴⁴ seem to support the contention that they reflect a household economy smaller than that of Uruk of the Late Uruk period,⁴⁵ but still larger than that registered in the grain accounts both from the 'Uqair' group,⁴⁶ and from the site Jemdet Nasr.⁴⁷

2.4. OTHERS

One small, and one large archive nearly complete the survey of those text groups from the archaic period which did not derive from regular Uruk excavations. Two small texts come from excavations of Tell Asmar⁴⁸, demonstrating that elites were active in the Diyala valley in the Late Uruk period. The second archive consists of 85 extraordinarily well preserved tablets from the former Erlenmeyer collection.⁴⁹ The archive deals above all with the administration of an archaic brewery and related grain depot; although this activity is poorly attested in the Uruk texts, the archive was, based on the use of professional names highly reflective of the Uruk professions list⁵⁰ and on the common attestation of the brewery office "KU ŠIM"⁵¹, presumably pilfered from either Jemdet Nasr or Uruk in the late 1950's.⁵² There

⁴⁴ Compare *MSVO* 4, nos. 44 (totals corresponding to 4N₃₀ 2N₄₀ 2N₁₀, corresponding to ca. 21,300 liters), 48 (8N₃₀ 1N₁₄ 2N₁, ca. 36,200 liters), 59 (2N₃₀ 2N₄₅ 6N₁₄ 3N₁ 1N₃₀ + 2N₃₇ 1N₄₇ 8N₂₀ 4N₃₅ + [] 2N₁₄ 2N₁ 1N₃₀, ca. 24, 130 liters) and 62 (three subtotals corresponding to ca. 45,000 liters).

⁴⁵ Compare W 17729, ca (notation corresponding to 4711 + N₁, or ca. 118,000 liters), W 20740, 6 (two subtotals of barley and emmer wheat corresponding to 4764 N₁ or ca. 119,000 liters), W 22123, c (a total corresponding to 5400 N₁ or ca. 135,000 liters; all three texts unpublished), and the account W 19726, a (a total corresponding to 36,032.2 N₁ or ca. 900,800 liters; see P. Damerow, R.K. Englund and H.J. Nissen, *Spektrum der Wissenschaft*, März 3/1988, p. 47, and H.J. Nissen, P. Damerow and R.K. Englund, *Archaic Bookkeeping*, pp. 32-34).

⁴⁶ Compare *MSVO* 4, 1-2 (totals corresponding to just 660 N₁, or approximately 16,500 liters).

⁴⁷ Compare *MSVO* 1, 65 (notation corresponding to 600 N₁ or approximately 15,000 liters); *MSVO* 1, 42 (somewhat more, but since it is from the antiquities market, its provenience remains uncertain). According to highly speculative models of calculation used in *MSVO* 4, p. 17⁴⁶, the often cited field measurement texts *MSVO* 1, 1-6, could represent a grain notional range of from 14,350 to 172,800 N₁, or ca. 360,000 to over 4 million liters for the largest account (see *MSVO* 4, p. 17⁴⁶).

⁴⁸ *MSVO* 4, nos. 79-80; see fig. 1.

⁴⁹ See H.J. Nissen, P. Damerow and R.K. Englund, *Frühe Schrift und Techniken der Wirtschaftsverwaltung im alten Vorderen Orient* (2nd edition, Berlin 1991; now available in English translation as id., *Archaic Bookkeeping: Early Writing and Techniques of Economic Administration in the Ancient Near East* [Chicago 1993]), and P. Damerow and R.K. Englund, *The Proto-Cuneiform Texts of the Erlenmeyer Collection*, *MSVO* 3 (Berlin, forthcoming). The majority (80) of the texts from this archive entered the antiquities collection of H. and M.-L. Erlenmeyer in the mid-fifties (only eight tablets were missed: the five texts from the Bibliotheca Bodmeriana, Geneva, published by E. Sollberger, "Sumerica," *ZA* 53 [1959] 1, 3, two tablets purchased in the 1960s (?) by G. Ligabue, Venice, and one bought by M. Thiery and published by J.-P. Gregoire, *MVN* 10, 81).

⁵⁰ See figs. 32 and 35 below.

⁵¹ On an unpublished tablet from Uruk (unnumbered) in the Iraq Museum, but note also the attestation of the sign combination KU₁₁ ŠIM₁ in the Jemdet Nasr text *MSVO* 1, 216 obv. i 2, and further the peculiar form of the sign EN₁ in the combination EN₁ SAL, 'wife of the EN', found both in Erlenmeyer texts (for example, in *MSVO* 3, nos. 61, 63 and 64; see below, fig. 72) and in those from Jemdet Nasr (especially in the field texts *MSVO* 1, nos. 1, 2, 3 and 5; see below, fig. 83).

⁵² It may be stated for the record that the recently deceased J. van Dijk in a personal communication reported that he was shown the spot in Uruk where the tablets were removed, apparently in connection with the

is some evidence in the antiquities markets in Europe, in particular in London, that archaic levels of one or more sites have been reached by recent irregular excavators; the extent of this post-Kuwait-war activity will only become apparent in the coming years.⁵³

2.5. URUK

Despite their often impressive state of preservation, an effect on the one hand of the firing of the Jemdet Nasr tablets which took place in antiquity, on the other of the sifting effect the antiquities markets have on tablets leaving Iraq and destined for a buying public in Europe and the United States, the sizes, and the temporal breadth of those archives pale in comparison with the numbers of tablets unearthed by the German excavations in Uruk. The data base of the Berlin-Los Angeles research project *Archaische Texte aus Uruk* currently comprises some 5410 numbers representing as many archaic texts and fragments from the periods Uruk IV and III. Of this number, fully 5000 represent archaic documents from those levels in the district Eanna of Uruk.⁵⁴

The early excavation and work on the objects from the southern Babylonian site of Uruk are inextricably linked with the names of two German scholars. The archaeologist J. Jordan⁵⁵ and the philologist A. Falkenstein⁵⁶ formed the early core of a group of Germans who have

removal in the same area of the late Uruk 'snake bowl' published in W. Nagel, "Frühe Großplastik und die Hochkulturkunst am Erythräischen Meer," *Berliner Jahrbuch für Vor- und Frühgeschichte* 6 (1966) 30-40 + pls. 2-8. While this must be understood as hearsay once removed, van Dijk had broad experience in Iraq, in particular with the Uruk finds, and was a garrulous and inquisitive scholar. The dealer M. Koutoulakis, Geneva, who moved almost the entire Erlenmeyer collection into European hands, was unable or unwilling to make any of the earlier circumstances of the tablets known to me.

⁵³ The confiscation by the Iraqi Department of Antiquities of hundreds of Ur III tablets pilfered in Umma has been widely, if informally reported; so too has the depressed market in London and elsewhere for texts from the same site due to the numbers of pieces currently being offered and their obviously unclear legal status.

⁵⁴ The archaic texts from Uruk are currently available for study in five Berlin publications: A. Falkenstein, *ATU 1* (Berlin 1936); M.W. Green and H.J. Nissen, *ATU 2* (Berlin 1987); A. Cavigneaux, in: A. Cavigneaux et al., "Uruk 33/34," *BaM* 22 (1991) 33-123 ("Die Texte der 33. Kampagne" and 124-163 ("Die Texte der 34. Kampagne") (copies and catalogue of the archaic texts from the 33rd and 34th campaigns); R.K. Englund and H.J. Nissen, *ATU 3* (Berlin 1993); R.K. Englund, *ATU 5* (Berlin 1994). A complete catalogue and four further volumes of archaic administrative documents are now in preparation, and a complete data base of all proto-cuneiform sources will be made available via the internet (currently [December 1997] in preliminary form under the URL <http://early-cuneiform.humnet.ucla.edu/>).

⁵⁵ J. Jordan studied architecture at the University of Dresden, and was introduced to Near Eastern archaeology by W. Andrae. His first excavation experience was with R. Koldewey at Babylon in 1903, then from 1903 to 1912 with Andrae in Assur, and from 1912 as director of excavations at Uruk.

⁵⁶ A. Falkenstein studied under B. Landsberger in Leipzig and completed his dissertation dealing with Sumerian incantations in 1929 (*Die Haupttypen der sumerischen Beschwörung literarisch untersucht*, *Leipziger Semitische Studien*, Neue Folge 1 [Leipzig 1931]). One year later, he assumed a position as research assistant at the Orient-Forschungs-Institut of the Max Freiherr von Oppenheim Foundation in Berlin. In the Vorderasiatisches Museum of the Berliner Staatsmuseen, Falkenstein further pursued his interest in literary texts, seeing to a very rapid completion the exemplary edition of 133 of the 250 such tablets (*Literarische Keilschrifttexte aus Uruk* [Berlin 1931]) discovered just two years earlier as part of the approximately 6000 cuneiform texts and text fragments from the 1928-29 German expedition to Uruk.

mounted yearly campaigns to Uruk since 1928, interrupted only, but often, by the effects of world and regional wars.⁵⁷ The first German campaign took place in 1912,⁵⁸ followed by a long hiatus caused by World War I and the subsequent convulsions in both the German diplomatic relations requisite to academic work in the British protectorate of Iraq and of course the financial capabilities of hard-pressed Weimar Germany to support and conduct large-scale excavations abroad.⁵⁹

Excavations resumed in 1928⁶⁰ when with financing of the *Notgemeinschaft der Deutschen Wissenschaft*, an organization created to secure short-term financing of projects which might otherwise have been irrevocably lost to German scholarship, Jordan began a large-scale attempt to recover the architectural remains of the major mound in the middle of the expansive remains, named, according to later identifications, Eanna, 'House of heaven' (figures 5, 6). A great appeal for the architect Jordan lay in the fact that in this central district archaic building levels were partially exposed, without the often tedious layers of later settlements which had to be removed and dutifully recorded. Nevertheless, the first campaign after the war was spent surveying the mound and making some preliminary cuts in areas including later deposits. Among the great numbers of neo-Babylonian economic documents from that campaign, only 4 archaic tablets were recovered, and these remained unidentified.⁶¹

⁵⁷ The campaigns through 1956 are described in some detail by R. North, "Status of the Warka Excavation," *Oriens* 26 [1957] 185-256.

⁵⁸ See J. Jordan, *MDOG* 51 [April 1913] 47-76, *MDOG* 53 [April 1914] 9-17, and *WVDOG* 51 [Leipzig 1928]. In fact, Uruk had been the object of some historical interest since J. Fraser's visit in 1835, reported in his *Travels in Koordistan, Mesopotamia, &c.*, [...], vol. 2 (London 1840) 139 (calling the mound 'Warka'); W.K. Loftus conducted a short excavation at the site in 1850 and again in archaic levels in the first months of 1854, as the result of which one archaic tablet and some other objects were sent to the British Museum. See J. Reade, "An early Warka tablet," *FS Strommenger* (Munich 1992) 177-179 + pl. 79. The text BM 1851-1-1-217, a numerical tablet of a type heretofore unknown in Uruk, bears a strong resemblance to a specific type of numerical texts from Susa, Tell Brak and Jebel Aruda (cf. A. Le Brun and F. Vallat, "L'origine de l'écriture à Suse," *CahDAFI* 8 [1978] 11-59, particularly p. 47; S.A. Josim and J. Oates, "Early tokens and tablets in Mesopotamia [...]," *World Archaeology* 17 [1986] 358; G. van Driel, "Tablets from Jebel Aruda," *FS Kraus* [Leiden 1982] 12-25). Loftus was also the first to publish a map of Uruk [W.K. Loftus, *Travels and Researches in Chaldaea and Susiana* [...] [London 1857] betw. 160-161], which he had drawn together with H. Churchill during his 1854 visit. R. Koldewey, in a survey expedition (together with the Berlin Orientalist E. Sachau) which resulted in his choice of Babylon as excavation site, examined and presented a detailed report of Uruk. On the 18th of December 1902, finally, W. Andrae visited and drew up a rough map of the ruin, and gathered some surface objects, including a Seleucid period cuneiform fragment from the ligal temple; see A. Kose, "Walter Andrae's Besuch in Uruk-Warka vom 18.12.1902," *FS Boehmer* (Mainz 1995) 299-306. Thus both men with whom Jordan first worked in Iraq had included Uruk among the possible sites of their own excavations.

⁵⁹ British officials in fact authorized R.P. Dougherty of Yale to assume control of the Uruk site in 1920; since Dougherty was unable to organize excavations in due time after the 1920 agreement, however, the director of antiquities in Iraq, S. Smith, returned excavation rights to Jordan.

⁶⁰ The 1928 campaign was designated the first Uruk excavation in the official publications of the excavators.

⁶¹ W 1872, 1-2, 2134 and 2352, see *ATU* 5, pl. 1; see the report by J. Jordan, *Uruk-Warka nach den Ausgrabungen durch die Deutsche Orient-Gesellschaft*, *WVDOG* 51 [Leipzig 1928]; id., *Erster vorläufiger Bericht über die von der Notgemeinschaft der Deutschen Wissenschaft in Uruk-Warka unternommenen Ausgrabungen* (UVB 1), *APAW* 1929/7 (Berlin 1930).

Over 200 archaic tablets and fragments were unearthed in the following campaign of 1929-30,⁶² for which the Assyriologist W. von Soden acted as philologist as replacement for A. Falkenstein, who was completing work on his doctoral candidacy. From 1930 on a research assistant at the von Oppenheim Oriental Institute, Falkenstein was able to participate in the following Uruk campaign of 1930-31,⁶³ in the course of which over 650 texts and text fragments were recovered. The importance of these finds was immediately apparent to the excavation team. Not only were a number of tablets of the Jemdet Nasr, that is, the Uruk III type among the recovered texts – Uruk III period tablets exactly like those published from Jemdet Nasr excavations conducted several years earlier and published by Langdon in 1928 – but the great majority of the archaic finds from the early campaigns were, based above all on paleographic criteria,⁶⁴ still older than the Jemdet Nasr style texts and thus the oldest known texts from Mesopotamia altogether.

Unfortunately, the paleographic identification of archaic Uruk documents would come to play a leading role in Late Uruk chronology, rather than the stratigraphy of the site.⁶⁵ Generally speaking, eighteen stratigraphic layers, counting from top to bottom, were identified within Eanna for the time before the Ur III period. Layer I dates to the Early Dynastic, layer III to the Jemdet Nasr period.⁶⁶ The layers IV to VIII were ascribed to 'Late Uruk'. Excavations have shown that the Uruk III level buildings were erected over the grounds of razed Uruk IV constructions, and that the leveling of the many pits formed in razing the old buildings resulted in substantial earth moving, including the transportation of fresh and already deposited debris from the prior administrative centers. Thus trash heaps of shards, bones and discarded tablets were mixed with ancient excavations of still older debris and used to fill in holes and pits. It is not difficult to imagine the impact this mixing and depositing had on the original archival contexts of the tablets concerned.

The archaeological context of the tablets from the early campaigns is thus heavily contaminated, particularly so in the case of the difficult architectural and above all stratigraphic situation encountered by the excavators in the region, chosen for digging in the 1930-31 campaign, to the immediate southeast of the Ur-Nammu ziggurat in the central district, Eanna (figure 6). The superimposition of diverse building levels reaching from the Uruk III into the Uruk V strata in this area led the excavators first to assume they had uncovered there a homogeneous Uruk IV period monumental building, called by Jordan the "Red Temple".⁶⁷ Subsequent work, however, has weakened the case for a discrete architectural feature,⁶⁸ leaving but remains of walls and floors which seem to be associated with one another in large part through contextual finds, including tablets. The confusing stratigraphic situation is vexing, since it

⁶² J. Jordan, Zweiter vorläufiger Bericht [...] (UVB 2), APAW 1930/4 (Berlin 1931), in particular pp. 28-29 and 43-47 for a short description of the finds.

⁶³ Cf. J. Jordan, Dritter vorläufiger Bericht [...] (UVB 3), APAW 1932/2 (Berlin 1932) pp. 11-12.

⁶⁴ These will be discussed below.

⁶⁵ See the commentary of Falkenstein's 'stratigraphic identifications' by H.J. Nissen in ATU 2, 26-28.

⁶⁶ Layer II has as a defective identification been dropped from current terminology.

⁶⁷ UVB 2, pp. 29-31 with pl. 4.

⁶⁸ H.J. Lenzen, ZA 49 (1950) 12; H.J. Nissen, ATU 2, 28-34; R. Eichmann, Uruk: Die Stratigraphie [...], AUWE 3 (Mainz 1989) pp. 30-31, pls. 1-4 and plan 1.



Figure 5: Plan of Uruk

Each square represents 100x100 meters. The district from which most archaic material was excavated is found in the middle of the mound. Its name Eanna, 'house of heaven,' derives from later identifications.

was precisely in this area that the largest groups of administrative tablets from the paleographic phase Uruk IV were unearthed.

The remains of the Red Temple and thus the tablets found there covered by a leveling of the area carried out in the beginning Uruk III period (Uruk IIIc) are now generally assigned to the building sub-phase Uruk IVa,⁶⁹ dated to ca. 3200 B.C. Large numbers of the pictographic tablets, however, are now ascribed by D. Sürenhagen to the stratigraphic levels Uruk IVc-b, and a small number of so-called numerical tablets (see below) to level Uruk V. Sürenhagen

⁶⁹ Nissen, ATU 2, 29-30, following Lenzen, explains the reasoning behind the correction of the original, paleographically determined dating of the building complex from IVb to IVa.

Texts from the Late Uruk Period

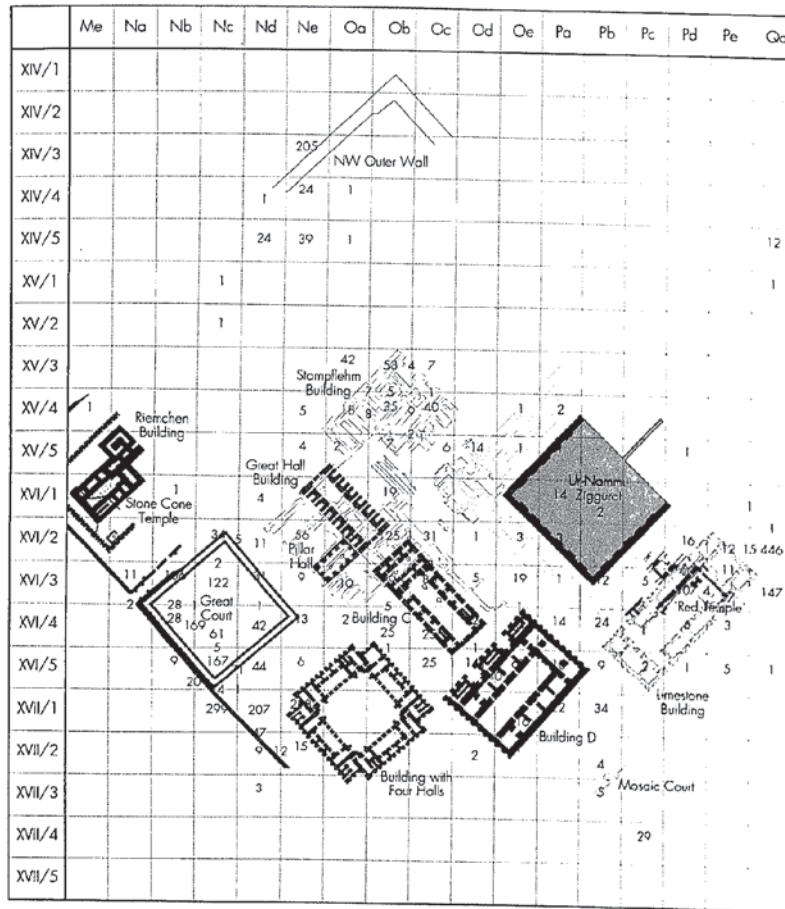


Figure 6: Plan of the central district Eanna. Each square represents 20x20 meters. The numbers of archaic texts found are indicated in the respective excavation squares. The highest concentrations of Uruk IV period texts came from in and around the area of the "Red Temple", that of the Uruk III period from in and around the area of the "Great Court".

Excavations and chronology - Uruk

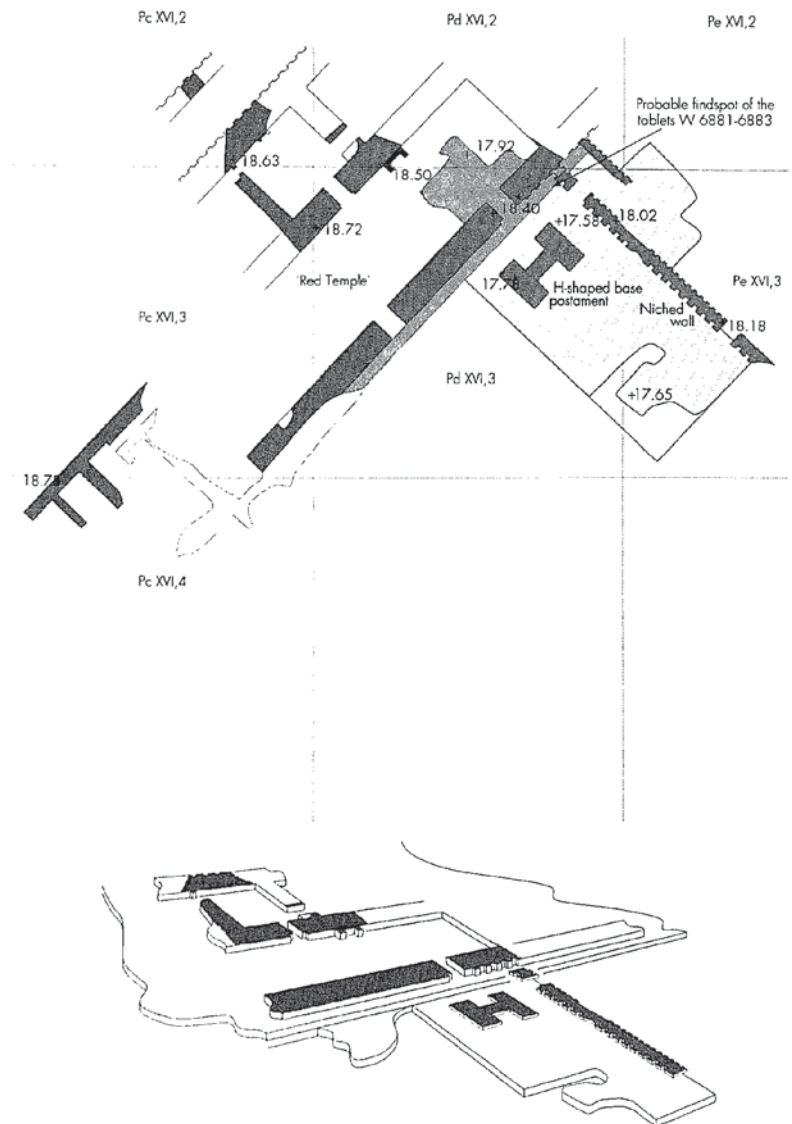


Figure 7: The so-called Red Temple. Wall elevations and the find spot of important numerical tablets are indicated.

bases this ascription on a review of the stratigraphy and architecture of this area and of the seal impressions and pottery found in association with groups of in particular the numerical tablets,⁷⁰ but above all based on his belief that the Red Temple through its association with the pillared terrace to the southwest is to be dated to Uruk IVb and that the niched wall shown in figure 7 above was in fact the enclosure wall of a temple below the Red Temple complex, of which only the H-shaped base postament was preserved. The tablets found in association with this wall will have thus been deposited at the time of the construction of the Red Temple or even earlier. This theory, if correct, would have severe consequences for the now conventionally accepted belief in an explosive development of proto-cuneiform during the Uruk IVa period.⁷¹

Toward the end of the third campaign, and again in the seventh, the Uruk excavators undertook to clear away and examine the remains of the White Temple [figure 8]⁷² in the squares K XVII which exhibited architectural parallels to the larger temple complexes of levels IV and V of neighboring Eanna, two hundred meters to the east. The gypsum tablets found in various rooms of this structure will be discussed in a later section; unfortunately, the stratigraphical relationship of the building complex to the major architectural remains of Eanna cannot, despite the dating trench dug between the two areas, at present be clarified, nor is the relationship of the tablets themselves to the building obvious, as H.J. Nissen has pointed out.⁷³

The publication of the archaic texts from the first three post-war Uruk campaigns appeared in 1936 as the volume *Archaische Texte aus Uruk*.⁷⁴ In this study, Falkenstein surveyed the material and techniques employed in the production of archaic clay documents, the text format of these tablets, and offered an outline of early cuneiform paleography, citing the sources and studies of early tablet archives known at the time.⁷⁵ The contents of the archaic

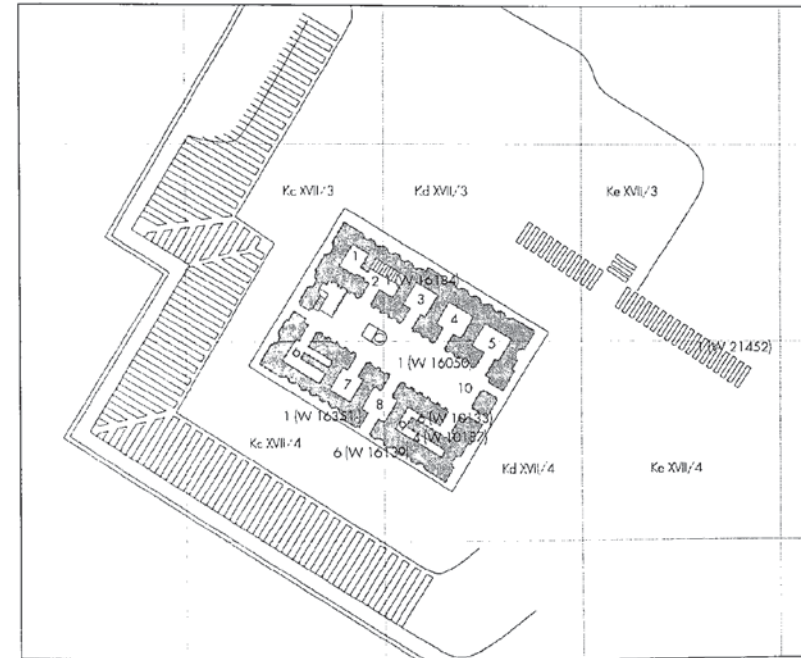


Figure 8: The White Temple from square K XVII in Uruk

⁷⁰ For a preliminary summary of Sürenhagen's arguments for this chronology, hopefully to be laid out in full with publication of his Habilitationsschrift, see his article "Relative Chronology of the Uruk Period [...]," *Bulletin of The Canadian Society for Mesopotamian Studies* 25 (May 1993) 57-70, in particular the figs. 5-7.

⁷¹ The matter will be discussed by H.J. Nissen in the introduction to a complete catalogue of the archaic texts from Uruk to appear as *Katalog der archaischen Texte aus Uruk, ATU 4* (Berlin, forthcoming). It may be noted here in advance of Nissen's catalogue that D. Sürenhagen includes among tablets with a terminus ante quem of Uruk IVb those from the squares Pe XVI, 2 and Pd-e XVI, 3-4 assigned the excavation numbers W6150, 6216, 6611, 6705, 6748, 6759, 6782, 6860, 6881-4, 7204, 7227, 7881-4. R. Eichmann will in his forthcoming AUVVE 14 volume on Uruk architecture offer a detailed review of the original excavation plans and an interpretation of the niched wall contrary to that of Sürenhagen (Eichmann believes this wall lay in the middle of and over the temple remains preserved at about 17.5 m above plain; note that the critical stratigraphic relationship between the niched wall and the southeast wall of the 'Red Temple' could not be clarified, since the section of the niched wall adjoining the Red Temple was completely missing).

⁷² So-called because of the white plaster used on its walls. See E. Heinrich, *Die Tempel und Heiligtümer im alten Mesopotamien* [...] (Berlin 1982) 35-45 and 61-67, summarized in W. Orthmann, *PKG 14* (1975), 132-133, and R. North, *Oriens* 26 (1957) 233-237. The temple was situated on the top level of the so-called Anu Ziggurat.

⁷³ ATU 2, 49.

⁷⁴ Now integrated into a series of the Berlin Uruk Project as ATU 1.

⁷⁵ ATU 1, pp. 4-43.

texts could be roughly divided into two major categories. The large majority of the texts from the early Uruk campaigns were shown to be documents from the administrative sphere of activities, for example, lists of personnel, records of rations distributed to officials, to workers and to livestock, accounts of products deriving from agricultural households and from craftsmen. Far fewer texts contained lists of signs and sign combinations which, the same as two comparable tablets already known from Jemdet Nasr,⁷⁶ represented archaic lexical compendia probably forming part of the curriculum of early scribes.⁷⁷

Tablets unearthed in subsequent campaigns were only very sporadically edited in preliminary reports of the German excavators. J. Jordan was named Director of Antiquities in Baghdad in 1931⁷⁸; consequently, direction of the Uruk excavations was transferred to A. Nöldecke,

⁷⁶ MSVO 1, nos. 242-243, originally published by S. Langdon as OECT 7, nos. 194 and 101, respectively. See now R.K. Englund and H.J. Nissen, ATU 3, 66.

⁷⁷ The lexical lists are treated below, section 5.

⁷⁸ Replacing Sydney Smith in this position on the 21st of March and continuing as director through to mid-November of 1934, thereafter as advisor to Sati al Hasri until 1939, when he was replaced by S. Lloyd. His residency in Baghdad was marked not only by the highly successful continuation of German excavations

who together with the architects E. Heinrich and H.J. Lenzen continued work there into the 11th campaign in 1939, when events in Europe would discontinue German accessibility to Iraq. Above all the architects Heinrich and Lenzen influenced the archaeological planning and execution of the Uruk campaigns throughout this period,⁷⁹ laying free the foundations of the major presumable temples in the Eanna area, including Buildings (Temples) C and D, the Pillar Hall and the Building with Four Halls, the intriguing 'Great Court', the function of which is entirely unclear (see figure 6). Tablets and other debris were used in the leveling and other architectural elements, including wall fill and the bricks themselves, of all of these buildings, in particular in and around the Great Court; however, none of the inscribed remains found could be shown to have been part of the original inventories of the buildings with which they were associated, so that any tentative reconstruction of an archival context of the texts will have to be proposed based on internal criteria.

H.J. Lenzen resumed excavations in Uruk after the Second World War in 1954 and continued work on archaic levels through the late 60's, with first A. Falkenstein, then H.J. Nissen, and finally A. Cavigneaux assuming responsibility for editing the archaic epigraphic finds. Despite the steady discovery of tablets among the debris of excavations subsequent to the early campaigns, no further systematic publication of the texts was presented by the editors following Falkenstein's ATU 1 in 1936 until Nissen and his collaborators in Berlin began to present the results of their cooperative effort to decipher the texts in 1987.⁸⁰

Unfortunately, the level of record keeping by the Uruk excavators on their archaeological, in particular inscribed finds, was, by current standards, inadequate in campaigns before and after the War. As a rule, all objects were recorded according to two criteria: first, the locus

in the south of the country, and by a particularly close relationship to the then director of the Vorderasiatisches Museum in Berlin, W. Andrae, but also by the developments in Nazi Germany and his own apparent anti-Semitism; see Agatha Christie: An Autobiography (London 1977) 561-562. Incidentally, Jordan had good contacts with representatives of the German Reichsaussenministerium in the early war years (see S. Wölffling, 'Die Altertums- und Orientwissenschaft im Dienst des deutschen Imperialismus,' *Wissenschaftliche Zeitschrift der Universität Halle* XX/2 [1971] 90-91) and presumably assisted in the planning of the Deutsches Orientkorps. The stated goal of its Sonderstab Grabba was, according to a memo from the office of J. von Ribbentrop from 6 November 1941, the 'Vorbereitung des deutschen Vormarsches in den arabischen Raum' (Documentation center of the German Democratic Republic no. 368142). A. Falkenstein and H.J. Lenzen belonged to the military arm of the Orientkorps, the Sonderstab Felmy. Jordan died in February 1945 in Berlin.

⁷⁹ Nöldecke was himself an historian of Islamic art who enjoyed some archaeological training with R. Koldewey in Babylon. Cf. the preliminary excavation reports published by Nöldecke, Heinrich, Lenzen and other contributors beginning with UVB 4 (Berlin 1932) through UVB 11 (Berlin 1940), and the considerable number of articles and monographs dealing with specific topics in the Uruk work, including E. Heinrich, 'Kleinfunde aus den archaischen Tempelschichten,' *ADFU 1* (Leipzig 1936); id., 'Die Stellung der Uruktempel in der Baugeschichte,' *ZA 49* (1950) 20-44; id., 'Die Tempel und Heiligtümer im alten Mesopotamien [...]' (Berlin 1982); H.J. Lenzen, 'Die Tempel der Schicht Archaisch IV in Uruk,' *ZA 49* [1950] 1-20; id., 'Mesopotamische Tempelanlagen von der Frühzeit bis zum zweiten Jahrtausend,' *ZA 51* (1955) 1-36; id., 'Die Entwicklung der Zikkurat [...]' *ADFU 4* (Leipzig 1941); A. Falkenstein, ATU 1. The early monographs and reports on the archaeological work are currently being thematically revised in the series *Ausgrabungen in Uruk-Warka: Endberichte* (AUWE).

⁸⁰ M.W. Green and H.J. Nissen, ATU 2. See above, n. 54, for further references.

of the object in excavation squares 20x20m was noted, and second a rough description of the relationship the object bore to some architecturally interesting feature was made. This method of recording often led to entirely horrific generalities about large agglomerations of small finds.

Archival information which might have been derived from the excavated Uruk texts was in great part lost, due both to the recording method of the excavators, but also and fundamentally to the fact that the archaic texts from Uruk formed – seemingly without exception – part of the general debris of pottery shards, animal remains, etc., removed from administrative units of the central district Eanna and either deposited in trash holes or used as fill in constructions of walls and floors. This find situation is of course not only disruptive in any attempt to reconstruct tablet archives of specific periods, but more seriously it exacerbates the difficulties of placing the texts in their chronological framework. Thus the construction levels capping this debris serve as *termini ante quem*, that is, as chronological levels before which the tablets must have served their purpose as communication tools.⁸¹ These stratigraphic aids, with few uncertain exceptions,⁸² have at best been helpful in assigning rough chronological divisions in the inscribed finds, for instance, between texts of Late Uruk and Early Dynastic date, but not between texts of Uruk III and Uruk IVa date, let alone among texts of the subdivisions a-c of the construction level Uruk III in Eanna. In these cases, Falkenstein, Nissen and others have attempted to define paleographical characteristics peculiar to specific subdivisions⁸³ which might serve to define essentially stratigraphic sequences.

Despite these difficulties, cataloguing and research of the Uruk text corpus have shown that in many cases at least the tablets found in particular loci formed substantially coherent and discrete administrative and lexical archives, that is, that often tablets from an individual accounting or school unit will have been gathered and directly deposited at a construction project, thus retaining some of the original integrity of the writing units. Precise information concerning the find locus of the tablets might consequently be expected to aid in the important analysis of archival relationships.

⁸¹ H.J. Nissen has written an extensive commentary on the chronology of the archaic texts in ATU 2, pp. 21-51 ('Datierung der archaischen Texte aus Uruk'), to which I make general reference as the current standard of our understanding of stratigraphic questions relating to the archaic epigraphic finds from Uruk. See also R. Eichmann's detailed treatment of the entire stratigraphy and architecture of the site in his Uruk: Die Stratigraphie [...], AUWE 3 (Mainz 1989) and Uruk: Die Architektur I [...], AUWE 14 (Mainz, forthcoming).

⁸² Disregarding the gypsum tablets from the White Temple (see the discussion above), it appears that only the group of texts ascribed the excavation nos. W 21300 might have belonged to the original inventory of the Uruk IV period Building C (fig. 6) where they were found. Excavation records place the tablets 'von Brandschutt überdeckt auf dem obersten Estrich im T-förmigen Langraum des Tempels C der Schicht IVa, dicht neben der Ecke aus nordöstlichem T-Arm und oberem Ende des Langraumes' (see ATU 2, pp. 39-40).

⁸³ H.J. Nissen, 'Innere Datierungskriterien,' ATU 2, pp. 53-62. The divisions chosen by Nissen are formally independent of the building levels Uruk IIIc-a, since there was no stratigraphic justification for assigning representative texts to the 'writing phases' he designated Uruk III.3-1. See my discussion below.

3. PREHISTORIC WRITING

Writing may be thought of as a set of commonly accepted graphic signs used to represent communication, historical writing a set of signs which represent a spoken language. There can be little debate about whether proto-cuneiform fulfills the criteria of the former definition. That writing system was a set of symbols commonly accepted and indeed transmitted from one generation to the next, and with it pieces of information were graphically communicated from one partner to another – from the transmitter to the receiver. Whether or not proto-cuneiform was used to represent a spoken language, for instance Sumerian, as many assume, or some other unknown language, is still a matter of debate. Certainly this was not its initial, nor ever its primary purpose.

As an accounting system, proto-cuneiform served above all to communicate and store administrative data. However, there is some evidence that despite its accounting role archaic writing could not but reflect elements of the early scribes' language. Personal names and toponyms can scarcely have been entirely iconographic combinations in proto-cuneiform, particularly in light of the contact with foreign peoples implicit in the Uruk expansion of the late Uruk period. Further, the lexical lists from the 15% of proto-cuneiform documents not classifiable as accounts contain evidence of writing conventions which could reflect spoken language, ranging from some standardized sign sequences in combinations which represented attribute – noun (see below, section 4) to a canonized composition which in all likelihood represented our earliest example of literature (see below, section 5).

Since the earliest ideographic system unearthed in Uruk, from the Uruk IV period, appears to have been highly developed and conventionalized, some historians have assumed that there must have been pictographic precursors before proto-cuneiform was in use in Uruk, which have either heretofore fallen prey to the vagaries of excavations and remain buried in Near Eastern tells, or were written on materials that could not survive the millennia as did clay and stone.⁸⁴

This conservative *argumentum ex silentio* can, however, be disregarded. The precursors to Uruk IV period proto-cuneiform are clearly found in the archaeological record from Uruk itself, as well as from nearly every major late Uruk site excavated in the Near East. The increasingly involved administrative tools employed by accounting offices of emerging urban centers in the 4th millennium B.C. included stamp and cylinder seals, counting devices and clay tablets, to name those devices which remained intact in Near Eastern ruins.⁸⁵

⁸⁴ For instance, S.J. Lieberman, "Of Clay Pebbles, Hollow Clay Balls, and Writing: A Sumerian View," *AJA* 84 (1980) 339-358, argues p. 358 that the level of standardization of the Uruk IVa texts "can only have resulted from a long development". The more recent and concrete example of I.L. Finkel, "Inscriptions from Tell Brak 1984," *Iraq* 47 (1985) 187-189, is unsatisfactory for two reasons. Aside from the fact that the two purportedly pre-Uruk-IVa tablets discussed by the author derived from fill above an apparent Old Akkadian level at Brak, the objects themselves cannot be shown to contain texts; rather, they may contain simple sketches of animals as ornamentation, and the 'numerals' (in both cases one circular impression at the top center of the tablets, giving the appearance of an unsuccessful string hole) might well serve some purpose unclear to the excavators.

⁸⁵ H.J. Nissen has most forcefully presented the view of a measured development of controlling devices employed in the Uruk period, of which proto-cuneiform was merely the most obvious. See his comments in

3.1. SEALS⁸⁶

As Adams and Nissen have shown, the Uruk period saw a substantial population movement into the Babylonian alluvial plain, above all into the region surrounding the southern center of Uruk.⁸⁷ At the same time, and well before the initial appearance of inscribed tablets, the first cylinder seals appear,⁸⁸ replacing the earlier used stamp seals. These devices carried some motif – from simple geometric incisions to highly plastic and naturalistic representations of animals and humans – and were impressed on a malleable surface, in Mesopotamia clay. The clay thus sealed might be a coil wrapped around a cord tying up a leather bag or fastening the door of a grain depot, it might also be a stopper pushed into the neck of a jar containing valuable dairy fat. The very act of sealing represents an expression of the authority of the person or office that owned the seal. With his 'signature', the sealing individual assumed responsibility for the correctness of a certain transaction and assured the integrity of the clay 'document' as long as it remained intact.

It has been noted that there were a large number of seals, based of course on the sealings they left, found in late Uruk assemblages (some few examples are depicted in figures 9-10), and that the larger the settlement the greater the number of motifs attested there.⁸⁹ The jacket

Archaic Bookkeeping p. 11. See also his "Aspects of the Development of Early Cylinder Seals," *BiMes* 6 (1977) 15-23; *Grundzüge einer Geschichte der Frühzeit des Vorderen Orients* (Darmstadt 1983) 83-87; "The Context of the Emergence of Writing in Mesopotamia and Iran," in: J. Curtis (ed.), *Early Mesopotamia and Iran: Contact and Conflict 3500-1600 B.C.* (London 1993) 54-71; further, M.A. Powell, "Three Problems in the History of Cuneiform Writing: Origins, Direction of Script, Literacy," *Visible Language* 15 (1981) 419-440, esp. 423-424 (marking on the fact that the work of D. Schmandt-Besserat offered the best evidence of a conceptual development prior to the emergence of proto-cuneiform).

⁸⁶ Beyond the standard 'seal books', see R.J. Matthews, *Clay Sealings in Early Dynastic Mesopotamia: a Functional and Contextual Approach* (unpublished Ph.D. thesis, University of Cambridge, 1989); id., *MSVO* 2; R. Dittmann, "Seals, Sealings and Tablets [...]" in: U. Finkbeiner and W. Rollig (eds.), *Gamdat Nasr*, 332-366; M.J. Shendge, "The use of Seals and the invention of Writing," *JESHO* 26 (1983) 113-136; D. Collon, *First Impressions: Cylinder Seals in the Ancient Near East* (London 1987); R.L. Zettler, "Sealings as Artifacts of Institutional Administration in Ancient Mesopotamia," *JCS* 39 (1987) 197-240; and the general survey McG. Gibson and R.D. Biggs (eds.), *Seals and Sealing in the Ancient Near East*, *BiMes* 6 (Malibu 1977). Early stamp seals have been recently studied in an exemplary publication by A. von Wickede, *Prähistorische Stempelglyptik in Vorderasien*, *MVS* 6 (Munich 1990).

⁸⁷ R.McC. Adams and H.J. Nissen, *The Uruk Countryside [...]* (Chicago 1981). Adams notes in the latter study, pp. 67-94, that the settlement patterns showed a decided movement of Middle Uruk inhabitants of the northern alluvium around Nippur and Adab to the south around Uruk in the late Uruk period (compare his tables on pp. 69 and 90); using the conventional assumption of a population of 125 persons per inhabited hectare, the population of his northern settlement enclaves decreased from 38,500 in the Middle, to 21,300 in the late Uruk period, while in the south it increased from 20,000 to 41,000.

⁸⁸ As early as Uruk VI. See H.J. Nissen, "The Development of Writing and Glyptic Art," in: U. Finkbeiner and W. Rollig (eds.), *Gamdat Nasr*, 316-331.

⁸⁹ See, for example, R.J. Matthews, *MSVO* 2, 14. The motifs in fig. 9 were possibly not simply chosen at random to represent some characteristic of archaic life, although that is certainly also the case. The cult represented in the first scene, the martial actions of the second, or the representation of domestic animals, including hunting dogs, in the next two, were clearly a common part of archaic existence well if indirectly documented in the written sources. R. Dittmann in his treatment of the practice of sealing in late Uruk and

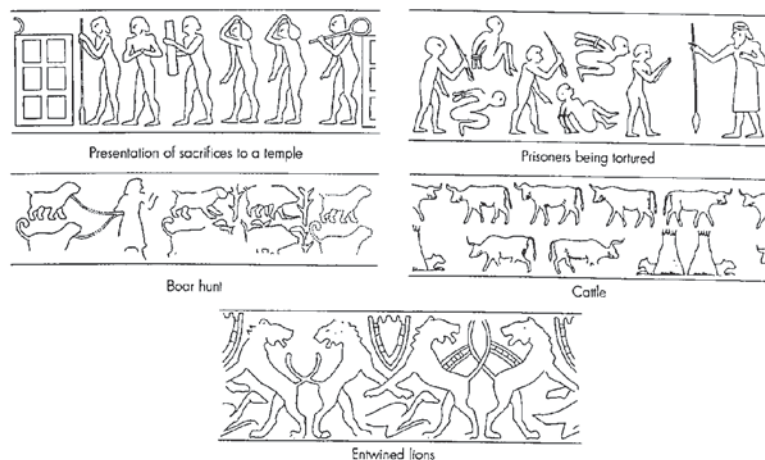


Figure 9: Common archaic seal motifs

of a cylinder seal offered space for a broad variation of forms, and we should assume that each seal represented one, and possibly several officials from a single office in a household administration. The seals had to serve as irrefutable proof of authorship should a sealed transaction be in any way contested. The need for clear correspondences between sealing individuals or offices and seal impressions also explains the large number of figurative seals – extrapolated from published sealings – in the Late Uruk period. At the same time, the numbers of seals are indicative of an increasing control of economic movements, and the need to store over time information bearing on the authority of numerous offices charged with controlling those activities.

proto-Elamite Susa in: U. Finkbeiner and W. Röellig (eds.), *Gamdat Nasr*, 332-366 (following M. Brandes, *FAOS* 3 [1979]), has suggested that more than containing characteristic scenes, the seals may have borne motifs directly related to the activities the sealing officials were controlling, thus, for instance, the flow of sacrifices to a temple household in the case of the first scene (here from Uruk) in fig. 9. This will scarcely be true in the case of the many hunting scenes attested in the late Uruk period. Fig. 10 contains eight separate scenes of boar hunts alone. The boar was known as a very dangerous beast with phenomenal charging strength, and hunting this animal will have been a sign of particular courage, to which the several depictions attest in those scenes of the hunt led by an elite of the archaic period (evident for instance in scene 'c' in his beard, headdress and his long spear; see also the second scene in fig. 9). These scenes must have derived from seals representing the authority and the household of a high-status official, presumably the ruler of the settlement in which the seals were used. See also the important contributions of P. Amiet, *Glyptique susienne, des origines à l'époque des Perses achéménides* [...], vols. I-II, *MDP* 43 (Paris 1972); M.A. Brandes, *Siegelabrollungen aus den archaischen Bauschichten in Uruk-Warka*, *FAOS* 3 (Wiesbaden 1979); and M.J. Shendge, *JESHO* 26 (1983) 113-136.

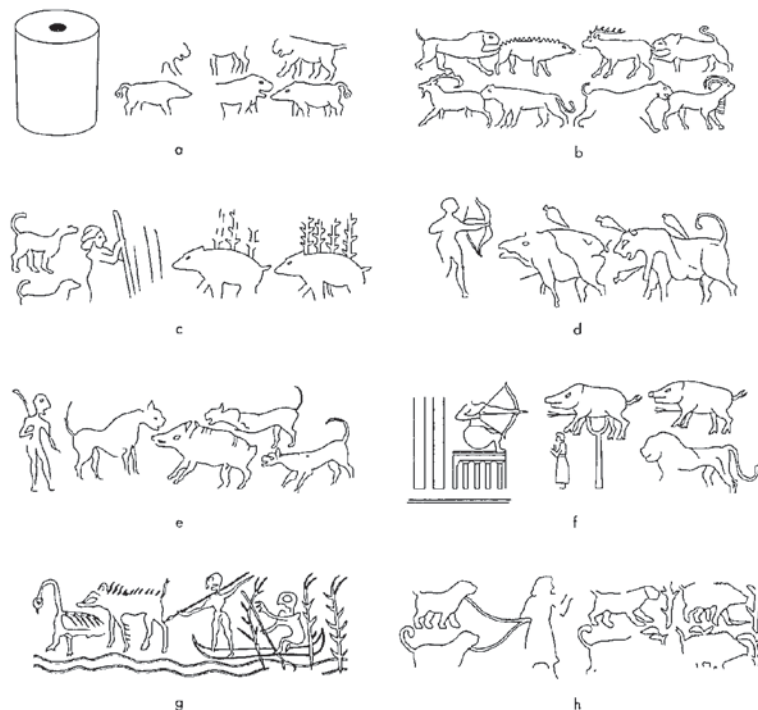


Figure 10: Archaic seals with scenes of wild pigs
Reconstructed seal impressions depicting lions and boars (a), lions, boar and caprids (b), and apparent hunting scenes (boars being hunted in seals from Uruk, Susa and Habuba Kabira, as a rule with dogs) (c-h) (scale ca. 1:2).

The seal impressions in the figure were drawn after the following publications:
a) R. Boehmer, in: R.K. Englund, *ATU* 5, pl. 131, no. 7 [cf. E. Schott, *UVB* 5 [1934] 43, pl. 25b, and P. Amiet, *La glyptique mésopotamienne archaïque* (Paris 1961) pl. 10, no. 184].
b) J. Jordan, *UVB* 2 (1931) 42, fig. 32 to W 7229 a-b, and Schott, *op. cit.*, 43, pl. 24e [cf. Amiet, *op. cit.*, pl. 10, no. 182].
c) Boehmer, *op. cit.*, pl. 139, no. 16 [cf. Schott, *op. cit.*, 43, pl. 25a. H.J. Lenzen, *ZA* 49 [1950] 11, fig. 14, and Amiet, *op. cit.*, pl. 10, nos. 187-188 [one seal]].
d) L. Ingrain, *MDP* 16 (1921) pl. 16, no. 243 [cf. L. le Breton, *Iraq* 19 [1957] 106, fig. 20, no. 22, and pl. 24, no. 6, and Amiet, *op. cit.*, pl. 39, no. 604].
e) Ingrain, *op. cit.*, pl. 16, no. 245 [cf. le Breton, *op. cit.*, 106, fig. 20, no. 3, and Amiet, *op. cit.*, pl. 39, no. 607].
f) E. Stromminger, *Habuba Kabira. Eine Stadt vor 5000 Jahren* (Mainz 1980) 62, fig. 55[d] [cf. Stromminger, *AJA* 84 [1980] 485, fig. 3].
g) Amiet, *op. cit.*, pl. 40, no. 609.
h) H.J. Nissen, P. Damerow and R.K. Englund, *Frühe Schrift und Techniken der Wirtschaftsverwaltung im alten Vorderen Orient* (Berlin 1991) 43 [the seal impression on a tablet from the former Erlenmeyer collection purchased by the authorities of the Metropolitan Museum, New York, was originally drawn by Abdallah M. Kahl; a commentary will be published by H. Pittman and J. Aruz].

3.2. TOKENS

Although the use of seals continued into the period of ideographic writing, it seems obvious that individuals and offices under whose authority goods and services were moving could identify themselves with use of the new script; the seal impression imparted a personal verification that a transaction was above-board and reconstructable. But the critical information, namely the objects and their numbers or measures that were being accounted for, was stored using other accounting tools. Since her early publications in the mid-1970's, D. Schmandt-Besserat has systematically gathered and studied small, often quite unassuming clay and stone objects found in nearly all excavations of pre-literate sites in the Near East, and based on her understanding of the use of these objects as the earliest preserved accounting tools in the Near East has presented a theory of the emergence of proto-cuneiform which substantially undermines the presumption that the conventionalized Uruk IVa writing system presupposes earlier pictographic forms. Her research into the form and function of the objects she called 'tokens'⁹⁰ has provoked a heated discussion of their meaning, with occasionally harsh criticism of her methodology and conclusions.⁹¹

In reviewing her work, it is important to first note those elements which are, based on the archaeological and epigraphic material, currently generally understood to be valid. Undecorated small geometric objects, Schmandt-Besserat's 'plain tokens', were present already

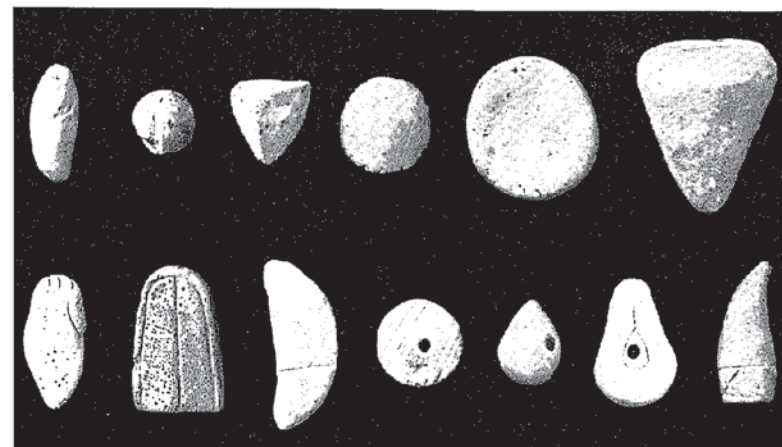


Figure 11: Examples of tokens from Uruk.

⁹⁰ These small objects had been collected in Near Eastern excavations since the turn of the century; however, they were invariably catalogued by the excavators as cult objects or gaming pieces. A. L. Oppenheim, 'On an Operational Device in Mesopotamian Bureaucracy,' *JNES* 18 (1959) 121-128, published a clay ball from the middle of the 2nd millennium B.C. which contained 48 pebbles in an inner cavity, and bore on its outer surface a list of small cattle, altogether 48 head. It was thus clear that the pebbles as counters represented, in a one-to-one correspondence, the individual animals. The director of the Oriental department of the Louvre Museum, P. Amiet, recognized the connection between the pebbles identified as counters by Oppenheim and similar clay objects found within clay envelopes from Susa dating to the late Uruk period ('Il y a 5000 ans Elamites inventaient l'écriture,' *Archeologia* 12 [1966] 16-23), and his student Schmandt-Besserat, finally, connected these clay pebbles with the innumerable small objects from pre-literate levels throughout the Near East which she had been studying in conjunction with work on the earliest examples of ceramics. See her 'The Use of Clay before Pottery in the Zagros,' *Expedition* 16/2 (1974) 11-17; 'An Archaic Recording System and the Origin of Writing,' *SMS* 1/2 (1977) 31-70; 'The Envelopes that Bear the First Writing,' *Technology and Culture* 21 (1980) 357-385; 'Before Numerals, Visible Language' 18 (1984) 48-60; 'The Origins of Writing [...],' *Written Communication* 3 (1986) 31-45; 'From Tokens to Tablets: A Re-evaluation of the So-called "Numerical Tablets",' *Visible Language* 15 (1981) 321-344. These studies were merged in her recent *Before Writing* vols. III (Austin 1992), which unfortunately due to a poor editorial effort did not offer a synthesis of her current understanding of early accounting and pictography (an abridged edition of vol. I was published in 1996 under the title of *How Writing Came About*). See the generally negative reviews by R.K. Englund, *Science* 260 (11 June 1992): 1670-1671; P. Michalowski, *American Anthropologist* 95 (1993) 996-999; P. Damerow, *Recht, historisches Journal* 12 (1993) 9-35; J. Friberg, *OZ* 89 (1994) 477-502; P. Zimansky, *Journal of Field Archaeology* 20 (1993) 513-517; and S.C. Brown, *CSMS Bulletin* 31 (May 1996), 35-43.

⁹¹ The first stinging rebuke of her work was made by S.J. Lieberman, *AJA* 84 (1980) 339-358, more recent criticism has come from G. Sampson, *Writing Systems: A Linguistic Introduction* (Palo Alto 1984) 57-61, S.A. Jasim and J. Oates, 'Early Tokens and Tablets in Mesopotamia: New Information from Tell Albrak and Tell Brak,' *World Archaeology* 17 (1986) 349-350, and most recently by the reviewers of *Before Writing* cited in the preceding footnote.

in Near Eastern excavation levels dating to 8000 B.C. and continued to be found in levels representing the centuries immediately before the appearance in ca. 3200 B.C. of true writing in Uruk. In the 4th millennium, decorated (in Schmandt-Besserat's terminology 'complex') tokens, i.e., clay tokens of plain and complex form which had been punched through and so probably hung on a string, or had been decorated with varying numbers of hatching incisions, or both, begin to appear. Many of these decorated tokens bear a striking resemblance to signs found on the earliest tablets, leading Schmandt-Besserat to identify them as symbolic three-dimensional precursors of two-dimensional proto-cuneiform signs; these tokens, too, generally ceased to exist with the emergence of writing. Archaeological context makes it very difficult to evaluate the true function of these objects (see figure 11); they were found or at least recorded with no convincing administrative context, and in some cases derived from loci which would seem to undermine any administrative function, for instance in the graves of children.⁹²

⁹² One of the less successful claims of Schmandt-Besserat's publications is that these early token assemblages represented a cogent and conventionalized interregional accounting system, which is unsupported by the archaeological record, on its surface improbable, and which led in many instances to ad hoc explanations of small finds that could have remained unexplained without damage to her basic ideas. Small clay objects found in sites of hunter-gatherers and herders in caves of 8th and 7th millennium Persia – really evidence of the need for skilled accountants? Tokens found in rubbish – really a reflection of the practice of discarding accounting tablets in Babylonia upon completion of a transaction? Small clay objects found in graves of adults, small stone objects in graves of children – really markers of the high status of archaic bookkeepers on the one hand, vicarious offerings of grain meant to last for eternity on the other?

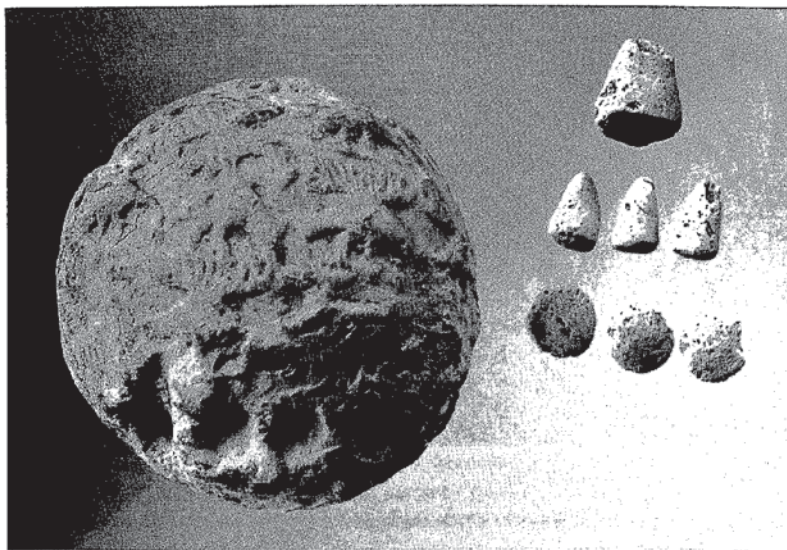


Figure 12: Clay envelope with contents, from Susa

3.3. CLAY ENVELOPES

More recent excavations in Persian Susa seem to demonstrate that, in levels immediately prior to the Uruk IV period,⁹³ administrators enclosed plain tokens in clay envelopes and sealed the outer surfaces of these hollow balls with figurative seals. In numerous late Uruk settlements, including Persian Chogha Mish,⁹⁴ southern Babylonian Uruk and Syrian Habuba Kabira, such clay balls have been found both opened and in context with enclosed tokens, and still intact, thus withholding from inspection token assemblages which could be heard moving loosely within the balls. These groups of tokens were thus the first contextually meaningful assemblages of accounting tools in the Uruk period, a reasonable first link in the very long use of simple geometrical shapes to represent discrete units or measures of commodities transferring through accounting offices of the late Uruk period. The role of the tokens found within or at least in context with clay balls as forerunners of the highly developed and conventionalized numerical signs of the earliest Near Eastern tablets (see below, section 6.1) is now unquestioned, although the reticence particularly of museum staff and

⁹³ A. Le Brun, 'Recherches stratigraphiques à l'Acropole de Suse, 1969-1971,' *CahDAFI* 1 (1971) 163-216; F. Vallat, 'Le matériel épigraphique des couches 18 à 14 de l'Acropole,' *Paleorient* 4 (1978) 193-195; A. Le Brun and F. Vallat, *CahDAFI* 8 (1978) 11-59.

A final report of excavations has recently appeared: P. Delougaz and H.J. Kantor (edited by A. Alizadeh), *Chogha Mish* vol. 1:1-2, OIP 101 (Chicago 1996); see 1:1, pp. 120-133, 1:2, pls. 34-40, 134.

excavation directors to open all clay envelopes, ostensibly to protect the integrity of the seal impressions on the surfaces, remains a vexing problem in our attempts to decipher their meaning.

It may come as a surprise that fully eighty of the total of ca. 130 excavated clay envelopes remain completely intact.⁹⁵ The prospect of using tomographic analysis in the future is no excuse for this obstruction, especially given the fact that the process is very expensive, time-consuming, and of limited value even if conducted.⁹⁶ Yet though limited, radiographic analyses of all clay envelopes would add some statistical evidence concerning the likely numerical systems employed in this early method of bookkeeping, and the particular signs within the systems. The current state of our understanding of the tokens does not allow us to postulate with confidence whether the best attested numerical systems in archaic Babylonia, namely, the sexagesimal and the grain capacity systems, are represented in the envelope groups and thus to make an educated guess concerning the types of commodities being controlled with these devices, and the quantities of those goods. Certainly the notion of an Uruk expansion driven by luxury demand in southern Babylonia would suffer if it could be shown that the clay envelopes from reputed late Uruk trade colonies in Syria and Persia contained without exception symbolic representations of small numbers of animals and of grain measures consonant only with the bureaucratic needs of a local administration, as I suspect is the case based on the little material currently available.

⁹⁵ D. Schmandt-Besserat, *Before Writing* I, 117, puts at just five, or less than 3% of the total, the number of envelopes whose contents are known with certainty: four specimens from Susa opened with a knife, one from Tepe Yahya sawed open (the latter statement, however, has been questioned by the Yahya excavator C. C. Lamberg-Karlovsky; see P. Damerow and H.-P. Meinzer, 'Computertomographische Untersuchung ungeöffneter archaischer Tonkugeln aus Uruk W 20987,9, W 20987,11 und W 20987,12,' *BaM* 26 [1995], p. 28³⁹).

⁹⁶ Two analyses of tomographically inspected envelopes have been published, both resulting from the generous permission of officials to 'misuse' the radiological departments of major medical centers. The first, F. Drillon, Pr. M. Laval-Jeanlet, and A. Lahmi, 'Étude en laboratoire de seize bulles mésopotamiennes appartenant au Département des Antiquités Orientales,' in: *Préhistoire de la Mésopotamie. La Mésopotamie préhistorique et l'exploration récente du djebel Hamrin*, Paris 17-18-19 décembre 1984 (Paris 1987) 335-344, dealt with sixteen envelopes from Susa housed in the collection of the Louvre. The second, P. Damerow and H.-P. Meinzer, 'Computertomographische Untersuchung ungeöffneter archaischer Tonkugeln aus Uruk W 20987,9, W 20987,11 und W 20987,12,' *BaM* 26 [1995] 7-33 + pls. 1-4, examined three unopened envelopes from Uruk in the Uruk-Warka collection of the German Archaeological Institute (DAI), currently housed in the University of Heidelberg. Despite the high resolution afforded by the choice of 0.3mm scanning cuts of the envelopes in the former study, and the differing density of the fired tokens as against the unfired envelopes in the second, neither publication could claim to have sufficiently identified all of the tokens within the analyzed envelopes. Objects in the Louvre collection were often only summarily noted and described according to a typology of forms employed by the museum curator P. Amiet; those in the DAI collection were in some cases possibly fractured parts of original tokens. In both studies, the resolution was such that eventual incisions on the surfaces of the tokens would not have been and were not recognizable, so that the question of whether decorated tokens were enclosed in these discrete assemblages could not be answered. However, even in the case of the crescent identified within the envelope Sb 1931 (Drillon et al., pp. 339-340; that noted for Sb 1937 on p. 339 is not obvious in the images on pp. 340-341), strokes across its surface would not necessarily identify the token as 'complex' and so for Schmandt-Besserat plastic ideograms; instead, these could represent early forms of decorated numerical signs, for which see below, section 6.1.

3.4. NUMERICAL TABLETS

At the same time or possibly somewhat later than the occurrence of sealed clay envelopes, two types of accounting devices clearly related to them came into use. In the first case, on the surface of some clay balls shapes were impressed which reflected in form and number the tokens enclosed within the balls (figure 12).⁹⁷ These impressions were evidently made with the tokens themselves, with other objects, presumably including styluses, mimicking in form the enclosed tokens, and even simply with fingertips. The ordering of these impressions gives us the first opportunity to speculate about the possible numerical structure, if any, of the system of counting or measuring which the tokens might have reflected. In the second case, clay lumps were pressed flat and, apparently dispensing with the enclosing of tokens, similar impressions were made on the surfaces of these 'tablets', and the whole sealed. The 'numerical tablets', obviously part of the accounting repertoire from archaic Uruk which entered settlements to the northeast, north and east of Babylonia (for primitive Syrian examples see figure 13)⁹⁸ quickly assumed the form of Uruk IV pictographic tablets⁹⁹ and are generally considered the immediate antecedent of the earliest true writing.

⁹⁷ A. Le Brun and F. Vallat, *CahDAFI* 8 [1978] 13-18, 45, 54-56; E. Strommenger, *Habuba Kabira. Eine Stadt vor 5000 Jahren* (Mainz 1980) 64, fig. 58.

⁹⁸ In addition to the those unearthed at Habuba Kabira [D. Schmandt-Besserat, *Before Writing* I, 136] and Jebel Aruda [G. van Driel, *FS Kraus*, 12-25], numerical tablets of a more primitive form were found at Tell Brak [S.A. Jasim and J. Oates, *World Archaeology* 17 [1986] 358], Mari [A. Parrot, "Les fouilles de Mari. Quatorzième campagne (Printemps 1964)," *Syria* 42 [1965] 12], Nineveh [D. Collon and J. Reade, "Archaic Nineveh," *BaM* 14 [1983] 34], Khafaje [H. Frankfort, *OIC* 20 [1965] 25], Godin Tepe [H. Weiss and T.C. Young, "The Merchants of Susa [...]," *Iran* 13 [1975] 9-10; ca. 30 numerical tablets from Godin Tepe remain unpublished], Chogha Mish [E. Parada, "Iranian Art and Archaeology: A Report of the Fifth International Congress, 1968," *Archaeology* 22 [1969] 58, number 432 A, and P. Delougaz and H.J. Kantor, *Chogha Mish* vol. I:1, p. 120, I;2, pl. 33B-G], and of course Susa [A. Le Brun and F. Vallat, *CahDAFI* 8 [1978] 18-20, 47, 57; D. Schmandt-Besserat, *Before Writing* I, 134-136; a number of numerical tablets, presumably from Susa, are in the collection of the University of Sao Paulo [71/5.36-37, 72/4.44-45]]. Apparently, none were found at Tall-i Malyan. Until all tablets are published, and more examples from the north are unearthed, it will be difficult to state with confidence whether a preliminary categorization of these texts into early and late formats is justified. As a working hypothesis, it seems that the numerical tablets from Syria and northern Mesopotamia were of a more primitive form than most exemplars from Susiana and Uruk. This primitive form, attested at all sites (including an exact parallel to the Syrian documents from Uruk recently published by J. Reade, "An Early Warka Tablet," *FS Strommenger* [Munich 1992] 177-179 + pl. 79 [and *ATU* 5, pl. 12]; see there p. 17-20)], is characterized by a more rounded format, earlier seal motifs, and often numerical notations impressed along the edge of the tablets; note also the fact that the early tablets from Jebel Aruda in fig. 13 contained notations which were not in accordance with bundling rules attested both in later numerical tablets from Susa and Uruk, and in Uruk IVa period tablets from Uruk. The later tablets were flatter, cushion-shaped, contained more structured numerical notations and later seal motifs. This diachronic typology suggests that late Uruk influence from southern Babylonia broke off earlier in the north than in Persia.

⁹⁹ The text in fig. 14 derives from a group of gypsum tablets excavated from the White Temple in Uruk (see above, section 2). All contained seal impressions and the circular impressions of round objects of varying diameters. The function of these, in some cases quite large and heavy tablets, i.e., whether they really contain numerical [grain measure] notations or are decorated stands of some kind, is not obvious to me.

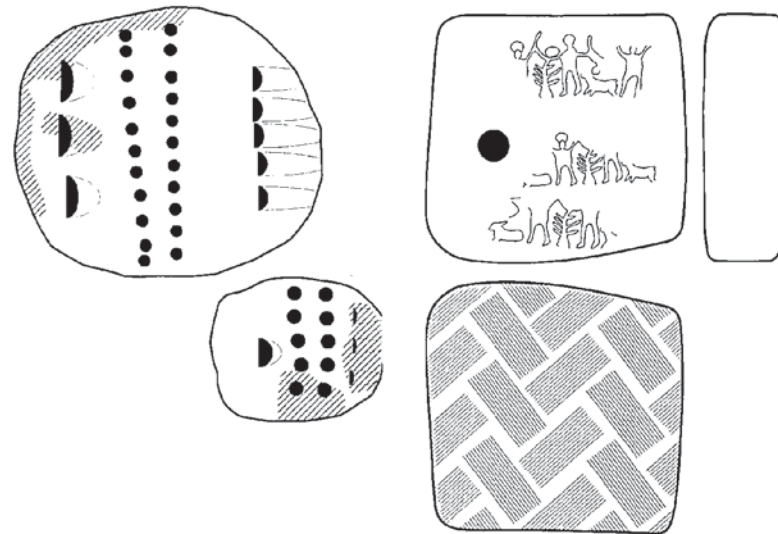


Figure 13: Early numerical tablets
Two preliterate numerical tablets from Jebel Aruda (after G. van Driel, *FS Kraus*, 14 fig. 1a, 6, and 2) document the repetition of signs exceeding the limit known from later texts.

Figure 14: The gypsum tablet W 10133,a
The gypsum tablets were placed on reed mats while still wet, leaving impressions of the matting on their bottom surfaces. The seal impressions have been dealt with most recently by R. Boehmer, *ATU* 5, 26 and 28. Scale of W 10133,a ca. 1:2.

The Uruk tablets in figures 15-16 contain interesting examples of features peculiar to this stage of writing and common to both Uruk and Susa. A stylus with a rounded end was used in both centers to impress numerical signs, in contrast to the use of a flat-ended stylus in the following ideographic phases, and only at this time, and again in both centers, was the shank of the stylus used to impress dividing lines between discrete notations, instead of the sharp edge of the 'ideographic' stylus.

3.5. NUMERO-IDEOGRAPHIC TABLETS

The most intriguing sign of contact between Uruk and the Susiana up to the very time of their respective development of separate ideographic scripts is evident in a number of 'numero-ideographic' tablets from both regions (fig. 16). These tablets share with the numerical tablets the characteristics of simple numerical notations, seal impressions, but the inclusion of one, at most two of a group of ideograms, common to both regions, which represent discrete

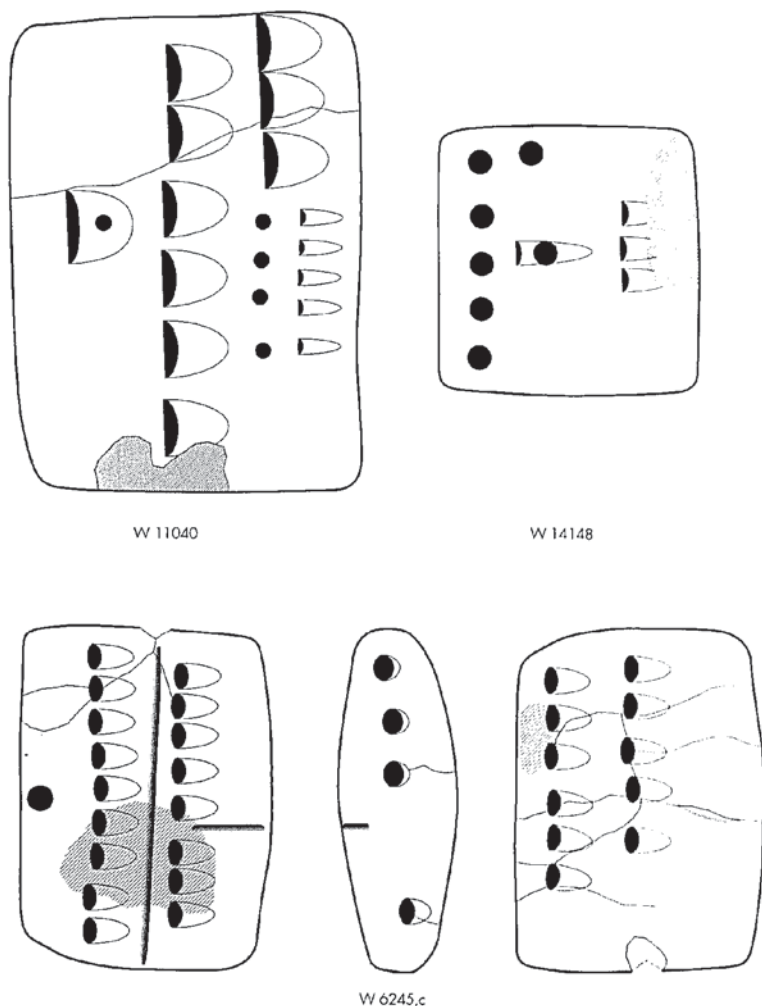


Figure 15: Three numerical tablets

The tablet to the upper left appears to be a numerical tablet recording a large sexagesimal number (corresponding to 1185 units); that to the upper right a field of ca. 120 acres. The reverse faces of both texts are unscribed. W 6245.c exhibits numerical signs created by the rounded butt edge of a stylus; this characteristic and the use of the stylus shank in drawing lines of case separation are common features of such tablets from Uruk and Susa of the pre-ideographic period.

objects (sheep, jugs of beer and dairy fats, strings of dried fruits, textile products).¹⁰⁰ Such object designations are in my opinion the missing link between numerical notations which according to context imply an ideographic meaning, for instance a grain notation, and the mixed notations of numerical signs and ideograms which mark the inception of proto-cuneiform. That the immediate influence of Uruk on its surrounding territories waned at this time is demonstrated by the fact that in the north no development into an ideographic script occurred until Babylonian cuneiform was imported in the Early Dynastic III period, and that to the east a writing system was introduced, conventionally called 'proto-Elamite', which, although having borrowed some conceptual elements from the Uruk sign repertory, employed entirely different signs.

The presumption that decorated tokens appearing from approximately the middle of the 5th millennium B.C. in Uruk (but only from ca. 3500 B.C. in Iran and Syria) led directly to pictographic script is the element of Schmandl-Besserat's work which has been most debated. Comparing the graphic forms, she was able to propose the correspondence of a large number of decorated tokens with later ideograms, and these identifications are now moving through the secondary literature as if they had been justified or even in part accepted by experts. The basic argument against such facile identifications is that we know graphic similarity, in the absence of contextual proof, can be notoriously misleading, placing as it has Sumerian scribes as far afield as Rumania and China. This is the more dangerous when not even the objects being analyzed can be shown to have been included in meaningful token assemblages, i.e., when complex tokens are not found within, or at least in context with clay balls. Of these, there are few; in fact, only the so-called oil token (presumed to correspond to the proto-cuneiform sign NI₆, ∇) was clearly enclosed in clay envelopes,¹⁰¹ and it may be questioned whether this key evidence is not simply a derived numerical sign

¹⁰⁰ See R. Dittmann, in: U. Finkbeiner and W. Röllig (eds.), *Gamdat Nasr*, 344-345; R.K. Englund, ATU 5, p. 33, to W 6782.a. The upper two tablets in fig. 16 contain ideograms which based on Uruk IV and later tradition represent textiles or possibly apparatus employed in the textile manufactories (see below, section 6.3.2 and the signs ZATU644 and ZATU662-663 [see the conventions listed above, n. 1]). W 6881.d to the lower left contains a clear precursor form of the Uruk III sign DUG₆, Iran 13, 9:2, to the lower right a possible early form of the sign DUG₆, both signs representing containers of dairy oils (R.K. Englund, 'Archaic Dairy Metrology,' *Iraq* 53 [1991] 101-104). All objects were apparently qualified with numerical notations derived from the sexagesimal system.

¹⁰¹ The 'crescent' noted above is the second clear candidate for a complex token in discrete administrative context. Indeed, the referent proto-cuneiform sign, KU_{30r}, has been translated by some, based on later cuneiform tradition, with 'silver', or more generally, 'precious metal', so that a successful identification might even be used in an argument about the use of this Late Uruk accounting device in controlling the movement of such metals into Babylonia. However, the simple form of this token, without incised strokes, is likely a simple numerical sign, and even if a decorated example of this token were in future found within one of the many unopened clay envelopes, it could represent either a numerical sign from one of the derived (incised) numerical systems, or really the sign KU₃₀ in its meaning of 'one-half' (container of dairy fat), as I have discussed in an earlier article ('Late Uruk Period Cattle and Dairy Products: Evidence from Proto-Cuneiform Sources,' *BSA* 8 [1995] 42⁴⁰). A third candidate for a complex token tradition can be seen in the group of tokens found associated with Uruk clay envelopes and labeled W 20987,27 (P. Damerow and H.-P. Meinzer, *BaM* 26 [1995] pl. 4). Among the plain tokens in that collection are not only the oil token, but also three exemplars of what Schmandl-Besserat fancifully interprets to be 'trussed poultry' (closer to the sign \gg , 'bull').

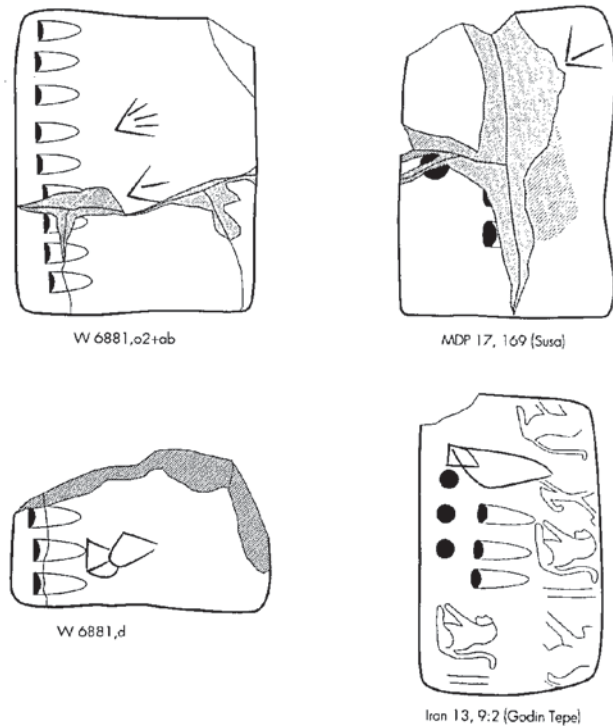


Figure 16: Examples of numero-ideographic tablets from Uruk and Susiana

much like the sexagesimal signs impressed with a single stroke and used, for example, to qualify a particular container of dairy oil in the archaic texts from Uruk. Certainly on the basis of this token, found in Uruk and in the Syrian site Habuba Kabira, no judgment is possible about the ultimate role of the myriad of decorated tokens from this period. One might rather wonder why other products of the archaic economies – beer, wool, etc. – were not so represented.

Further, a possible connection of some of these complex tokens with corresponding signs in the proto-Elamite script, which evolved after the emergence of proto-cuneiform in Mesopotamia, has gone unmentioned, despite the fact that the majority of contextually determined tokens derive from Elamite Susa. And proto-Elamite texts would seem to offer the best evidence for a limited transfer of decorated tokens into Late Uruk writing systems. Signs for small cattle – in both cases so-called abstract signs of the type often mentioned in

Schmandt-Besserat's work – are not only graphically, but also semantically related in the two archaic scripts, for example, the proto-Elamite ∇ seems clearly related to proto-cuneiform E , meaning collectively "sheep and goats".¹⁰²

A corollary development in the discussion put in motion by Schmandt-Besserat is the currently espoused belief that the evolutionary view of the origin of writing from a primitive stage of pictography through levels of abstraction, best stated by I.J. Gelb in his famous *A Study of Writing* in 1952,¹⁰³ has been discredited.¹⁰⁴ It has not. The basis of the argument put forward by Schmandt-Besserat and others is that the archaic repertory consisted of a large number of abstract signs, indeed that there were but relatively few pictographic signs in the earliest stages. However, once the proponents of an abstract sign system – and we need to remember that Schmandt-Besserat is really speaking of a two-dimensional representation of plastic complex counters – have cited the sign UDU₀ (the sign E), representing both sheep and goats, as evidence of this archaic abstraction, there is little more discussion of further evidence.¹⁰⁵ That is understandable, since among the Uruk IV period signs few, if any others can be demonstrated to be non-pictographic, given the fact that we often cannot judge what the real referents behind difficult graphemes might be.¹⁰⁶

¹⁰² The most current treatment of the proto-Elamite texts is found in P. Damerow and R.K. Englund, *Tepe Yahya*; to the question of signs representing small cattle, see pp. 53-55, and compare the earlier works of J. Friberg, *ERBM-II*, and A.A. Vajman, "Über die Beziehung der protoelamischen zur protosumerischen Schrift," *BaM* 20 (1989) 101-114 (translation of his Russian article from *VDI* 1972/3, 124-133).

¹⁰³ In the second edition of his *A Study of Writing* (Chicago 1963), p. 201, Gelb states that "writing must have passed through the stages of logography, syllabography and alphabetography in this, and no other, order."

¹⁰⁴ See for instance J. Friberg, *OLZ* 89 (1994) 478; P. Damerow, *Rechtshistorisches Journal* 12 (1993) 27-29 and 32-35. P. Michalowski, "Writing and Literacy in Early States: A Mesopotamianist Perspective," in: D. Keller-Cohen (ed.), *Literacy: Interdisciplinary Conversations* (Cresskill, NJ, 1994) 49-58, goes so far as to parodize an evolutionary concept; however, the author seems himself a victim of traditionalist views when he states p. 55 that "earliest Mesopotamian writings include phonetic [he means Sumerian] elements, so one cannot conclude that this was a later development," thereafter citing various scholars who also believe this to be true. This radicalism of conviction in specialists, who then are cited by general historians of writing, cannot be welcomed. More general treatments of the history of writing have been kinder both to Gelb's teleological view of the evolution of writing and to Schmandt-Besserat's handling of her data; see for instance M. Kuckenburger, *Die Entstehung von Sprache und Schrift. Ein kulturgeschichtlicher Überblick* (Cologne 1989), and H.M. Röhr, *Writing: its evolution and relation to speech* (Bochum 1994).

¹⁰⁵ It is not even obvious what these critics of the pictographic theory understand abstract signs to be, wholly artificial constructs or signs including abstracted representations of original pictograms. Friberg, loc.cit., has validly mentioned the numerical signs themselves as abstract signs in this connection; there has, however, been little controversy in ceding the point that contextually charged numerical symbols had a long history in preliterate societies such as those of the 4th millennium Near East.

¹⁰⁶ Indeed, all of these signs seem to be pictograms representing either complete or, according to the common graphic practice of *pars pro toto*, partial objects. Since, moreover, it is not possible to isolate and identify any phonetic use of signs in the archaic period, we cannot presume that the original use of proto-cuneiform signs was not simply as referents of the objects they represented, presumably with the rapid development of multivalency in sign usage. Thus particularly the very many phonetic values ('readings') of cuneiform signs in later periods could point towards precisely the graphic development Gelb had in mind, whereby 'Sumerian' readings of signs can be object names derived from the language of those who created pictographic proto-cuneiform.

4. THE NATURE OF PROTO-CUNEIFORM AND THE SUMERIAN QUESTION¹⁰⁷

Unfortunately, the 'numerical tablets' unearthed in archaic levels of Uruk were found in secondary locations among debris and other, late Uruk tablets,¹⁰⁸ making it impossible to archaeologically ascribe those texts to a level preceding that of ideographic texts. This may be inferred, however, from comparable finds from Susa, where in the levels Acropolis I 19 through 17B-A both clay envelopes and numerical tablets are found, in some cases bearing the same seal impressions.¹⁰⁹ 'Numero-ideographic' tablets have been tentatively ascribed to the level 17A 'contact' or 17Ax,¹¹⁰ immediately before the level 16 from which the earliest proto-Elamite tablets derive.

4.1. TABLET FORMATS

Even something as seemingly unassuming as tablet format is a good indication of chronological development of writing during the archaic period. It may be reasonably speculated that the clay envelopes and their contents, as well as the sealed numerical tablets, and at the end of this preliterate development the numero-ideographic tablets, each represented one discrete transaction within a complex administration. For instance, the tablet *Iran* 13, 9:2, in figure 16 above, might have contained the record of the receipt by an official of a temple household – the person who sealed that tablet – of thirty-three jars of dairy oil from a representative of Godin herders. This documentation was presumably only of importance during a short accounting period, so that a precise dating was not included, or was recorded in some other fashion invisible to us.¹¹¹

¹⁰⁷ For an excellent recent summary of the major characteristics of the cuneiform writing system, see M. Kiebert and H.J. Nissen, "Die sumerisch-akkadische Keilschrift," in: H. Günther and O. Ludwig (eds.), *Schrift und Schriftlichkeit* (Berlin 1994) 274-288, with literature. Jerrold Cooper kindly discussed the following section of this paper with me; the mistakes and misconceptions that remain are my own.

¹⁰⁸ See ATU 5, nos. W 6245, 6613, 6881, 6883, etc. Even in those cases which appear to represent a modicum of archival deposition, for instance, the uniformly numerical or numero-ideographic appearance of the tablets with the excavation numbers W 6881 and 6883, there are grounds for deep suspicion that these 'archives' were constructed by the Uruk excavators. All tablets W 6881-6883 were found in the square Pd XVI, 3 (see fig. 7 above) 'against the northern edge of the niched wall belonging to level IV, 1-2 m northwest of the door, partly in a depot in the wall recess 1.5 m northwest of the door' (ATU 5, p. 34), including those numbered 6882, a group of sixteen with a somewhat irregular tablet format, but without exception of Uruk IVa period sign forms.

¹⁰⁹ A. Le Brun and F. Vallat, *CahDAFI* 8 (1978) 11-59. In line with this sequence is the fact that inscribed material in Syria (Habuba Kabira, Jebel Aruda, possibly Mari) and northern Mesopotamia (Nineveh) ceases after the occurrence there of numerical tablets, that is, that sealed numerical tablets at those sites derived from distinct strata prior to the appearance of ideographic writing.

¹¹⁰ R. Dittmann, *BBVO* 4/1 (1986) 296-297 and 458, tab. 159e, following A. Le Brun, discussed level 17Ax or 17X. The 'contact 16-17' proposed by Le Brun, *CahDAFI* 1 (1971) 210, is derived from unstratified material from earlier de Mecquenem excavations; tablets edited by F. Vallat, *CahDAFI* 1 (1971) 237 as 'contact 17A-16' were apparently equally unstratified (cf. Dittmann, in: U. Finkbeiner and W. Röllig [eds.], *Gamdat Nasr*, 171). See also D. Schmandt-Besserot, "Tokens at Susa," *OriAnt* 25 (1986) 93-125 + pls. 4-10; A. Le Brun and F. Vallat, *CahDAFI* 8 (1978) 11-59; R. Dyson, *BAR International Series* 379 (Oxford 1987) 648-649.

¹¹¹ In fact, much information which we cannot see was doubtless in play in this, and in less involved numerical

Essentially the same format is found in the least complex, and the oldest tablets from Mesopotamia, those texts dating to the Uruk IV period (ca. 3200 B.C.) and, based on current excavation records and on our best understanding of objects dealt through the antiquities markets, without exception from the Eanna district in Uruk. Only the obverse of these texts is inscribed, and only with one entry (an entry will usually consist of either a numerical notation, or one or a combination of ideographic signs, or, most frequently, both¹¹²). Each tablet was meant to carry one concise unit of information (see figures 17:1 and 19, W 19592,n).¹¹³

One subtype of these single-entry accounts known as 'tags' (figure 18) is characterized by a peculiar cushion-shaped format, by a perforation through the long axis of the tablets certainly used to hang the tablets on a string,¹¹⁴ and by the absence of any numerical notations. While a number of the ideographic notations on these texts contain no obvious object designations and so probably represent proper nouns, either personal or official names, but not, it appears, toponyms,¹¹⁵ several do consist of signs which denote presumable beverages and dried fruits and so might indicate their use to tag shipments or stored amounts of these commodities.¹¹⁶

The more common single-entry tablets correspond fully to the sealed numero-ideographic accounts in their use of numerical notations and object designating ideograms to qualify the

tablets and envelopes. The inclusion of these documents in baskets tagged with global qualifications, to name one example, would add much specificity to this and accompanying texts; to name another, we have no way of knowing whether further qualifications to simple accounts were kept on perishable materials or were signaled simply by the holder of these accounts.

¹¹² There is some, if not strict, organization evident in the position of signs within individual entries. The first and thus most prominent position in the entry is assumed by the numerical notation, always found at the head of a single-entry, or of an individual case of a multiple-entry text. Numerical signs within a numerical notation follow a strict sequential pattern dictated by the value of individual signs within the numerical system the notation reflects. As a general rule, signs representing counted objects are situated closest to the numerical notation, inscribed, insofar as this is discernible due to the existence of sign distortions caused by subsequent inscription, immediately after the numerical notation and before the impression of the accompanying ideograms.

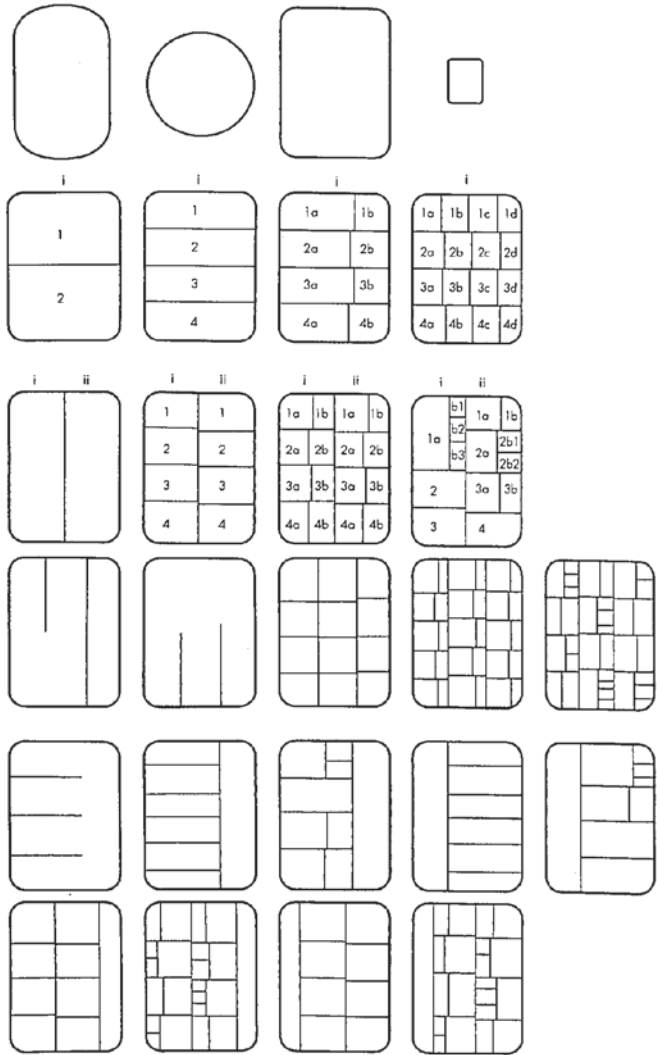
¹¹³ For an overview of archaic text formats see M.W. Green, "The Construction and Implementation of the Cuneiform Writing System," *Visible Language* 15 (1981) 345-372, esp. 349-356; further, A.A. Vajman, "Formale Besonderheiten der proto-sumerischen Texte," *BaM* 21 (1990) 103-113 (translation of his Russian article in *VDI* 1972/1, 124-131).

¹¹⁴ This transversal perforation, like that of cylinder seals, suggests that the strings holding the tablets were knotted at one end such that the tablets hung like pendants from the objects – or persons – they qualified.

¹¹⁵ In contrast to the published opinion of the German excavators of the predynastic Egyptian site Abydos that the tags found in the grave complex Uj there documented the place names of those settlements from which the tagged goods (according to the excavators bolts of cloth) derived (see G. Dreyer, *Umm el-Qaab I: Das prädynastische Königsgrab Uj und seine frühen Schriftzeugnisse*, AV 86, [forthcoming]). These tags contained the earliest known examples of writing in Egypt.

¹¹⁶ The sign DIN in the texts W 20883 and 21183 in fig. 18 is conventionally understood to represent a type of wine; the sign combination DUG₆ LAM₆ on the tag W 9656,n1 might too represent a type of wine, considering the fact that the simplified form of LAM₆ KUR₆ is known to qualify a type of DIN (see ATU 2, pl. 6, with photo of W 20907,2) and that DUG₆ represents a jar with a spout, used to store liquids, in particular beer. The text W 7000, finally, consists only of the sign HĀSHUR, a stringed fruit, in later texts a type of apple (see I. J. Gelb, "Sumerian and Akkadian Words for 'String of Fruit'," *FS Kraus* [Leiden 1982] 67-82; ATU 2, 150²⁶; R.K. Englund, *Ur III-Fischerei*, 38-39, with footnotes).

Texts from the Late Uruk Period



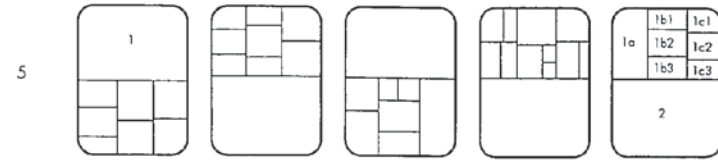
1

2

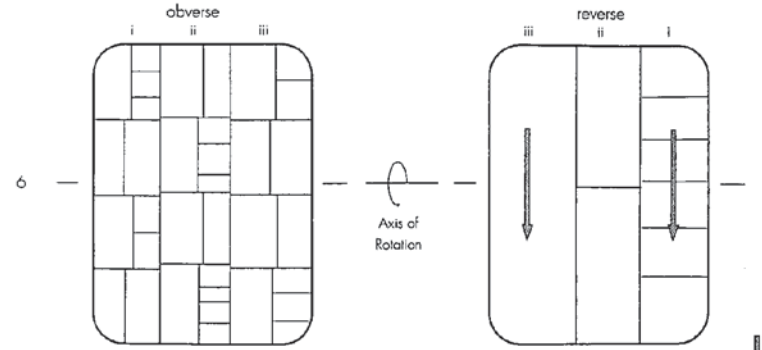
3

4

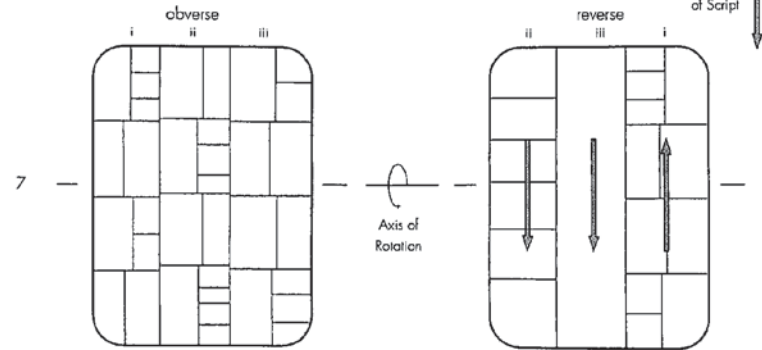
The Nature of Proto-Cuneiform and the Sumerian Question – Tablet formats



5



6



7

Figure 17: Tablet formats found in the archaic texts

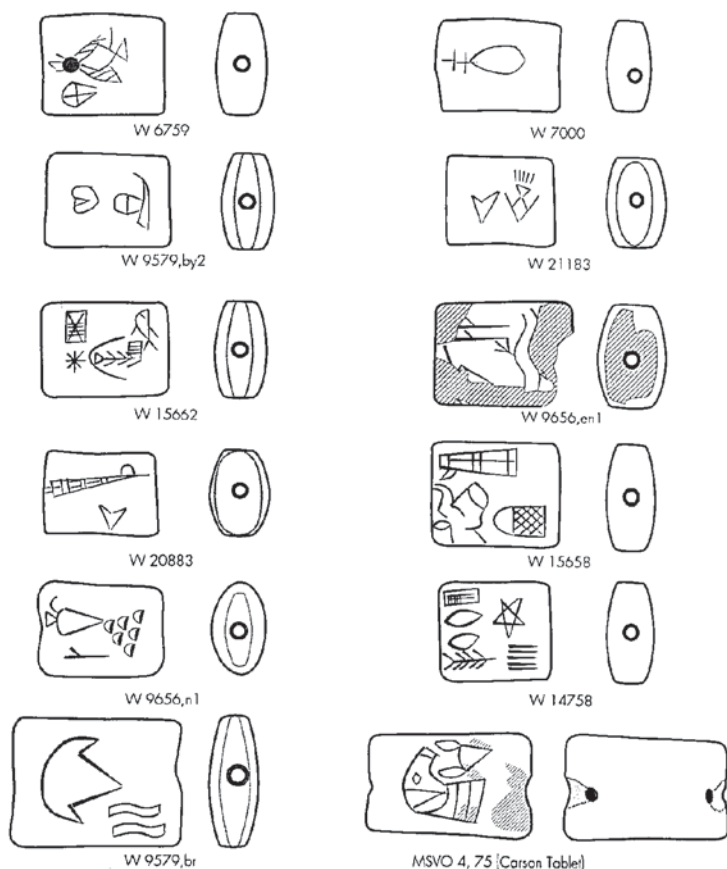


Figure 18: Archaic 'tags'
Small tablets characterized by a lack of numerical signs and by perforation through their length, and so presumably strung, might represent tags attached to commodities. The inscriptions seem to qualify either persons or offices, or in some cases the commodities themselves, including beverages and dried fruits.

object of the recorded transactions, and of a further ideographic notation qualifying the person(s) or office responsible for the correctness of the data. Such accounts probably represented receipts and formed the lowest order in a hierarchy of texts leading into large, consolidated accounts (figures 17:2-6 and 19, W 20368,2, 20044,38, and 20044,58). More complex texts are characterized by the division of the tablet surface into columns and cases, each case containing a single entry and so corresponding to one of the single-entry texts discussed above. Thus Uruk IV period accounts could consist of two or more entries

recording numbers and measures of objects together with an accounting official, and these single entries could themselves be further divided to attach to the main unit of information such qualifications as were deemed necessary to fully identify a given transaction (figure 17:2¹¹⁷); still more single entries were entered into a single account by dividing the length of the tablet into two or more columns, each column consisting of one or more individual entries¹¹⁸. The relationship of these single-entries to each other in an administrative sense is obvious when with smaller texts two or more entries consisting of only numerical notations and ideograms representing objects are globally qualified by an ideographic notation physically distinct from the numerical notations (figure 19, W 20368,2); with larger accounts, the scribes will often include, as a rule on the reverse face of the tablet, summations of numerical notations included in individual entries. Both types of information correspond to the colophons of later cuneiform tradition. These totals consolidate multiple entries into a single notation, thus documenting the fact that the individual entries represent intrinsically comparable goods, and that they all fell under the responsibility of a single accounting office. Ideographic notations accompanying numerical totals act as global qualifications of objects recorded in the accounts, of the responsible offices or officials, and of the type of transactions recorded. This accounting typology became substantially more complex, just as the quantities of goods became substantially greater, in the Uruk III period, that is, in the period of purported decline after the great building activities, and the presumable colonizations of the 'Uruk expansion' ending in the Uruk IV period.¹¹⁹

The two account types in figure 17:6-7 represent high levels of accounting, found only in the Uruk III period. Multiple entries filling three obverse columns in the former text are consolidated in three steps on the account's reverse surface. A concrete example of this involved procedure is shown in figure 20 in a (reconstructed) summation of the Jemdet Nasr account MSVO 1, 185.¹²⁰ Various summanda are here totaled through three levels of commonality. This reconstruction of the reverse side of the text implies that, as is obvious from the entries on the tablet's obverse, the text consists of the accounts of three years (1-3N₃₇+U_d) and that the counted objects "DUR₆" (meaning unknown) are qualified either as BA or GI. The tablet is then rotated around its horizontal axis and each yearly account individually itemized in the right-hand column of the reverse face. The first summations consist of the addition of BA DUR₆ and GI DUR₆ for each year; secondly, all the BA DUR₆ and all the GI DUR₆ are totaled, and finally the two sub-totals of BA and GI are subsumed in a general total of all DUR₆.

¹¹⁷ The numeration within the text formats indicates the entry sequence, counting the cases 1 ff. from the top, and 1a, 1b etc. within particular cases.

¹¹⁸ Fig. 17:3; the columns are in conventional transliterations qualified with the use of Roman numerals i, ii, etc. Note that this simple multiple-entry format was that of the so-called lexical texts discussed below, section 5.

¹¹⁹ The apparent economic expansion documented in the accounts in a time of seeming decline – note also that the commodities represented in proto-Elamite accounts far eclipse in economic value any goods documented in such preliterate accounts as clay envelopes and numerical tablets, insofar as we can understand their meaning (see P. Damerow and R.K. Englund, Tepe Yahya) – should act as warning to proponents of an expanding southern Babylonian administration in the late Uruk period, followed by decline and withdrawal from regions bordering Mesopotamia in the Jemdet Nasr/Uruk III phase.

¹²⁰ See also the example MSVO 1, 95, in fig. 21 below.

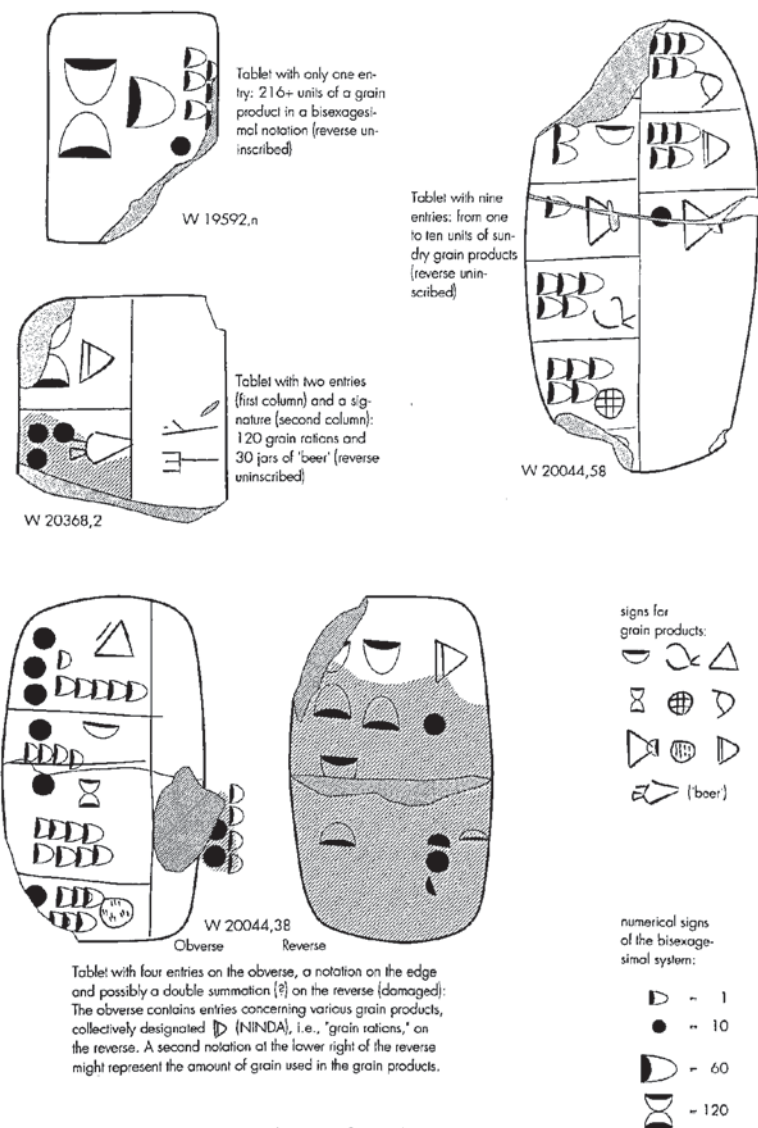


Figure 19: Tablets with varying degrees of complexity

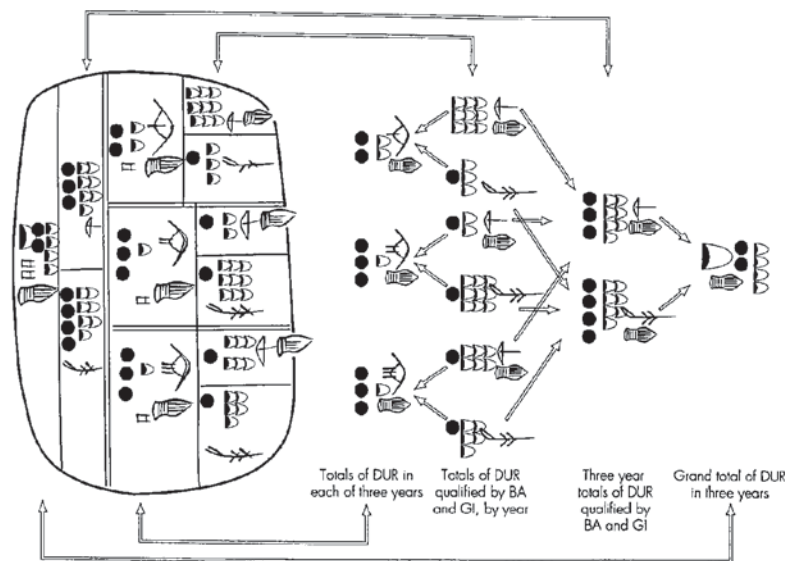


Figure 20: Complex summations
The totals contained on the reverse face of the Jemdet Nasr tablet MSVO 1, 185, could be confidently reconstructed based on preserved numerical notations. The sign DUR has not been deciphered.

In those cases in which the obverse did not offer enough space to complete all separate entries – represented by the latter text –, the tablet was first rotated around its vertical axis, the entries completed, and then, before the summations were written, the tablet was either turned 180° or, as seems more likely, was turned over to begin tallying the numerical notations, after which it was again rotated around, this time, its horizontal axis to use the normal space for totals. A second Jemdet Nasr account, MSVO 1, 99, in figure 21, presents an example of such an accounting procedure. This is a phenomenon noted also in the Jemdet Nasr period proto-Elamite texts from Persia.¹²¹

With one or two possible exceptions, we have in the archaic text corpus no clear examples of the early use of proto-cuneiform to reproduce in writing a spoken language (see the discussion below of the so-called Sumerian question). Rather, the formal division of the administrative tablets reflects the 'grammar' of the archaic accountants' syntax. Roughly speaking, assuming that the accounts available to us are the records of distribution, of which receipts are the simplest form, then numerical notations and object designations of individual cases or receipts represent direct objects, attached personal designations indirect objects of verbal actions explicit or implicit in global qualifications of text colophons. Divisions of individual cases into two or more sub-cases correspond to the adjectival, divisions of colophons to adverbial qualifications in more advanced syntax.

¹²¹ Cf. P. Damerow and R.K. Englund, *Tepe Yahya*, 11-13 + fig. 6.

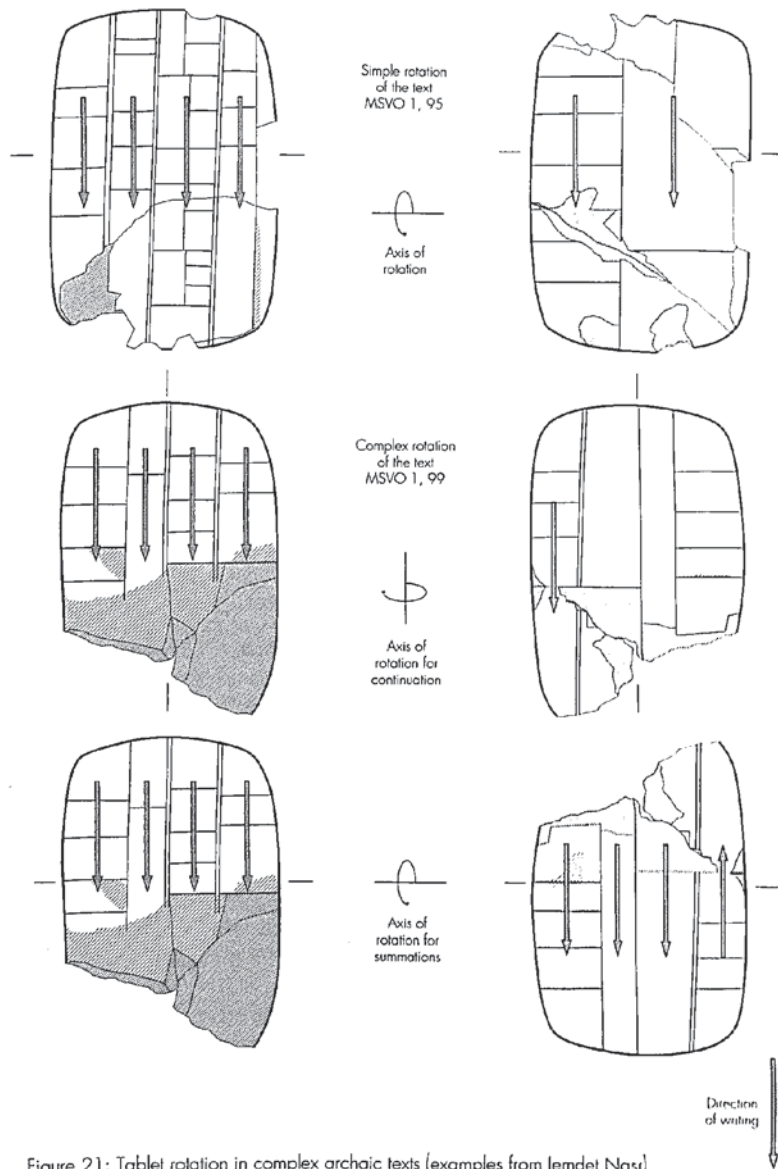


Figure 21: Tablet rotation in complex archaic texts (examples from Jemdet Nasr)

4.2. RESEARCH OF PROTO-CUNEIFORM

Our basis for judging the characteristics of the proto-cuneiform writing system is not small. Some 5820 archaic texts and fragments containing close to 35,000 individual entries (cases) and 42,000 individual occurrences of ideograms¹²² are currently catalogued and transliterated according to values assigned the signs in the sign list ATU 2.¹²³ Despite the impressive amount of material, it has not been possible to positively identify the language of those scribes who developed and used proto-cuneiform in the periods Uruk IV-III, so that when we speak of advances that have been made in the decipherment of the writing system, we mean formal advances in our understanding of the context of the archaic texts and in the meaning of individual signs, and not a classical decipherment of an unknown language. Beyond our own limitations, several factors act to hamper work, be it systematic or intuitive, to effect this classical decipherment. In the first place, it may well be that the language of the archaic scribes no longer existed following the Late Uruk period, given the fact that major upheavals apparently disrupted Babylonia following Uruk III and before Early Dynastic I, upheavals which might themselves have led Sumerians into the southern alluvium.¹²⁴ Second, the script was not used to represent a spoken language in a large majority of texts available to us. Approximately 85% of all archaic texts are administrative accounts; the conciseness of such texts is known to anyone who has tried to reconstruct the history of a transaction using them – and such difficulties are, one might say luckily, more pronounced for the auditor than the taxed citizen, who has some background knowledge of the circumstances surrounding particular receipts. Further, even the non-administrative records, the so-called lexical lists (see below, section 5), are with one exception comprised of simple lists of semantically related words, such as lists of domestic animals, of professional names,

¹²² That is, excluding numerical signs, which are individually the most numerous. Counting iterative notations of one numerical sign in discrete notations as one attestation of that sign (e.g., counting a notation 7·N₁ [= '7' in numerical systems used to qualify discrete objects] as a single notation of the sign N₁), the total number of sign attestations reaches over 62,000.

¹²³ Of the 5820 texts, fully 5000 represent archaic documents from the levels Uruk IV and III in the district Eanna of Uruk. The remaining 820 texts derive from regular and irregular excavations of archaic levels of Babylonian settlements, including the approximately 245 Uruk III period texts from the small northern Babylonian mound of Jemdet Nasr, 85 extraordinarily well preserved tablets from the former Erlenmeyer collection, and 410 texts from Early Dynastic I-II levels from Ur (published by E. Burrows, UET 2 [London 1935]. 17 clay documents from Early Dynastic levels of Uruk may now be included in this writing stage, as well as most if not all of the inscriptions on stone tablets recently edited and erroneously dated to the late Uruk period by I.J. Gelb, P. Steinkeller and R.M. Whiting, OIP 104 [1991] 39-43; see ATU 5, 127]. Also included in this latter group are 80 tablets today found in various small collections and deriving mostly from the antiquities market, now collected in MSVO 4.

¹²⁴ This is a view held by few in the field; see, for instance, C.H. Gordon, *The Ancient Near East* (New York 1965) 34. A. L. Oppenheim, *Ancient Mesopotamia* [...], (Chicago 1964) 49, recognized the incongruencies of proto-cuneiform in writing Sumerian; he believed, however, that the creators of the script, and their writings, dated to a period before Uruk IV: 'It is quite likely that the Sumerians had adapted for their own use an already existing system and technique of writing. This seems to have been the creation of a lost and earlier, either native or alien, civilization, which may or may not have had some relation to the foreign elements in the Sumerian vocabulary, the topographical names of the region, and possibly, the names of the gods worshipped there'.

and so on, with no syntactical interrelatedness such as is offered in the shortest of royal inscriptions; the exceptional 'Tribute List' (see below, section 5, under *Literature*) has unfortunately also led to no successful decipherment attempts, and was apparently not understood even by successive redactors in the Fara, and even into the Old Babylonian period.

The formal advances in understanding the context of the archaic texts are really no small accomplishment, since a detailed description of the archaic script as found in the archaic levels Uruk IV-III is a rewarding endeavor in terms of the light it sheds on the administrative and scholarly world of late 4th millennium Babylonia, and will be helpful in defining the contours of the decipherment possibilities the script holds; it may, however, be disappointing to those who have found in secondary literature evidence for identifying Sumerian as the language of the creators of writing.

A. Falkenstein's archaic signlist ATU 1 was in its time, following just three excavation campaigns in the Eanna district of Uruk, a substantial achievement. The Sumerologist was able, in this publication of the first 600 tablets unearthed in Uruk, to catalogue a total of 50 numerical¹²⁵ and 890 ideographic signs. The latter signs were categorized and numbered according to graphic form. Falkenstein recognized early forms of later cuneiform signs in many of his entries, but was on the whole reticent to ascribe these values to the archaic material.

The work of H.J. Nissen and M.W. Green on the subsequent finds from Uruk, above all on the great numbers of witnesses to a growing compendium of lexical lists attested in the archaic period, represented a substantial advance in the means to identify meaningful correspondences between the archaic sign repertory and that of following periods, from which line for line copies of the lexical lists were known. The comparisons of those signs which assumed the same positions in respective lists made possible a large number of *formal* identifications of the archaic signs with later counterparts. The belief of both editors of the revised archaic sign list, ATU 2, that there was sufficient evidence to identify Sumerian as the language of the archaic scribes, and of M.W. Green that the same scribes frequently used graphic variants to represent specific signs, resulted in the decision to publish the list in a particular form. In the first place, nearly all graphically similar signs were, often regardless of contextual usage, grouped together under one 'lexeme'. This policy led to a substantial reduction of signlist entries to 770, plus nearly 60 numerical signs.¹²⁶ In the second, Sumerian readings (i.e., phonetic realizations) were assigned to all those archaic signs found to have counterparts from Fara period and later lexical list witnesses, for which readings could be inferred, as well as to those not lexically attested but presumed to be clear graphic precursors of later signs.

The second decision is perhaps most easily excused, although there is precious little, if any evidence for any Sumerian readings of archaic signs. We have in subsequent work and publications of the archaic material used these readings, always with the understanding that they are entirely conventional. There is even a certain mnemonic advantage in the

¹²⁵ See below, section 6.1.

¹²⁶ The editors, moreover, felt charged to limit their efforts to the archaic texts from Uruk, leaving aside all evidence from the text corpus from Jemdet Nasr and from other collections.

transliteration system these readings offer us, since it is often easier to make note of the sign denoted AMAR than its correspondence from the Falkenstein list ATU 1, 458. However, the graphically similar groups formed by Green are more difficult to excuse, not only because following the publication of ATU 2 large numbers of 'variants' gathered in this way under a single entry have proven to be distinct signs, but because this likelihood should have been evident based on a simple consideration: all graphemes which do not share very close forms with those signs identified through the lexical lists as precursors of identified cuneiform signs can only be assigned the same 'readings' if their contextual usage can be shown to be the same.¹²⁷ If that is not the case – and it is not the case in many sign identifications in ATU 2 – it would be imperative to assign such signs other 'readings', or at least codes which would serve to preliminarily differentiate them from the sign of comparison. As a result of this error of judgment, the signs identified in ATU 2 were retroactively differentiated using a series of indices adopted to the indices already used in the signlist.¹²⁸

In fact, following this supplemental differentiation, the current list of archaic signs gives us 60 numerical signs, and nearly 1900 ideograms. This more than doubling of the total published in ATU 2 in all likelihood errs on the side of caution, assigning separate codes to all signs whose contextual usage cannot be shown to demonstrate an allomorphic relationship to a sign whose identification is supported by lexical attestations. Thus until it can be shown that signs rotated to the right or left, so-called *tenū*-forms, have no meaning which differentiates them from the same signs in a conventional orientation – sign rotation in a number of cases can be shown to fulfill simple space needs, that is, rather than distorting to fit it into a prescribed space, scribes are known to rotate a sign – such forms receive distinct names (for example, T₀ and T₁). These types of rather obvious variations are numerous in the earlier archaic period Uruk IV (see, for instance, the signs EN and SANGA in figure 22) and can lead to an inflation of identified signs. Another example of probable overcautiousness are the many sign identifications resulting from the more or less pictographic renderings of animals' heads in the Uruk IV period. In these cases, sign name differentiations were chosen as a stop-gap measure to keep some control of Uruk IV as opposed to Uruk III forms, remembering just the same that it is precisely the series of animal heads from the Fara signlist

¹²⁷ This is also the major criticism of the reviewers cited below, n. 130.

¹²⁸ The indexing of suspect signs was already underway at the time of publication of the signlist (see ATU 2, pp. 347-350). New sign forms are for the moment being assigned consecutive numbers following the last attested number in ATU 2, ZATU783. We have attempted to make this information available to interested scholars in two ways. In the first, all of our pertinent files current at the time of publication were included on diskette with the volume ATU 5; those relational files, in ASCII format but prepared for loading into a common data base program, included a complete catalogue of all archaic texts, a signlist and a text file with all transliterations, corrected (i.e., published) and uncorrected (unpublished; these latter transliterations, and thus the entries they bring into the project glossary, are unevenly collated, with a high reliability in those texts from European collections, and for obvious reasons a relatively lower reliability in those from the Iraq Museum). In the second, we are currently preparing for internet publication a data base with digitized images of all accessible tablets (photos or originals), published copies and individual sign forms linked to text transliterations and catalogue entries. The WWW address of this data base is 'http://early-cuneiform.humnet.ucla.edu', with European mirror on the server of the Max Planck Institute for the History of Science, Berlin.

which remains a major stumbling block in any attempt to write a paleography of cuneiform for the period 2500-2000 B.C.¹²⁹ Unnecessary differentiations can, moreover, be much more easily dismissed at a later date than necessary differentiations retroactively introduced.¹³⁰

While compared with a logographic script such as classical Chinese with its 50,000-60,000 signs¹³¹ the current archaic sign list appears rather modest, it should be noted that like the Chinese script our proto-cuneiform is a very productive writing system. The two best-known means of creating new signs in cuneiform are by graphically changing a discrete sign, and by forming sign combinations. Graphic changes of discrete signs include rotations (*tenū*, *inversum*, and in the Uruk IV period often mirror images¹³²) and decorations with added strokes and dots (*gunū*, *šessig*¹³³). Signs were, moreover, combined in a variety of ways, the most popular being the insertion of a qualifying sign into a free space offered by another sign. For instance, the majority of the long series of signs inscribed within the sign DUG_b representing a jar found in the lexical list "Vessels" (see figure 29 below) are nowhere else attested and might represent the paradigmatic 'fullness' felt in many lexical lists of the third millennium, resulting in such improbable designations as 'old calves' not because scribes considered this a reasonable entry, but because it satisfied an appetite for completeness and symmetry in the lists. Thus all commodities which one might have imagined within a pot were included, even if not practically feasible.

If the current sign list is cleansed of combinations and of those sign derivations which seem least likely to be meaningful, the number of ideograms remaining is just under 900, and there is little doubt that this will decrease even more with further work on the archaic texts. This total, while again comparable with those of both Falkenstein (ATU 1) and Green and Nissen (ATU 2), must be considered a more valid basis for judging the sign repertory of the archaic period, which at this complexity might still assume the role of a reduced logographic, and not an ideographic writing system.¹³⁴

¹²⁹ Specifically, LAK 239-264.

¹³⁰ The need for these differentiations has been made clear in a number of reviews of ATU 2, including most forcefully those of D.O. Edzard, ZA 83 (1993) 136-141, M. Krebernik, OLZ 89 (1994) 380-385, and P. Steinkeller, BiOr 52 (1995) 689-713.

¹³¹ V. Mair, "Modern Chinese Writing," in: P.T. Daniels and W. Bright (eds.), *The World's Writing Systems* (New York, Oxford 1996) 200, notes that dictionaries starting at the end of the 1st century A.D. went from ca. 9350 to 12,800 logograms in 400 A.D., to 26,900 in 753, to 33,200 in 1615. The most recent dictionary of single graphs lists about 60,000. At the same time, studies have shown that 90% of all text occurrences in China are covered by 1000 signs, 99% by 2400. Similarly, 625 of the 'extended proto-cuneiform sign repertory of 1950 are attested just once, 239 twice, and 134 three times; this means that more than half of the listed graphs represent just 2.5% of the total sign occurrences of ca. 62,000 (ideograms and numerical signs).

¹³² See fig. 22, signs EN, SANGA, and MUŠ₃.

¹³³ The addition of one or more impressions of the blunt end of a 'numerical' stylus might be included here, inexplicitly called '+TAR' in ATU 2 (see, for example, fig. 22, sign GURUŠ, but also NUN).

¹³⁴ This judgment must await a better understanding of the functions of the signs, but we need to remember that the classical logography of Chinese reduces to just 500 discrete graphs in a myriad of combinations, and that Babylonian ideograms introduced in later periods were rarely new, but merely combinations of old elements.

	Uruk IV	Uruk III		Uruk IV	Uruk III
	DUG _b				
	DUG _c	Pots		EN	Chief Administrators
	DUG _c				
	KAS _b			SANGA	Exchequers
	AB _b	Sea ²			
	GU ₄	Oxen		3 NUN	Gods ²
	AMAR	Calves		GURUŠ	Workmen
2	ŠAH ₂	Pigs			
	BU _a	Snakes		MUŠ ₃	Inanna
	SAG	Men			
	TUR	Children		Gl ₆	Nights
			4	AN	Stars
				GA _b	Milk buckets

Figure 22: Paleographic differences
The table demonstrates some of the graphic developments between the Uruk IV and III periods. 1: straightening of oblique lines, 2: abstraction of pictograms, 3: simplification of elements, standardization of sign orientation, 4: varia

Counting signs might seem an effete exercise, yet we know that such efforts can tell us much about the purpose of the texts these signs appear in. The list presented below indicates those non-numerical signs of greatest frequency (from 1000 down to 100 attestations; translations are for the most part hypothetical) in the administrative text corpus dating to the periods Uruk IV-III, beginning with EN_o, which seems to represent the highest official in archaic administration.¹³⁵ This sign is attested more than twice as often as the next-most numerous sign, ŠE_o = 'barley'. The sign BA of about the same frequency as ŠE_o represents an administrative function, presumably 'distribution' or 'inspection'. AN and NUN_o are both likely designations of deities (possibly An and Enki, respectively; notice that MUŠ_{3o} = Inanna is quite low in this list!). The object designations with the highest frequency are, not unexpectedly, ŠE_r, followed by SAL = 'female slave', and UDU_o = 'small cattle'.

sign	meaning	frequency	sign	meaning	frequency
EN _o	"chief administrator"	996	ME _o	"a textile?"	223
ŠE _o	"barley"	496	GU ₂	"ration"	220
BA	"distribution"	495	MUŠ _{3o}	"Inanna?"	219
AN	"An?"	485	GAR	"grain ration"	212
NUN _o	"Enki?"	456	NAM ₂	"official qualification"	209
PAP _o	"overseer?"	409	AB ₂	"cow"	202
SAL	"female slave"	388	TUR	"small (person)"	197
GI	"delivery?"	368	DUG _c	"dairy oil jug"	196
SANGA _o	"accountant"	365	IB _o	"household?"	195
GAL _o	"large (person)"	353	UNUG _o	"Uruk"	190
E _{2o}	"household"	335	NE _o	"red?"	186
UDU _o	"small cattle"	330	SI	"? (horn)"	183
ŠU	"hand, receipt"	298	DUG _o	"beer jug"	181
U ₁	"day"	286	HI	"egg?"	180
TUG _{2o}	"bolt of cloth"	268	SUHUR	"dried fish"	179
BAR	"?"	265	KU _{oo}	"fresh fish"	176
BU _o	"? (snake)"	265	TE	"an official"	162
ŠITĀ _{o1}	"an official"	252	GA _o	"milk bucket"	155
A	"water"	250	ERIM _o	"prisoner?"	153
AB _o	"large household"	242	MA	"string (of fruit)"	151
ŠU ₂	"cap?"	238	KU _{3o}	"half measure of oil"	146
DU	"? (foot)"	237	ZATU753	"?"	132
PA _o	"supervisor?"	236	SU _o	"leather"	131
KI _o	"place"	229	APIN _o	"plow"	115
SAG	"human"	224	MAŠ	"mole kid"	115

¹³⁵ This is to be noted to the curious fact that EN is not listed in the lexical professions list Lu, A, for which see below, section 5. This might suggest that the term is a general designation of household administrators (compare below, section 5 [with n. 227-228], to ll. 14-22 of the lexical list UKKIN), or that the profession list merely included those members of the administration who answered to the EN.

GAN ₂	"field"	114	ŠUBUR	"pig"	106
KUR _o	"male slave"	113	ZATU752	"seal?"	106
DA _o	"?"	111	ŠE ₃	"dung?"	105
MUŠEN	"bird"	110	NI _o	"dairy oil container"	104
GU ₁	"ox"	108	SIG _{2o}	"wool"	104

Another form of 'sign-crunching' which might have been used to derive statistics from the texts helpful in establishing statistically significant sign sequences is the frequency of signs in first and last position of isolated sign combinations, the frequency of signs in a 1-2 and 1-2-3 sequence, and so on. The same graphotactic characteristics of proto-cuneiform which make an identification of language elements difficult, however, also hamper a necessary further cleansing of variants. For although sign notations follow a strict sequence insofar as numerical and object designating signs are concerned, ideograms which represent persons and administrative functions are notoriously fluid in their case positioning. This phenomenon has been noted throughout the ED II and IIIa (Fara) periods; a standardized sign sequence reflecting spoken Sumerian seems first attested in the early pre-Sargonic Lagash period around 2500 B.C. Certain types of combinations do, nonetheless, seem to follow a prescribed sequence, at least in the Uruk III period. For instance, professional designations attested in the ED Lu₂ A list (see below, section 5, and figure 32) invariably exhibit the sequence NAM₂/GAL_o/EN_o+qualifier, whereas other lists suggest that qualifiers precede inanimate object designations.¹³⁶

4.3. CHARACTERISTICS OF THE SCRIPT

The physical characteristics of proto-cuneiform signs have been discussed in earlier publications.¹³⁷ I have stated above my conviction that with few exceptions all proto-cuneiform signs are pictographic representations of real things. Such pictograms either took the form of a complete rendition of some object, or, using the method of *pars pro toto*, a part of an object, most often the head of an animal or human. It seems likely that with such pictograms as ŠU, 'hand', ideographic meanings are implied which would reflect actions related to the pictogram. The original meaning of the Sumerian composite verb šu-ti, 'hand-approach' will have had no more impact on its understanding by native speakers than the pedantic references in German middle schools to the literal meaning of *be-greifen* have on students today. Thus such administrative uses of ŠU in archaic accounts should be understood to represent actions of giving and receiving; a reduplication of the sign as a global qualification of an account in such texts as MSVO 1, 11 and 36, is even more suggestive of its ideographic use.

¹³⁶ See, for example, the combinations with TUG₂ and GA'AR in the list 'Vessels' below, fig. 29, and note the consistent sequences GAL_o + JAR and JAR + TUR in the text MSVO 3, 11, below fig. 76.

¹³⁷ See still the admirable study of A. Falkenstein, ATU 1, 22-29. All general histories of writing have included descriptions of archaic signs, including recently M. Kuckenburg, *Die Entstehung von Sprache und Schrift. Ein kulturgeschichtlicher Überblick* (Cologne 1989); A. Robinson, *The Story of Writing* [...] (London 1995); P.T. Daniels and W. Bright (eds.), *The World's Writing Systems* (New York, Oxford 1996) (and see D.O. Edzard's contributions "Die Keilschrift" in: U. Hausmann [ed.], *Allgemeine Grundlagen der Archäologie* [...] [Munich 1969] 214-221, and in RIA 5 [Berlin 1976-80] 544-568).

Remembering that to achieve the original orientation of proto-cuneiform texts we would need to rotate all figures in this contribution 90 degrees clockwise, it is not difficult to find a strong tendency on the part of the scribes to achieve a symmetrical design through the vertical (conventionally, our horizontal) axis of most pictograms, including the abstracted numerical signs. This is not a fortuitous development but rather is grounded in cognitive experience of the world, and may have played a role in the entire process of abstraction which can be shown to have been at work between the Uruk IV and III periods in Uruk. The physical constraints on sign forms of writing on a clay surface using a carved stylus of wood or reed seem overemphasized, since we cannot say with certainty how scribes held either tablet or stylus. But it does seem likely that the natural tendency to increase the speed of writing in an administrative, and not a literary context, influenced the form of pictograms and gave archaic cuneiform the same 'flow' in the direction of writing – again, along a vertical axis – known from later cursive forms.¹³⁸ Thus a simple count of 'heads' and 'tails' of archaic wedges will show that those impressions drawn against the flow of writing in the Uruk IV period are dropped, and often replaced in favor of those drawn with the flow.¹³⁹

Figure 22 attempts to demonstrate some of the common graphic elements evident in the Uruk IV period which in a process of abstracting and presumably more rapid writing were altered in the following script phase. These changes range from the most obvious of, in the interest of writing economy, straightening those oblique and curved strokes which better represented the form of pictographic referents, to simplifying physical elements in the heads of animals and humans, including deleting facial contouring and eliminating eyes. Gunitation and cross-hatching can be standardized to a series of parallel strokes. For example, the impressed dots in the Uruk IV period sign $K\bar{A}\bar{S}_o$, probably borrowed from the numerical system used to qualify barley groats (below, figure 41), formed parallel lines in the Uruk III period sign (see figure 22:1). Cross-hatching in the Uruk IV period sign GA_o , representing the matting of reed baskets, was in the Uruk III period made to conform to a vertical/horizontal pattern (figure 22:4). Further, by the Uruk III period, sign orientation was so far standardized that variant orientations were no longer used, including, for instance, the mirrored forms of the signs EN and $MU\bar{S}_o$. Attempts by Falkenstein and Nissen to assign, using less objective criteria, certain texts to paleographic subdivisions of the Uruk III period have by and large been unconvincing.¹⁴⁰

¹³⁸ H.E. Brekle, 'Konventionsbasierte Kriterien der Buchstabenstruktur am Beispiel der Entwicklung der kanaänisch-phönizischen zur altgriechischen Schrift,' *Kodikas/Code Ars Semiotica* 10 (1987) 229-246, has emphasized the historical and cognitive importance of vertical symmetry in early alphabetic scripts. In 'Some Thoughts on a Historico-Genetic Theory of the Lettershapes of our Alphabet,' in: W.C. Watt (ed.), *Writing Systems and Cognition* [...], Neuropsychology and Cognition 6 (Dordrecht, Boston, London 1994) 129-139, the same author reminds us of the tendency of letters in the Phoenician-Greek-Roman line of script development to 'look' in the direction of writing, i.e., that the ideal letter consists of an initial vertical followed by one or two additions in the direction of writing.

¹³⁹ A. Falkenstein, *ATU* 1, p. 9 (with fig. 2).

¹⁴⁰ See *ATU* 2, 53-62, and *Archaic Bookkeeping*, 21-23 + figs. 24-25, with a division into Uruk III.3-1, reflecting, but not employing the archaeological subdivisions Uruk IIIc-a. The subdivisions were based on few texts and on a presumed mixing in those texts of sign forms from both phases Uruk IV and III.

4.4. THE SUMERIAN QUESTION

It seems an inherently reasonable assumption that proto-cuneiform should have been invented and developed by Sumerian administrators. Despite the discontinuities obvious in the archaeological and epigraphic record of the third millennium, major architectural, artistic and administrative remains suggest that in fact a homogeneous culture reigned in southern Mesopotamia,¹⁴¹ which was transmitted to the east, the north,¹⁴² and, it seems, to the south.¹⁴³ The great preponderance of Sumerian readings of signs, both as logograms and as syllabograms in the writing of Semitic names in the Fara period, of entire Semitic texts beginning in the Old Sumerian period (Ebla), makes it appear that the cuneiform of this period was borrowed by East Semitic Akkadians from Sumerians and consequently that the Akkadians, as the second dominant cultural element in the Fara period, are not candidates to have been the inventors of proto-cuneiform.¹⁴⁴

Attention should also be drawn to some few apparent elements in archaic orthography which may or may not have grammatical relevance. First, as an agglutinating language Sumerian also forms duratives and iteratives, as well as marks plurality of subject or object, by repetition of ideograms. There are some instances of this practice in archaic accounts, including a doubling of the signs ŠU and GI, both of which according to their position in

¹⁴¹ This is most clear with respect to the major cultural diagnostics of the Late Uruk period, namely in the conception and realization of community buildings, in ceramic design and typology, in the production and administrative use of the cylinder seal, and in the exploitation of writing. Plans of temples and other monumental buildings show a progressive development beginning in the Ubaid period and continuing throughout the third millennium. The same applies for artistic representation in sculpture and relief, as well as in depictions on seals. Most important appears to be the continuous use of the same script as a general administrative tool, moreover of specific text formats, of specific numerical and metrological systems, and of specific signs and sign combinations as stable representative devices throughout this period of over a thousand years.

¹⁴² Thus the long-lasting discussion of a 'Sumerian expansion' in the Late Uruk period. See, for example, G. Algaze, 'The Uruk Expansion: Cross-cultural Exchange in Early Mesopotamian Civilization,' *Current Anthropology* 30 (1989) 571-608; id., 'The Uruk World System: The Dynamics of Expansion of Early Mesopotamian Civilization' (Chicago 1993); P. Michalowski, 'Memory and Deed: The Historiography of the Political Expansion of the Akkad State,' in: M. Liverani (ed.), *Akkad, The First World Empire: Structure, Ideology, Traditions*, HANE/S 5 (Padua 1993) 69-90, esp. 72.

¹⁴³ M. Tasi, 'Early maritime cultures of the Arabian Gulf and the Indian Ocean,' in: S. Al Khalifa and M. Rice (eds.), *Bahrain through the ages: the Archaeology* (London 1986) 103; H. Mynors, 'An Examination of Mesopotamian Ceramics Using Petrographic and Neutron Activation Analysis,' in: A. Spinnall and S. Warren (eds.), *Proceedings of the 22nd Symposium on Archaeometry, School of Physics and Archaeological Sciences* (Bradford 1983) 377-387.

¹⁴⁴ Note also that R.D. Biggs, *OriNS* 36 (1967) 55-66, refutes D.O. Edzard's suggestion, *Genava* n.s. 8 (1960) 243¹⁰, that some names from the archaic texts from Ur, primarily of the so-called 'Banana' type, can have been Semitic; they probably reflect a non-Semitic element in the population. See also the comments of I.M. Diakonoff, *VDI* 84/2 (1963) 168⁹. Given the high unreliability of ascribing Sumerian values to proto-cuneiform signs, P. Steinkeller's proposed Akkadian interpretations of the sign combinations MAS.GAN₂ (for *maskanu*, this was also the feeling of M.V. Green, who included this sign combination as a ligatur in the signlist *ATU* 2) and BA.DAR (for *palaru*; disregarding the speculation concerning E₂.DUR, for *o₂.duru₂*, of possible Semitic etymology) in *BiOr* 52 (1995) 695, can, based on the context of the available administrative attestations (BA.DAR is, in fact, only found on the ED I Blau tablet OIP 104, no. 11), be disregarded – a simple sorting program would generate hundreds of equally probable Akkadian readings.

texts and to their later cuneiform tradition would seem to represent administrative functions, and specifically probably verbal actions. The counterpart to GI mentioned above, BA, however, is never reduplicated in administrative context.

A certain Sumerian bias might explain the early identification of a presumed example of Sumerian multivalency in the archaic script by the Assyriologist and Archaeologist S. Langdon.¹⁴⁵ As excavator and epigraphist of the first large group of archaic texts unearthed in Mesopotamia, those found at the northern mound of Jemdet Nasr, Langdon isolated among the many apparent personal designations of the Jemdet Nasr texts the sign combinations EN E₂ TI, which he analyzed as a common Sumerian form (^dEn.lil₂.ti, 'May Enlil give life'. This personal designation would share two characteristics with Sumerian prosopographical practice. In the first place, the name would exhibit devotion to members of the Sumerian pantheon, in which the god Enlil played the leading role. In the second, it would exhibit the feature that many Sumerian names consist of sentences with subject and predicate, or of other recognizably grammatical elements.¹⁴⁶ A correct analysis En.lil₂.ti would, moreover, provide us with clear evidence for the multivalent use of the sign ARROW in proto-cuneiform,¹⁴⁷ namely, in that the word for 'arrow' should be a homophone of the word for 'life', 'to live'. As has been noted to distraction, this homophone construction is known only in the Sumerian language.

A closer look at the combination EN E₂ TI, however, makes this analysis of the name unclear, if not improbable. Of the ca. 50 attestations of the sign, TI is found in no other case in the archaic corpus together with a presumable divine name and in only one case of a tablet from Uruk together with EN E₂ (W 17729,ee rev. i 3b).¹⁴⁸ This posited divine name

¹⁴⁵ Langdon was, in fact, so fixated on the Sumerian origins of Mesopotamian culture as to venture in "A New Factor in the Problem of Sumerian Origins," JRAS 1931, 593-596, that planoconvex builders [of the Early Dynastic I period] were a "recrudescence of the culturally retrograde indigenous inhabitants of South Mesopotamia," although, to the contrary, planoconvex bricks may have been the earliest contribution of Sumerians to Mesopotamia!

¹⁴⁶ See the introduction to H. Limet, L'Anthroponymie sumérienne [...] (Paris 1968) 61-112, and more recently W. Heimpel, "Sumerische und akkadische Personennamen in Sumer und Akkad," AFO 25 (1974-77) 171-174, and R.A. di Vito, Studies in Third Millennium Sumerian and Akkadian Personal Names, SIPohl SM 16 (Rome 1993) 18-122.

¹⁴⁷ The sign itself is a pictogram of an arrow and a bow. This would more precisely be called a paronomastic use of pictographs, since multivalency is defined as the use of a graph paronomastically and parosemantically (the same graph represents variable, phonetically distinct words). Only after a growing ambiguity – resulting from increased multivalency – has led to confusion will the use of semantic and phonetic 'determinatives' be introduced, as these are posited for the archaic writing system by some scholars (see below, n. 158).

¹⁴⁸ A.A. Vajman, "Die Zeichen É und Ûl in den proto-sumerischen Texten aus Djemdet Nasr," BoM 21 (1990) 114-115 (translation of the article which appeared in Peredneaziatiskij sbornik 1979/3, 57-59), thus analyzed the combination EN E₂ TI either as e₂ en.ti, "house of the god Enti," or as e₂ ebil, "house of Ebikh". The hypothetical divinity En.ti could be analyzed as 'Lord (Bow and) Arrow' or as 'Lord Life', dependent on the proclivity of the philologist concerned. Some support of this interpretation may be derived from a comparison of in particular entries AB₃ EN₂ TI in the Uruk III period text W 14355 obv. i 3 and E₂ EN₂ TI in Uruk III period texts from Uruk (W 17729,ee rev. i 3b) and from Jemdet Nasr and elsewhere (for example, MSVO 1, 196 obv. i 2, 212 rev. i 3a, 4a, and MSVO 4, 13 obv. ii 2, 36 obv. iii 6). Both AB₃ (later reading e₃) and E₂ represented households nominally headed by gods. Ebikh was a settlement in the northern Diyala region, thus probably in at least commercial contact with the region

EN E₂ is on the other hand represented in about 30 archaic attestations, however only in texts from the northern settlement of Jemdet Nasr together with TI.¹⁴⁹

MSVO 1, 196	obv. i 2	1N ₁ ; EN ₂ E ₂ TI
MSVO 1, 212	obv. ii 1a	1N ₁ ; KUR ₂ EN ₂ TI E ₂
MSVO 1, 212	rev. i 3a	1N ₂ ; E ₂ EN ₂ TI
MSVO 1, 212	rev. i 4a	1N ₂ ; SAL E ₂ TI EN ₂
MSVO 1, 213	obv. ii 2a	1N ₂ ; SAL+KUR ₂ E ₂ EN ₂ TI
MSVO 1, 213	obv. ii 3a	1N ₂ ; SAL+KUR ₂ EN ₂ TI E ₂
MSVO 1, 213	obv. ii 4a	1N ₂ ; SAL+KUR ₂ EN ₂ TI E ₂
MSVO 4, 13	obv. ii 1	E ₂ EN ₂ TI
MSVO 4, 36	obv. iii 6	1N ₁ ; EN ₂ E ₂ TI ¹⁵⁰

While it may be that EN E₂ represents something other than the expected 'administrator of the household', its ascription to the god Enlil would appear to be excluded by the only clear lexical attestation of the sign combination. The Uruk III period text W 21126, the only witness containing the initial lines of the archaic city list (fig. 24 below),¹⁵¹ attests in its

around Jemdet Nasr. The presumable Jemdet Nasr geographical list MSVO 1, 243 (tablet purchased by the trustees of the British Museum in 1924 from the Parisian dealer J.E. Géjou; see MSVO 1, p. 7) contains obv. iii 4 an apparent reference to this settlement with the entry A.A EN.TI, and the Uruk IV period administrative text W 9579,oo obv. i 1 contains the entry 1N₁; PAP₂ TI EN₂ IDIGNA GAL₂ UNUG₂ with a possible association between EN.TI and the Tigris IDIGNA. Note the presumable attestation of the same place-name in the Abu Salabikh list OIP 99, 39-43 (see 39 vi 4 // 43 vi 5).

¹⁴⁹ Note that the text MSVO 1, 213, represents a copy of a section of 212, thus reducing the number of real attestations in Jemdet Nasr to four. It is not clear to me whether the use in the two MSVO 4 texts of the b-variant of the sign E₂ in this sign combination reflects a scribal or regional variation. See the following footnote.

¹⁵⁰ MSVO 4, 13 and 36, certainly the latter and probably both deriving from Uqair excavations, write the combination with the variant form E_{2b} (more than two horizontal strokes inscribed in the sign). The case before obv. iii 6 of the latter text contains the notation 1N₁; EN₂ DARA₂ TI; the sign DARA₂, parallel to E_{2b}, was used to qualify oxen/bulls and calves in the lexical list of domesticated animals and is believed to represent a color designation. See J. Krecher, "Eine unorthographische sumerische Wortliste aus Ebla," OrAnt 22 (1983) 179-189, esp. 184-185, and note the combinations dara₂ ti ab₂ in line 14 of the composition, understood by Krecher as 'cow with dark/colored rib [area]'.

¹⁵¹ The text was first discussed in M.W. Green, "A Note on an Archaic Period Geographical List from Warka," JNES 36 (1977) 293-294, with a reading – based on excavation photographs – of the second entry of EN E₂; this reading formed the basis of H.J. Nissen's short discussion of the sign combinations EN E₂/KID in "Ortsnamen in den archaischen Texten aus Uruk," OrNS 54 (1985) 228. My subsequent collation of the tablet in the Iraq Museum, Baghdad, (JESHO 31 [1988] 131-132^o, and see R.J. Matthews, MSVO 2, 34-40, and R.K. Englund and H.J. Nissen, ATU 3, 34-35, 145), showed that the second entry consisted of the signs EN KID₂. This correction is to be noted to the recent comments of Th. Jacobsen, "The lil₂ of ^dEn.lil₂," FS Sjöberg, 267-276, to whose paleographical table on p. 267 the archaic form of KID₂ may be appended (note that the variant KID₂ should represent some type of comestible, in particular as attested in the Jemdet Nasr texts, for which see R.K. Englund and J.-P. Grégoire, MSVO 1 s.v.; P. Steinkeller's discussion of this matter in BiOr 52 [1995] 700, is uninformative). Jacobsen in this article (p. 270, citing the early opinion of A. Deimel, Pantheon 356.1b) incidentally analyzes the name Enlil again as 'lord wind', against current opinion that the name represents a popular Sumerian etymology of a substrate name Ellil/Ilil, whence the Akkadian *ellilu*, *ellilutu*, derived (Jacobsen presumes an assimilation of n and l took place). Note finally that as Matthews has already stated in MSVO 2, 34, the element KID₂ was in the Jemdet Nasr city seal impression replaced by the sign NUN, and that the reading of Enlil in an

second case the sign combination representing the city Nippur, which according to later tradition was written with the same signs as those representing the tutelary god of that city, Enlil.¹⁵² In this and in one other probable lexical text dealing with apparent geographical designations,¹⁵³ the second element of the sign combination was not E₂ but KID_o, that is, the same sign which in its later Early Dynastic form was reserved for the position of /lil/ in the writing of the consort of Enlil in the Sumerian pantheon, Ninlil.¹⁵⁴

A review of the attestations of this sign combination in the archaic text corpus exhibits its consistent usage in colophons and summations in a position which would make sense if it represented a geographical designation; it is attested only in texts from the northern settlement of Jemdet Nasr, and in these cases together with apparent designations of high officials, including a PA_o KALAM ('overseer of the land' ?; MSVO 1, 94 rev. i 1b1), a SANGA_o ('exchequer' ?; MSVO 1, 185 obv. i 4), and an EN_o ('chief administrator', corresponding to the head of administration EN_o of Jemdet Nasr, for which see below, section 6.3.5; MSVO 1, 107).¹⁵⁵

These considerations lead me to believe that the combination EN_o E₂ TI_o should provisionally be left untranslated; considering that the designation seems to be of an official who stands in some relationship to counted slaves in Jemdet Nasr texts, and that the pictogram TI represented a counted object registered also in baskets and, at least in proto-Elamite texts, in very large numbers, it would not be unreasonable to anticipate a meaning 'household of the bows and arrows', 'armory' of the term.

Another candidate which might represent a Sumerian rebus writing in the archaic corpus is the sign GI. A.A. Vajman first drew attention to the fact that the sign GI was found often in archaic texts in a context which excluded its interpretation as a representation of a reed stalk,¹⁵⁶ but rather in which the sign must represent an administrative action concerned with

apparently cryptographic orthography from the Fara period was UD.GAL.NUN, with UD - AN/dingir, GAL = EN, and NUN = e₂/lil₂ and, in the writing of Ninlil, KID [M. Kiebnik, *Die Beschwörungen aus Fara und Ebla [...]*, TSO 2 [Hildesheim, Zürich, New York 1984] 279]. Whether the value /lil/ of KID, adduced by R.D. Biggs, OIP 99 (1974) 111³ (and see Jacobsen, *op.cit.*, p. 267¹) for the Ur III period also obtains for the Early Dynastic texts is unclear.

¹⁵² This list of city designations was copied into the Old Babylonian period, attested by the text UET 7, 80, from Ur, transliterated in MSL 11, 62 (the reverse face of the tablet contains a list of gods). Of the three Early Dynastic witnesses of the same list, SF 23 and OIP 99, 21-22, the first text is damaged and commences with the 5th line of the city list, the latter two – both from Abu Salabikh – preserve only the sign E₂ of the second entry, suggesting that the city name was misrepresented or reinterpreted during the preceding, ED I period.

¹⁵³ The text W 20921, an unidentified list with entries containing for the most part the sign EN_o together with other signs or sign combinations; obv. i 5 consists of the entry EN_o KID_o, and is followed by an entry reading EN_o SURUPPAK_o. This latter entry would seem to indicate an interpretation of EN_o in the preceding entry as a separate logogram – and of KID_o as a place name – and may serve as a warning to remain suspicious of all readings of archaic sign combinations based on later tradition.

¹⁵⁴ The sign E₂/lil₂ was in this period found in the writings of Enlil₂ and Nippur [EN.II₂]. See R.D. Biggs, JCS 20 (1966) 84⁸⁵, and OIP 99 (1974) 111³, and Th. Jacobsen, FS Sjoberg, 267-276.

¹⁵⁵ See also MSVO 1, 95 rev. ii 1, with a possible time notation (3N₂ SU₂ GIBI) and a notation representing a chief cook (ENGIZ ŠAGAN) [this text was discussed by the author in J. Høyrup and P. Damerow (eds.), *Changing Views on Ancient Near Eastern Mathematics* (Berlin, forthcoming)], and MSVO 1, 115 rev. ii 1, with EN_o KID_o in similar context.

¹⁵⁶ "Über die protosumerische Schrift," *ActAnth* 22 (1974) 16.

the control of goods and agricultural land. The natural choice of interpretation would seem to be that GI = /gi/ and thus the homophone of the Sumerian administrative term gi₁, 'to (cause to) return'. It is, however, difficult to explain the qualification with GI and BA of two quantities which are subsumed in a common total, since a Sumerian identification of BA as 'distribute' would result in the consolidation of entries qualified 'income' and 'expenditures'. Moreover, GI and BA can qualify parcels of land in archaic accounts, suggesting that both interpretations may need to be revised. Other attempts to identify within the proto-cuneiform sign repertory phonetic elements,¹⁵⁷ in particular phonetic indicators (signs added to indicate one reading of an ideogram which presumably had several) derived from Sumerian have, in the aggregate, been unsuccessful.¹⁵⁸

A sophisticated attempt to locate Sumerian in archaic Mesopotamia derived from an analysis of ancient numerical systems. In 1972, M. Powell first stated his conviction that since the

¹⁵⁷ J. v. Dijk, "Ein spätaltbabylonischer Katalog einer Sammlung sumerischer Briefe," *OrNS* 58 (1989) 446, suggests a reading pa:na₂:su₂/sa₃, interpreted further as na₂-su₂-pa = nam sipa(d), of the professional designation PA.NAM₂.RAD/ZA known in the herding texts edited by M.W. Green "Animal Husbandry at Uruk in the Archaic Period," *JNES* 39 (1980) 1-35, to qualify a person responsible for accounted animals. su₂ is believed to be a plausible Sumerian reading of the sign RAD (derived from su₂), variant sa₃ (ZA). ZA is however a different sign (NUNUZ, ZA₂), the author meant 'A', a simplified form of RAD. PA is likely the designation of the administrative function of the persons involved, NAM₂.RAD the designation of their charges.

¹⁵⁸ M.W. Green suggested in *ATU* 2, p. 174, that the sign MA together with the sign DARA₃ or PIRIG represented a Sumerian phonetic determinative. Aside from the fact that 'MA' is only secondarily a Sumerian value of the sign (reading peš₃, a type of fruit; a meaning of 'ma' is not known), we have good reason to believe that MA represented a noose with which the animals DARA₃ or PIRIG were led into captivity. The same use of MA (the sign seems pictographically to represent the cord on which fruits were dried) is found in the sign SAG+MA found in only one Uruk text, but in a number of Jemdet Nasr accounts (MSVO 1, 212-217). Whether the sign NA attached to UR₁ represents the Sumerian moon god NANNA (p. 252, NA simplified to KI in later tradition) is provisional on an understanding of the meaning of the sign NA. M. Kiebnik in *OLZ* 89 (1994) 383-384, and P. Steinkeller in *BiOr* 52 (1995) 694-695, have listed a number of other possible phonetic usages of proto-cuneiform signs which would indicate a spoken Sumerian at the time of earliest script development. Unfortunately, the context and continuity of application of the signs cited by both have not been sufficiently documented to lead to any firm conclusions about their phonetic realizations. The reading of /am/ for AN, as a presumable phonetic indicator of the sign ANNA, is itself a construct of grammarians of Old Sumerian texts, and we cannot say whether this sign meant 'mother' in the archaic texts (nothing speaks for this interpretation, and only the form ANNA [GIŠ+AN] survives into the ED I texts from Ur), or whether, for instance, the sign AN was rather a semantic determinative. The same weakness applies to the sign MEN consisting of EN written within GA₂; here, we should expect that if EN was a phonetic indicator, the sign MEN should have had a reading which at least contained the full form of EN, namely /emen/, since over-full phoneticisms are unlikely (cp. J. Bauer, *AFO* 36-37 [1989-90] 78) and neither the reading emen of MEN, nor men of EN, is attested. Of the long list of 'certain or fairly certain' phonetic indicators given by Steinkeller, *loc.cit.*, only NA in NANNA and ZA in AZ are not evidently ad hoc. Neither, however, would make a case for Sumerian writings in the archaic period [if I correctly understand such statements as "the fact that this sign [EŠGAR] appears to be a logogram for 'female kid' is not sufficient grounds for assigning to it a phonetic value ..." in *BiOr* 52 [1995] 700 to no. 149 (and compare p. 701 to no. 184; IAK 490 is indeed related to ga.AR₃!), Steinkeller believes the majority of the Sumerian values ascribed by Green to the proto-cuneiform sign repertory in *ATU* 2 are proven). I have indicated above (n. 147) that the use of semantic and phonetic indicators should fallow on a lengthy development of multivalency. It may be noted in passing that a homophonous relationship appears to exist between the signs ZI and SI₄ in *ATU* 5, pl. 35, W 9123,a1.

sexagesimal system of counting was found amply documented in the earliest texts from Mesopotamia, and since this numerical system was only known in Sumerian texts and documented as Sumerian-bound in lexical attestations of number words, the archaic script must have been invented by Sumerian-speaking scribes.¹⁵⁹ This theory seems disclaimed both by the historical facts and by Sumerian numeracy. On the one hand, it is more likely that the Sumerian number word series originated in the inscribed sexagesimal system rather than the other way around;¹⁶⁰ on the other, there is greater evidence for a vigesimal rather than a sexagesimal basis to those Sumerian number words attested in the third millennium.¹⁶¹ The strength of the assumption that Sumerians developed proto-cuneiform and that the script was used to write texts in Sumerian¹⁶² seems so imbedded that it even hampers discussions of the inadequacy of cuneiform in representing the phonetic structure of Sumerian words. Both C.P. Boisson¹⁶³ and, following him, M. Schretter¹⁶⁴, have in recent publications

¹⁵⁹ ZA 62 (1972), 172.

¹⁶⁰ See P. Damerow and R.K. Englund, ATU 2, 150²². The attestations of Sumerian number words of the series of multiples of 60, that is, of 2x60 = geš₂.min, 3x60 = geš₂.eš, and so on, of 10:60 = geš₁₀, and of 60:60 = šar₂, are with the exception of attestations of the last sign, derived not from third millennium, but rather from first millennium scholastic texts, that is, from texts post-dating the end of the spoken Sumerian by some 1500 years. Such paradigmatic word lists need not be unreliable, given the extremely conservative lexical tradition in Mesopotamia, but the – understandable – lack of phonetic representations of numbers from periods of spoken Sumerian must serve as a warning to judge later representations with some skepticism. Even if the late lexical tradition were to present a true reflection of Sumerian number words, these would not in and of themselves offer any more than passing support of the Sumerian involvement in the invention of proto-cuneiform, since the attested word sequences could equally have arisen from the borrowing of the sexagesimal system from a precursor culture and the simple assigning of a descriptive terminology to these signs.

¹⁶¹ As Powell and others have stated, the rather well attested Sumerian number word sequence below 60 exhibits a vigesimal structure, in which u = '10', niš = '20', ušu = 30 (ušu possibly derived from nis+u, 'twenty + ten', with loss of initial n and vowel harmony of a short i with a long u; first proposed by A.P. Riffin in 1927, for which see I.M. Diakonoff, "Some Reflections on Numerals in Sumerian [...]", JAOS 103 [1983] 85-22), nimir = 40 (*niš.min, 'two twenties'), ninnu = 50 (*niš.min.u, 'two twenties, ten'), geš₃ = 60 (possibly derived from niš+eš, 'three twenties', with haplogical reduction; this term, incidentally, may have been an early 'infinity' in Sumerian, since it would at the same time stand for 'many twenties', the number word eš, 'three', being a plural marker of this language. M.A. Powell, *Visible Language* 6 [1972] 17-18^a has noted, however, the following complications in this identification: 1) a syncope of /s/ is poorly attested in Sumerian orthography, and 2) lexical attestations of the number word for 20 write NI-iš, and NI is never used for the /n/ phoneme [some grammarians do believe NI might be a nasalized vocalic /i/]; note further that it would be difficult in the proposed etymology to explain the /st/ Auslaut of the word for 60, most recently discussed by P. Steinkeller, "Alleged GUR.DA = ugula-geš₃-da and the Reading of the Sumerian Numeral 60," ZA 69 [1979] 176-187. This vigesimal structure seems, however, entirely missing in the numerical system, in which, for instance, the quantity '20' is not represented by an independent sign, but rather by the simple addition of two signs, each representing '10'.

¹⁶² See also A. Falkenstein ATU 1, 37-43, and F.R. Kraus, *Sumerer und Akkader* [...] (Amsterdam 1970) 55. A. Cavignoneaux, "L'écriture et la réflexion linguistique en Mésopotamie," in: Auroux, S., Mordago, P. (eds.), *Histoire des Idées Linguistiques*. Vol. 1: La naissance des métalangages en Orient et en Occident (Lige-Brussels 1989) 100, identifies a 'good argument for attributing to Sumerian the edition of texts for the period immediately following [Uruk IV] [called Uruk III or Jemdet Nasr, circa -3000]: because they contain lists of words which are without doubt Sumerian, ...' [my translation, my emphasis].

¹⁶³ "Contraintes typologiques sur le système phonologique du Sumérien," *Bulletin de la Société de Linguistique de Paris* 84 [1989] 201-233; "Topics in Sumerian Phonology," unpublished manuscript from 1991 cited by M. Schretter (see the following footnote).

¹⁶⁴ "Sumerische Phonologie: Zu Konsonantenverbindungen und Silbenstruktur," *Acta Orientalia* 54 [1993] 7-30.

underscored the difficult phonological situation with respect to the graphic realization of possible consonant clusters in initial or final position in Sumerian words.¹⁶⁵

We have mentioned above the major factors complicating the determination of a possible substrate language in the archaic texts, be that Sumerian or some other language, namely, that bookkeeping is not language oriented, and that there appears to be no adherence to a language-bound sign sequence. Yet this apparent laxness can be demonstrated only to a certain extent. Number sign sequences within discrete notations are, as might be expected, very rigid and so follow a defined numerical 'syntax'. Within text entries, moreover, the position of numerical notations relative to ideographic notations is fairly rigid. The remaining ideograms are presumed to represent proper nouns, above all personal designations (names and professions) and place names on the one hand, and administrative functions, for instance GU₇ = 'rations', on the other. The need to represent personal names, and the known pattern of grammatical syntax within Sumerian names, would seem to invest these isolatable sign combinations with particular importance. Such texts as W 23999,1 and W 20274,2 in figure 65 below, as well as the series of texts MSVO 1, 212-214, present us with incontestable lists of personal designations, and yet the sign combinations in those text entries appear to be incompatible with Sumerian syntax and lexicon, regardless of the sign sequences chosen.

It may seem improbable that a script comprising close to 900 discrete signs, used in a highly eclectic fashion, should not have included elements of multivalency comparable to those found in early Chinese and Mayan, but more importantly in the approximately contemporaneous documentation from Egypt.¹⁶⁶ Candidates for a determination of a Sumerian

¹⁶⁵ Instead of considering the reasonable possibility that proto-cuneiform might have been borrowed and not developed by Sumerians, a hypothesis which would more simply explain the many incongruities found in the representation of their language through the use of that writing system, however, Schretter writes that "Boisson counters one possible argument against the assumption of consonant clusters in Sumerian, namely that cuneiform was developed for Sumerian and so must have been fitted to the language, with the case of the Luvian syllabic script, and indicates further that the Sumerian vowels are certainly inadequately represented ...". Such clusters are in current grammars considered anathema to Sumerian phonology, a view based, however, largely on a non-critical analysis of a lexical tradition founded in Old Babylonian Nippur scholasticism. M. Civil has often, for example, in "Studies on Early Dynastic Lexicography," *OrAnt* 21 [1982] 10 (discussing /gludr/; see also his important survey of the presumed Sumerian syllabary in "From Enki's Headaches to Phonology," *JNES* 32 [1973] 57-61, and "The Sumerian Writing System: Some Problems," *OrNS* 42 [1973] 21-34), emphasized the very preliminary nature of our understanding of Sumerian phonology. See also G.J. Selz, *ASJ* 17 (1995) 255¹³, to /dri/ etc., who presents further evidence for consonant clusters in initial and final position in Sumerian (and cp. id., *OLZ* 87 [1992] 140¹⁹; M. Yoshikawa, *BiOr* 45 [1988] 501; J.A. Black, *RA* 84 [1990] 107-118).

¹⁶⁶ The inscribed labels found in tombs in the Nile delta settlement of Abydos and recently edited by G. Dreyer, *Umm el-Qaab I: Das prädynastische Königsgrab Uj und seine frühen Schriftzeugnisse*, AV 86, (forthcoming), demonstrate the already developed nature of this script. The finds have been dated to a period of from 3350-3100 B.C., roughly corresponding to the late Uruk period IVb-a in Mesopotamia. I find the presumption of Dreyer and others of the multivalent nature of this script convincing, yet I must draw attention to a possible chronological connection to late Uruk developments. It has been shown that many of the products tagged by these labels were imports from Palestine and Syria, of which at least parts were in this period influenced by trade and possibly colonial contacts with southern Babylonia. Among the cultural elements brought into Syria during the late Uruk period were both sealed clay envelopes and numerical tablets, indisputable administrative tools serving as precursors of writing in Mesopotamia. Such so-called 'bills of lading' will have been understood and exploited by native Syrian traders, who in turn may have been the source of some of the exports into Egypt.

component in the earliest inscriptions must be characterized as imposing. There is no need to burden the comparatively well understood Sumerian syllabary of the later 3rd millennium to build a list of sign combinations from the archaic material amenable to multivalent analysis. Texts from succeeding settlement periods in southern Mesopotamia dated to before the inception of the Old Sumerian period of pre-Sargonic Lagash, during which a grammatically, syntactically and phonetically developed Sumerian was written, contain ample evidence of the use of cuneiform to write Sumerian.

The Fara period dates some three to four hundred years after the collapse in southern Babylonia of Uruk III. Texts from this period excavated primarily in Fara, ancient Shuruppak, and in Abu Salabikh, exhibit the homophonic use of Sumerian words in personal names and as grammatical elements in verbal forms.¹⁶⁷ The most obvious example of the latter phenomenon is the use of the sign MU, Sumerian /mu/, "name", to denote a prefix mu- in finite verbs, for example, the sign combination MU DU, literally "NAME FOOT", can be demonstrated to represent the verbal chain mu.ġen, "I went". The sign GA, Sumerian /ga/, "milk (container)", to cite another example, is found often in Fara period texts together with the sign KA, "mouth"; the combination must be understood as the verbal form du₁₁.ga, in which the latter phonetic element represents the syllable-final consonant of the verb du₁₁.(g), "to speak", combined with the independent element with nominalizing force, that is, /dug/ + /a/, "the spoken (thing)". Such writings prove the use of the early script to write Sumerian both from a phonetic as well as from a grammatical standpoint.¹⁶⁸

A consideration of some readings of signs, finally, could present alternative, but very obscure candidates for the language behind the archaic texts. Doubtless most Sumerologists have paused at such readings as /bi/ of the sign KAŠ and any number of other readings noted in the course of sign 'acculturation'. If it is unlikely that such readings reflect entirely arbitrary decisions of early scribes or scribal schools, then /bi/ should represent some object or actions related to the production of beer (Sumerian ka.s/š). The most plausible explanation would seem to be that such readings represent loans from an unknown language; put another way, bi might be the word for beer in archaic Uruk. In the same vein, we might wonder why Sumerian 'foot' is written with the sign giri₃, a pictogram of an equid, and not with du, the pictogram of a foot. One possibility: /giri/ or /gri/ might be the name of an animal in a lost language, and its pictographic representation was chosen as a rebus by ED Sumerian intruders.¹⁶⁹

¹⁶⁷ See the early treatment of the verbal forms from Fara by R. Jeslin, *Tablettes sumériennes de Shuruppak* [...] (Paris 1937) 9-14, and the current review by M. Krebernik in this volume.

¹⁶⁸ In fact the period succeeding the Uruk III period after an apparent gap of some 200 years, represented epigraphically by texts on tablets found both in Uruk and, in much larger numbers, in archaic levels of Ur, seems to contain substantial numbers of sign combinations which can be so interpreted. See preliminarily R.A. di Vito, *Studies in Third Millennium Sumerian and Akkadian Personal Names* [...], *StPohl SM 16* (Rome 1993) 23-24, and add such examples as MES.PA₃.DA (JET 2, p. 35, no. 529, // UM.PA₃.DA), MES.KUR.RA (p. 38, no. 710, sub UM.KUR.RA). I have profitably discussed the ED I texts with K. Abrahamson in Berlin.

¹⁶⁹ Such writings as ab.sin₂, 'furrow', might represent 'deep loans' into Sumerian from a consonantly inflected archaic language, whose word for plow was 'apin', as has been suggested elsewhere (B. Landsberger, "The Beginnings of Civilization in Mesopotamia," in *Three Essays on the Sumerians*, SANE 1/2 [Los Angeles 1974] 10).

While these explanations might appear all too *ad hoc*, there are a number of concrete examples from the archaic texts of signs whose pictographic referents cannot have represented the objects they denote, and so might present us with evidence for a vocabulary of the language 'Archaic'.¹⁷⁰ The sign AB in its Uruk IV form (figure 22) can scarcely represent a temple built on a high terrace; rather its graphic form seems more easily connected to the Sumerian referent of AB, 'sea', perhaps the depiction of the Persian gulf and the large swamp of southern Babylonia. However, the Jemdet Nasr texts¹⁷¹ give very strong evidence for interpreting the sign to represent a (temple) household, consonant with the reading /eš/ of the sign and thus explaining the confused identification of the pictogram. Again, the archaic sign GURUŠ is a clear depiction of a sled, and appears in the Uruk IV period pictographically supported by apparent wheels or at least logs. Yet the large cereal field account MSVO 1, 1 (below, figure 87) places this sign in clear context together with SAL, 'female slave', such that its interpretation as 'male slave'¹⁷² seems binding, consonant with the reading /guruš/ of the sign. I would suggest that /eš/ and /guruš/ or /gruš/ were homophonic words for 'sea' and 'household', and for 'sled' and 'worker', respectively, in the posited language 'Archaic', and that the rebus use of the signs (eš/household, guruš/worker) was borrowed into later Sumerian. Accordingly, it would be reasonable to assume that, since only in the ED I texts (of the SIS 4-8 levels in Ur, with some further texts from Uruk and other sites) do we find apparent evidence of Sumerian phonetic determinatives, and there at once in some numbers, the Sumerians entered the southern alluvium shortly before the period represented by those levels, bringing with them the diagnostic planoconvex brick.¹⁷³

¹⁷⁰ In avoidance of the term 'proto-Euphratic', which B. Landsberger coined to describe an important substrate language in existence prior to the invention of writing by Sumerians (*Three Essays on the Sumerians*, SANE 1/2, 9-12). Another straightforward element which should enter considerations of alternative choices in language decipherment of the archaic texts is graphotactics in those sources which offer an apparently static sequence of two or more signs. For instance, lexical lists discussed below, section 5, include entries of objects qualified in various ways. As a rule, when signs representing objects and attributes (colors, origins, forms, etc.) are clear, the attributive sign precedes the noun (see below, n. 349-350, for some examples), in contrast to the sequence noun – attribute in Sumerian. While this may be orthographic convention, the regularity of the sign sequence, which by the way also contradicts that of the proto-Elamite texts (see P. Damerow and R.K. Englund, *Tepe Yahya*, pp. 13-15 with fig. 7), is striking, and may be language-bound.

¹⁷¹ See MSVO 1, 26, 79, etc., and the attestations together with NI₆+RU (compare the examples MSVO 1, 108, below, fig. 79, and MSVO 1, 2, fig. 83), which I have posited might represent the ancient name of that settlement.

¹⁷² And so parallel to KUR₆; see below, section 6.3.3.

¹⁷³ J. Høyrup's understanding of Sumerian as a Creole type language would be consonant with this view. See his 'Sumerian: the descendant of a proto-historical creole? An alternative approach to the 'Sumerian Problem'; *Annali dell'Istituto Orientale di Napoli: Annali del Seminario di studi del mondo classico*, Sezione linguistica 14 (1992) 21-72.

5. LEXICAL TEXTS AND ARCHAIC SCHOOLS

Approximately 670 of the 5820 archaic texts and text fragments unearthed in Babylonia share specific features identifying them as lexical lists.¹⁷⁴ Such lists are above all recognizable by the strict and simple format of separate cases arranged into text columns; each case contains an inscribed notation consisting of a sign or sign combination preceded by the numerical sign which represents the basic unit in the sexagesimal system (i.e., the sign N_1 ,¹⁷⁵ according to the signlist ATU 2 = N_1),¹⁷⁶ in contrast to the great majority of administrative texts, whose individual entries contain, as a rule, numerical notations representing varying quantities of goods or measures. Further, the texts we identify as lists contain entries which with few exceptions follow a standard sequence such that copies of the same text can be compared and fitted together to form so-called scores (German *Partitur*). Finally, these texts from Uruk are merely the earliest witnesses of a very long scholarly tradition of copying lexical lists, apparently as part of the school curriculum of scribes. Their slavish adherence to tradition was of great importance for the reconstruction of the Uruk lexical material, since even very small tablet fragments containing some lines or even just some signs of a particular list could be included in an archaic text score based on the correspondence of these sign sequences with those found in canonized list copies from later periods in the third millennium.

5.1. FORMAT OF THE LEXICAL LISTS

The rigid format of tablets containing archaic lexical lists as a rule presents sufficient evidence for their categorization as such. The tablets are usually larger than administrative texts – and

¹⁷⁴ For a discussion of the secondary find situation of nearly all archaic texts from Uruk, and to my knowledge of all school texts, see above section 2 and H.J. Nissen, ATU 2, 21-51; R.K. Englund and H.J. Nissen, ATU 3, 10. See below for a discussion of the relationship between list witnesses dated to the earliest, Uruk IV writing level, and those dated to the following Uruk III period.

¹⁷⁵ The substantial number of text colophons including, as a total of the tablet entries, numerical notations with two or more of the signs N_{24} (𒀵) representing '60' prove that the sign N_1 was understood as the basic unit '1' of the sexagesimal system. For a general review of the lexical tradition of the early third millennium see H.J. Nissen, "Bemerkungen zur Listenliteratur Vorderasiens im 3. Jahrtausend [...]," in: L. Cagni (ed.), *La lingua di Ebla* (Naples 1981) 99-108; id., "Remarks on the Uruk IVa and III Forerunners," in: M. Civil (ed.), *The Series Lu = ša and Related Texts*, MSL 12 (Rome 1969) 4-8; A. Cavigneaux, "Lexikalisches Listen," RIA 6 (1980-83) 609-641; and most recently R.K. Englund and H.J. Nissen, ATU 3, 9-37 (cf. the comprehensive review of this volume by N. Veldhuis, *BiOr* 52 [1995] 433-440).

¹⁷⁶ Only two such texts from the late Uruk period have been found outside of Uruk. I.Ch. Watelin's 1928 Jemdet Nasr campaign unearthed the fragment MSVO 1, 242 (= S. Langdon, OECT 7, 194 and JRS 1931, 842, no. 6; see OECT 7, p. VIII) with a copy of the archaic list 'Vessels'. The tablet MSVO 1, 243 (= OECT 7, 101; for both texts, see also ATU 3, 66 and pls. 67, 79, and X), with a list of toponyms, was purchased in 1924 from the Parisian antiquities dealer J.E. Géjou, who had himself bought a group of archaic tablets including this text from the dealers Dumani Frères. This group of documents was said to have derived from illicit excavations in Iraq conducted before 1915; see R.K. Englund and J.-P. Grégoire, MSVO 1, p. 7. The Vessels witness is of particular importance as our only incontrovertible evidence of the use of such school texts outside of Uruk, indeed well to the north close to the large settlement Kish, from which a number of archaic administrative texts were also recovered. There can be little doubt that, beyond all the other key text archives which have been suspected to exist in unexcavated levels of Kish, large numbers of archaic texts, both administrative and lexical, remain buried.

this size is also demonstrable in the case of badly damaged fragments, since their thickness and the curvature of their preserved surfaces help to deduce their original size – and are divided by lines drawn the length of the tablets into columns of regular size. The columns, inscribed from left to right, are further divided into regular cases inscribed from top to bottom. An inspection of preserved tablets demonstrates that the dividing lines closing cases were drawn after completion of the individual entry. The upper dividing line of such an entry could, but need not necessarily be used as a line of orientation for the physical impression of signs, just as in later periods signs generally 'hung' from this rafter.¹⁷⁷ Composition of signs within cases seems for the most part, however, to have been up to the scribe, although some effort was made to center signs or sign combinations on a vertical axis through the case. Care was taken to justify the columns by inscribing one or more signs of the entry to the right of the case.

The reverse faces of list witnesses are seldom inscribed with list entries, but rather if inscribed then usually only with a colophon which indicates with a sexagesimal notation the number of entries recorded on the tablet obverse, and with ideograms possibly the scribe or office responsible for the inscription. In some few cases, the list found on the obverse of a tablet is continued on its reverse; here, scribes followed the bookkeeping practice of administrators and turned the tablet around on its vertical axis (see figures 17 and 21 above) and continued the list in columns from left to right.¹⁷⁸ I am aware of no exception in the archaic lexical material to this rule.

The individual entries of all archaic lists generally began with the sign N_1 , representing the basic unit "1" of the sexagesimal numerical system.¹⁷⁹ The actual entry consisted of one or a number of ideographic or numerical signs representing an enclosed concept. Dependent on the nature of the list, such entries might consist of signs standing for substantives, i.e., logograms, as a rule a designation of an object; of signs standing for qualifiers, for example, definitions of physical composition referring to colors, to age, to size, and so on; signs presumably standing for abstracta and other specific language concepts like kin relationships, justice, piety, etc. The relative position to each other of signs in multiple sign entries – remembering that the numerical sign introducing the entry is always the first sign in the case – is generally rigid. For instance, the first nine entries of the list Lu₂A all consist of a numerical

¹⁷⁷ See, for example, ATU 3, pl. 4, W 15895,s; pl. 47, W 15895,p+; pl. 51, W 21208,2.

¹⁷⁸ See, for example, ATU 3, pl. 4, W 11986,a (Lu₂A on the obverse, Metal on the reverse face of the tablet; in both cases, columns reading from left to right); pl. 23, W 9656,h (Uruk IV); pl. 36, W 12139; pl. 39, W 21075,3; pl. 43, W 22090,2+ (note that, in accordance with administrative practice, the tablet was initially rotated around its vertical axis to continue inscription of individual entries, then returned to its original obverse position to be rotated around its horizontal axis for the inscription of a tablet colophon); pl. 79, 8: MSVO 1, 243.

¹⁷⁹ It may be noted that the corresponding entry identifier in the Fara lists was the sign N_{34} (𒀵) representing '60', that is, the same oblique impression, but made with a rounded end of a large stylus. Both signs correspond to the vertical wedge $\bar{\text{I}}$ representing '1' in entries of the lexical lists of the second and first millennium, and were in all cases simply visual and memory aids in counting the number of lines inscribed on tablets so as to be able to collate line totals on original and copies. The same means of rechecking line numbers are often found on tablets containing literary texts, with, for example, a check mark impressed before every tenth line.

sign representing "I", followed by two ideograms representing the designation of a profession in the archaic Uruk administration.¹⁸⁰ The first of these ideograms, either GAL₀ or NAM₂,¹⁸¹ seems to represent a qualifier of the second sign designating an office. No Uruk III period writing of these lines – on average over twenty witnesses per line – deviated from the sequence NAM₂ SIGN,¹⁸² suggesting either that writing conventions dictated specific sign sequences in defined environments, or that the signs represent the sequence of words or concepts in a spoken language.

It was above all the tablet formats and the evident copying of these texts which led A. Deimel in his initial publication of the Fara texts to identify them as "school texts,"¹⁸³ akin to the writing exercises and text copies well attested in later periods. Practice exercises are found among the archaic texts (figure 23); they are, however, rare. The large majority of lexical list witnesses appear to be the result of a practiced hand, and few examples are known of sections of lists either on small tablets, or inscribed together on larger tablets.

5.2. USE OF LATER LISTS

A very conservative view of knowledge and organization of concepts is obvious in the transmission of school curricula in Mesopotamia. The possible gap of one or at most several centuries between the latest archaic lexical witnesses from the Early Dynastic I period represented by the SIS 4-8 level texts from Ur¹⁸⁴ and the highly conventionalized and in many cases nearly completely preserved list witnesses from the Early Dynastic IIIa period in Fara and Abu Salabikh may seem imposing in modern terms. But the absolutely clear correspondence of texts from both periods allows of no doubt as to the uninterrupted use of these lists in scribal schools. We must imagine the movement and expansion of schools from

¹⁸⁰ See below, fig. 32. The first entry is only an apparent exception to this rule; NAMESDA is simply the conventional name given the combination ŠITA+GIS NAM₂. It is to be noted, however, that the common sign NAM₂ otherwise always assumes first position in the sign sequence of a professional name.

¹⁸¹ The sign might be a pictogram and represent some sort of pedestal or 'seat of office', and so bear graphic and semantic relationship to the sign KU₀/DUR₂. There has been some speculation about whether this sign might have assumed the function of a true abstract-builder and so borne a linear relationship to the sign NAM in later, Sumerian practice. The etymology of this latter word is still debated but most seem to assume that it is to be analyzed as either *ana-am or *na-am, in both cases Sumerian stative phrases meaning 'what is it' or 'it is indeed', respectively; it need not have a Sumerian etymology at all, however, assuming that the original sign NAM₂ represented a discrete object or an abstract concept in a non-Sumerian language, phonetically realized as /nam/, and that this phoneme assumed the same function as, for example, -it- in Akkadian or -tum in German. That the sign NAM₂ functioned as a qualifier in the list Lu₂ A seems best supported by the fact that in the Uruk IV period witness W 9206,k the sign was omitted in the first entries.

¹⁸² The Uruk IV period witnesses W 9656,h and W 20421,1 (ATU 3, pl. 23) are less consistent, as are Uruk IV period administrative texts, for example, W 6611 obv. i 1 and W 9579,dc obv. i 1 (ŠU, KAB NAM₂) compared to W 6738,c obv. i 1a (with ŠU, NAM₂ KAB), W 9656,g obv. i 2, W 21060,2 rev. i 1 (both KAB NAM₂); W 9656,ar (with DI? NAM₂), and W 8274 (with ERIN NAM₂).

¹⁸³ A. Deimel, *Die Inschriften von Fara II: Schultexte aus Fara*, WVDOG 43 (Leipzig 1923) 2*-6*.

¹⁸⁴ The texts E. Burrows, UET 2. *Archaic Texts* (London 1935) nos. 14, 264, 299-301, all contained copies of the professions list (Lu₂ A); no. 234 represents the only substantial archaic witness of the fish list. The SIS 4-8 texts can be placed in the ED III period and so only roughly dated to ca. 2700 B.C.

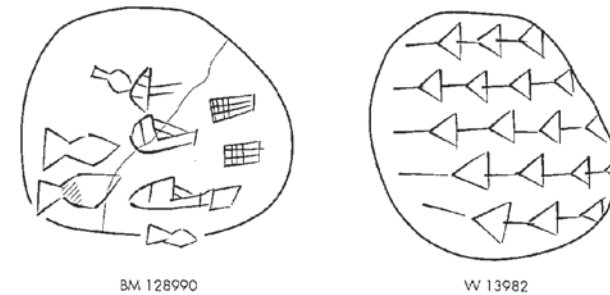


Figure 23: Archaic scribal exercises

The text to the left seems to contain attempts of a student to copy various signs, the text to the right doodles based on the sign T₁₀ (←←←).

one political or economic center to another, bringing with them much the same lexica and lists of exercises. Documentation of these schools is in the tells of Iraq – as yet undiscovered.

Both administrative and "school" texts from the Fara period remain extremely difficult to interpret; yet it can be shown that the Fara archives form part of a long tradition of writing in Mesopotamia. Texts from the Fara period demonstrably contain evidence of the phonetic use of signs to represent both the Sumerian and Akkadian languages. Further, comparison of the Fara period sign repertory with that of the pre-Sargonic Lagash archives excavated earlier than those of Fara allowed the editor of the Fara material, A. Deimel, to identify with some confidence a large number of the logograms, i.e., signs representing above all discrete objects, as well as designations of persons and divinities, toponyms, and verbal stems. This level of understanding made it possible to identify in the Fara lists organizing principals, encompassing concepts such as designations of professions, of domestic animals, fish and ceramic pots. In these isolated semantic fields, specific examples were listed, organized according to rules which were in many cases clear. Large cattle, for example, were divided according to sex and age, then further into categories of color, use, and so on. These conceptual structures evident in the Fara texts led to the use of the term "lexical lists" to define this text genre.

Yet the slavish copying of archaic lists in the Fara period should also not be over-valued. For many concepts represented by proto-cuneiform ideograms had, so far as we can judge from the use of those ideograms, little or no meaning in post-archaic periods, yet those ideograms were copied time and time again throughout the third millennium. For example, the list now conventionally called ED Lu₂ A or List of Professions, based on the number of witnesses found during excavations of archaic Uruk levels certainly the most popular list of the archaic period, contains large numbers of sign combinations which are attested in the contemporary archaic administrative text corpus, but which are absent in Fara accounts.

5.3. DEVELOPMENT OF LISTS DURING THE LATE URUK PERIOD (see figure 24)

Instruction in the use of proto-cuneiform took place in all likelihood within the confines of the central district Eanna. With but one exception,¹⁸⁵ all list witnesses derived from excavations within this area. Although H.J. Nissen has often warned against an unfounded acceptance of an *argumentum ex silentio* that scholarly activity was confined to the Eanna district – very little of the Late Uruk levels outside of the Eanna district have ever been excavated¹⁸⁶, and later lexical material was as a rule found in private contexts¹⁸⁷ – the great preponderance of lists from the area, including find loci with up to 190 lexical fragments representing all known lists,¹⁸⁸ must indicate the existence of scribal schools in the immediate vicinity, from which tablets and fragments no longer kept for archival or didactic purposes were taken for disposal. The information to be derived from the lexical lists to assist in our efforts to interpret the proto-cuneiform documentation may be viewed from several perspectives. Of course, these compendia are of crucial importance in our understanding of the meanings of signs and sign combinations in the much larger group of administrative documents of this period. The necessity of writing these accounts, after all, with high likelihood prompted the early development of writing altogether, and thus the development of tools – lists – to instruct students in archaic schools in the use of writing. Further, the principles of composition evident in these lists certainly reflect an archaic organization of the world into a hierarchy of men, of animals and of inanimate objects. The chronological development of lists is also obvious in the material accessible to us. Rapid development and standardization are obvious in the Uruk III period after an inchoate lexical organization accompanying the first widespread use of writing in Uruk IV.

Lexical lists are in fact exceedingly rare among the Uruk IV period texts. No pockets of texts from this period contained solely or predominately lists, a phenomenon well documented for the Uruk III period. Of the ca. 670 tablets and fragments identified as lists, only 11 are with some certainty from the Uruk IV period,¹⁸⁹ a further 5 may belong to this group. Only three lexical lists are securely attested in the Uruk IV period. The list Lu₂ A seems sufficiently

represented by five texts,¹⁹⁰ of which one, W 9656,h1, was nearly complete, with 9 columns containing on average 9 entries each. Uruk IV versions of the lists "Vessels" and "Metal" are represented by two, possibly three texts.¹⁹¹ Three further texts seem to contain so-called vocabularies, lists of signs possibly arranged according to graphic criteria.¹⁹²

The text W 9656,h1 is the only true precursor of a canonized list from the following, Uruk III period, the other cited examples either being too fragmentary to chart real correspondences between witnesses from the two writing phases, or representing lexical compendia clearly only marginally related to later canonized versions. Even in the case of W 9656,h1, its correspondence to the canonized Lu₂ A list of the Uruk III period does not hold throughout.

The fact that only three of fifteen lists sufficiently attested in the archaic period to allow of the arrangement of a textual score which can be compared with Fara period correspondences may, with reasonable certainty, be dated to the Uruk IV period might be coincidental, since the Uruk IV lists are also among the best attested lexical texts of the following, Uruk III period (Lu₂ A nearly 180 tablets and fragments, Metal over 50, and Vessels nearly 100¹⁹³). Still it should be underscored that nearly 1900 tablets and fragments date, according to paleographical considerations, to the Uruk IV period; that is about 40% of the total of archaic documents from Uruk. A total of 15 Uruk IV period lexical lists would on the other hand correspond to just over 2% of the total of lexical lists, and indeed less than 1% of the total of Uruk IV period documents. This seems to represent clear evidence of a real expansion in the composition and use of lexical texts in the period following the earliest development of writing,¹⁹⁴ and make suspect the assumption of some scholars that the tradition of composing lexical lists must have enjoyed a long history before the inception of writing.

The frequency and find situation of Uruk III period lists suggests not only that from a constricted beginning of at most several lists, of which only the professions list could be shown to have

¹⁸⁵ The large Lu₂ A fragment W 21761,a-c was discovered in the square K/L XII, identified by H.J. Nissen, ATU 3, 10¹⁵, as a probable craft center; see also Nissen, BoM 5 (1970) 151. W 21761 was probably removed from its original deposition site in antiquity. That tablets were excavated in tertiary deposits is proven by the fact that pieces of the same tablet were found in different loci; see H.J. Nissen, ATU 2, 24-25.

¹⁸⁶ ATU 3, 10.

¹⁸⁷ Beginning in the Old Babylonian period, lexical material shows up in private homes, in particular in Assur and Nippur, but it is important to remember that residential areas are very poorly excavated in comparison to the monumental buildings which attracted the attention of field scholars.

¹⁸⁸ Lexical lists formed the majority of tablets found at the loci W 15895 (75 texts, of which at least 64 could be identified as lexical lists), W 20266 (186 texts of which at least 183 were lists; to this number, the 7 lexical tablets accessioned under the excavation number W 20258 should be added, since both 20258 and 20266 were identified as deriving from the same locus) and W 21208 (all 47 tablets lexical lists).

¹⁸⁹ Stratigraphical evidence supports the dating of two of the eleven, W 9206,k and 9656,h1, to a period prior to Uruk III. See ATU 2, pp. 28-34, in particular p. 34, and compare the excavation plan in ATU 3, p. 11, and the discussion in ATU 5, pp. 14-16.

¹⁹⁰ W 9206,k, 9656,h1, 9656,x, 20421,1 and 20421,2. The first text apparently listed the first entries of the Lu₂ A compendium excluding the sign NAM₂ found as qualifier of corresponding entries in all other witnesses.

¹⁹¹ W 16621,a contained a precursor of the Uruk III metal list, W 21060,5[+6?] the vessels list followed by metal (note that the same phenomenon occurs in the Uruk III period in the text W 12256,i+; otherwise only attested in W 20266,44 [Tribute] followed by 'Plants'), and W 21060,16 possibly the vessels list.

¹⁹² W 9123,d, 19548,a+ and 21002,6. Only the first text, however, can be dated to the Uruk IV period with relative certainty.

¹⁹³ Only the "Tribute" list attested in 55 tablets and fragments was recovered in comparable numbers.

¹⁹⁴ It is still difficult to judge the curriculum of proto-Elamite schools. We have stated that no texts have been discovered in Elamite excavations which bear even superficial resemblance to the lexical texts from Mesopotamia. The characteristics we might expect, without being able to decipher the meanings of the signs attested, would be a rigid format of cases, inscriptions which did not include numerical notations, some common denominator of the ideographic notations which could be documented in the proto-Elamite administrative archive, and above all multiple copies of the same passages, indicating that one text had assumed a "school function". Thus the instruction in the use of the early Persian script must have involved writing practice accounts or tablets containing repeated administrative entries, and we do have evidence of this practice. The large account MDP 26, 362, seems to represent an attempt to document the use of all known numerical signs in the proto-Elamite capacity system, and contains no ideographic notations which would identify an administrative function of the tablet. Texts such as MDP 17, 328, on the other hand, seem to represent simple "exercises". See P. Damerow and R.K. Englund, Tepe Yahya, 18-20, and in particular the two volumes cited there, J. Friberg, ERBM I-II.

Texts from the Late Uruk Period

Period: (site)	Uruk IV-III (Uruk)				Uruk III (Imdud Nuzi)	ED I (U)	ED IIIa (Fara)	ED IIIa (Abu Salabikh)	ED IIIb (Ebla)	ED IIIb (Girsu, Nippur)	Old Akkadian	Ur III	Old Babylonian
	Total	IV	III	?									
Name:													
Lu ₂ A (namešda)	185	5	158	22		UET 2, 14, 264; 299-301	SF 33-35, 75-76, W 12466	OIP 99, 1-3, 483, 487	MEE 3, 1, 2+5, 3+4	DP 337 ECTJ 220	ZA 29, 79; OSP 1, 11; YOS 1, 12; MDP 14, 88		SLT 112-113
Lu ₂ E (dub.šar)								OIP 99, 54+56, 55, 57-60	MEE 3, 6-11		MAD 5, 35 HSS 10, 222		
Lu ₂ X								OIP 99, 61-81				Fales/Krispijn, JEOI 26, 39-46	
Vessels	91	3	79	9	MSVO 1, 242		SF 64	OIP 99, 4, 7-9					
Tribute	56		51	5			SF 12, 13, 155 264	OIP 99, 402, 459, 465	MEE 3, 47	MVN 3, 15		6 N-T 676	SLT 42 + Ni 1597
Metal	55	1	44	10			SF 8-9	OIP 99, 13-17	MEE 3, 26+76	FT 2, pl. 44 Speleers, RIAA 46; CBS 14182, Ni 5034, A 3670		Gurney, Iraq 31 3-7	
Wood	30		28	2		UET 2, 204 ?	- SF 68, 74	- OIP 99, 18-20					
Cattle A	24		20	4			SF 81	OIP 99, 25-27	MEE 3, 12-17, 62 [syllabic]				cf. MSI 5, 92ff.
Cattle B								OIP 99, 27-28	MEE 3, 21-25				
Officials A	23		22	1			- SF 59		- MEE 3, 50				cf. MSI 12, 9-10
Officials E							SF 59		MEE 3, 50				
Officials B									MEE 3, 43				
Fish	22		21	1		UET 2, 234	SF 9-11	OIP 99, 10-12	MEE 3, 27-38, 64+ [syllabic]			6 N-T 677- 680	
Cities	17	1	13	3			SF 23-24	OIP 99, 21-22					UET 7, 80 (MSI 11, 62)
Geogr.	12		12		MSVO 1, 243			- OIP 99, 91-111	- OINS 47, 50ff. (All. geogr.)				
Grain	9	1	8				SF 15-17	OIP 99, 5-6	MEE 3, 48+49, 63 [syllabic], ARET 5, 23		MDP 18, 21; MDP 27, 196		
Birds	6		4	2			SF 58		MEE 3, 39, (40)			ITT 2, 5898 + 5, 9251; 6 N-T 681+89	
Plants	5		5				SF 58, 67 + NISS 123	OIP 99, 23+24, 301, 402, 412, 436				6 N-T 933	Civil/Biggs, RA 60, 8-11
Pigs	2		2										
Vocabulary	11		11										
Unidentified	125		125										
God lists		W 20713, 1 ?				UET 2, 105 ? (W.G. Lambert, ASJ 3, 34)	SF 1-7, 23-24	OIP 99, 82-90	MEE 3, 44-46, 53				
Ebla Monolingual									MEE 4, 780-815 (W.G. Lambert, Bilinguismo 393ff.)				
Mathematical									MEE 3, 51-52				
Ebla Vocabulary (eš ₂ -bar kin _x)									MEE 3, 54 (1-10), 73				
									MEE 4, passim				

Lexical Texts and Archaic Schools – Development of lists during the late Uruk Period

ED IIIa (Abu Salabikh)	ED IIIb (Ebla)	ED IIIb (Girsu, Nippur)	Old Akkadian	Ur III	Old Babylonian
OIP 99, 1-3, 483, 487	MEE 3, 1, 2+5, 3+4	DP 337 ECTJ 220	ZA 29, 79; OSP 1, 11; YOS 1, 12; MDP 14, 88		SLT 112-113
OIP 99, 54+56, 55, 57-60	MEE 3, 6-11		MAD 5, 35 HSS 10, 222		
OIP 99, 61-81				Fales/Krispijn, JEOI 26, 39-46	
OIP 99, 4, 7-9					
OIP 99, 402, 459, 465	MEE 3, 47	MVN 3, 15		6 N-T 676	SLT 42 + Ni 1597
OIP 99, 13-17	MEE 3, 26+76	FT 2, pl. 44 Speleers, RIAA 46; CBS 14182, Ni 5034, A 3670		Gurney, Iraq 31 3-7	
- OIP 99, 18-20					cf. MSI 5, 92ff.
OIP 99, 25-27	MEE 3, 12-17, 62 [syllabic]				
OIP 99, 27-28	MEE 3, 21-25				
	- MEE 3, 50				cf. MSI 12, 9-10
	MEE 3, 50				
	MEE 3, 43				
OIP 99, 10-12	MEE 3, 27-38, 64+ [syllabic]			6 N-T 677- 680	
OIP 99, 21-22					UET 7, 80 (MSI 11, 62)
- OIP 99, 91-111	- OINS 47, 50ff. (All. geogr.)				
OIP 99, 5-6	MEE 3, 48+49, 63 [syllabic], ARET 5, 23		MDP 18, 21; MDP 27, 196		
	MEE 3, 39, (40)			ITT 2, 5898 + 5, 9251; 6 N-T 681+89	
OIP 99, 23+24, 301, 402, 412, 436				6 N-T 933	Civil/Biggs, RA 60, 8-11
	MEE 3, 44-46, 53				
OIP 99, 82-90	MEE 4, 780-815 (W.G. Lambert, Bilinguismo 393ff.)				
	MEE 3, 51-52				
	MEE 3, 54 (1-10), 73				
	MEE 4, passim				

Figure 24: Major lexical lists of the 3rd millennium. Conspicuously absent in the earliest levels are the lists of gods first clearly attested in the Fara period. These compositions may represent an innovation of Early Dynastic theologians.

been copied in the Uruk IV period, the lexical repertory was expanded to incorporate large numbers of copies of at least fifteen, and probably substantially more, already canonized texts, but also that they were written and kept together in some distinct part of the central administrative district. The latter point seems best supported by the fact that a number of distinct find loci produced large numbers of, or exclusively lexical texts. Despite the fact that like the great majority of the archaic texts from Uruk these finds too were made in secondary contexts, the exclusivity of the lexical finds suggests that the tablets will have been gathered from a particular location to be discarded, thus preserving in their secondary context the primary context in which the tablets had been stored.

The largest lexical 'archive' identified in this regard, W 20266 and including W 20258, derived from a locus "between the two Early Dynastic walls, the outer wall and the parallel wall lying before it" in the excavation square Nd XVII, 1.¹⁹⁵ Of the 193 tablets and fragments identified in this find, fully 190 were witnesses of lexical lists (ca. 30% of the total of all list witnesses). Further, the texts in this archive were representative of the breadth (number of different lists) and depth (copies of individual compositions) of the lexical material on the whole. Represented are: Lu₂ A with 52 numbers (ca. 30% of a total of 176), Officials with 0 (of 13), Cattle with 12 (50% of 24), Fish with 6 (30% of 21), Birds with 2 (33% of 6), Wood with 4 (15% of 30), Tribute with 25 (45% of 56), Plants with 2 (+1 together with the list Tribute [W 20266,44]; of 4), Vessels with 17 (20% of 92), Metals with 17 (30% of 53), Grain with 1 (of 9), Cities with 7 (45% of 16), and Geography with 8 (70% of 11). A further 29 texts containing unidentified lists (of 121) completes the archive. Of the lists whose witnesses are attested in numbers of statistical significance, namely, Lu₂ A, Tribute, Vessels and Metals, only Tribute with a total of 45% in the W 20266 'archive' would appear to be over-represented. The other three are so in line with expectations that we must assume that the location from which these texts were removed represented a school or library in which scribes were instructed in the use of proto-cuneiform and in the terminology requisite to their inclusion in the scribal caste.

5.4. THE LISTS

The archaic lexical lists can be placed in five general categories¹⁹⁶:

- Designations of places (see figures 25-27)
- Designations of animals
- Designations of plants and manufactured products (see figures 28-29)
- Literature (see figures 30-31)
- Designations of persons (see figures 32, 33, 35)

¹⁹⁵ The terminus ante quem of Early Dynastic II given by this find is not helpful in dating the tablets stratigraphically. See Nissen's discussion in ATU 2, pp. 41-51.

¹⁹⁶ The somewhat amorphous categories of 'vocabularies' and 'practice texts', as well as the 122 texts and fragments which according to their formats could with some certainty be identified as list witnesses but which we were unable to compile into scores will not be treated here; see the short discussion in ATU 3, 37.



URI₅
NIBRU
ARARMA₂₀
UNUG₆

Figure 25: W 21126
The text contains the first lines of the archaic City List, beginning with the toponyms representing Ur, Nippur, Larsa and, in fourth place, Uruk [reverse unscrubed].

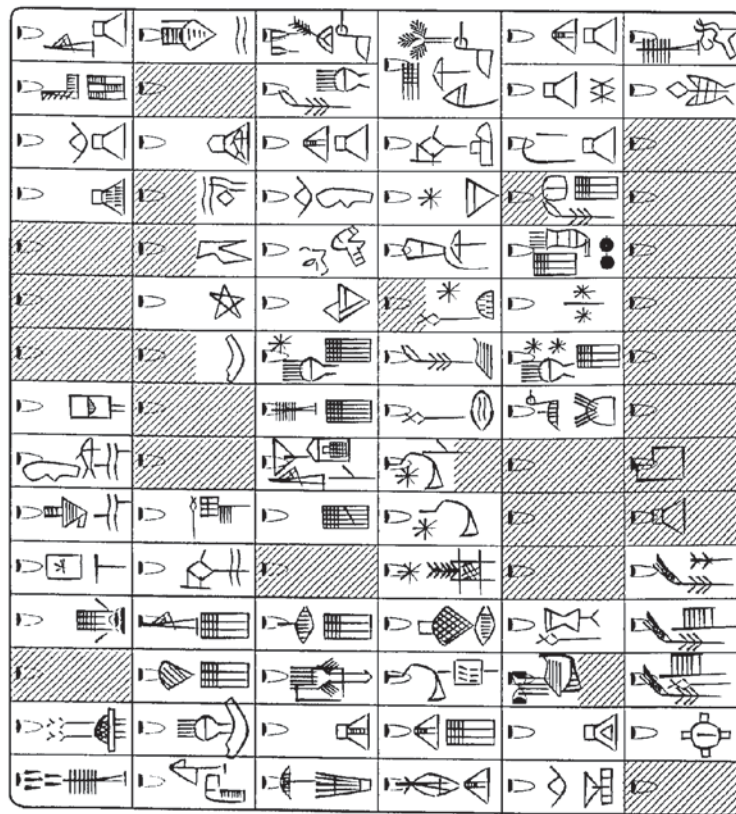
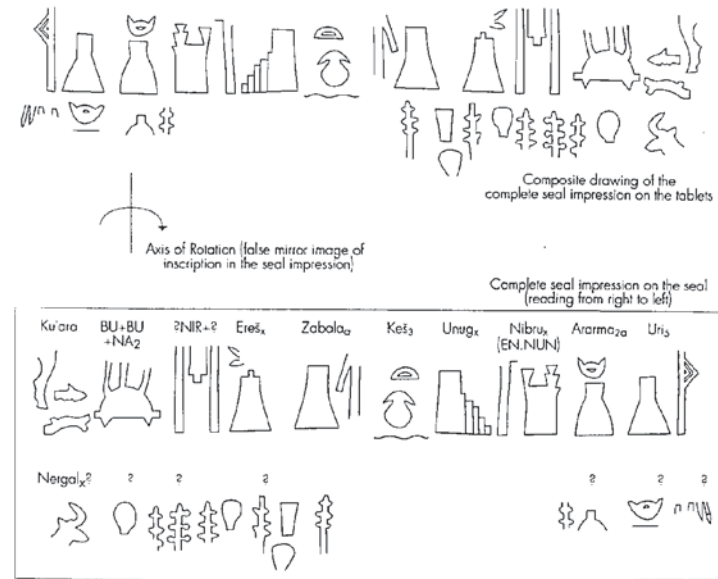
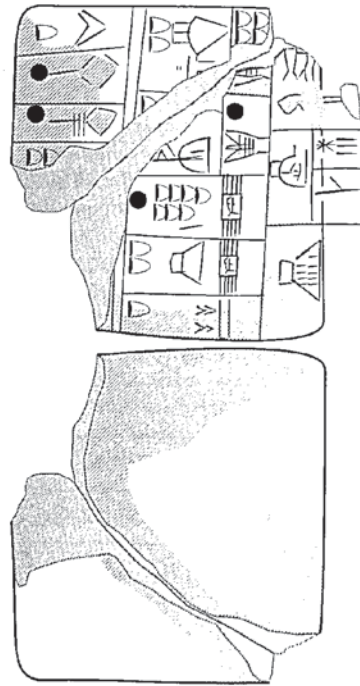


Figure 26: Composite copy of the lexical list 'Cities'

Figure 27: The archaic "City Seal"

The so-called City Seal was impressed on a large number of tablets from Jemdet Nasr dealing primarily with dried fruit. To the right is a copy of the only tablet (MSVO 4, 15) with this seal not clearly from Jemdet Nasr, but with the same types of commodities recorded. On page 93 is a composite drawing of the seal impressions with a comparison of their legend with the first lines of the archaic City List (see ATU 3, 34-35), from a study of archaic sealing practice by R.J. Matthews (MSVO 2, 36-39).



5.4.1. Places (see figures 25-27¹⁹⁷)

All 16 witnesses of a list of city names derive from the Uruk III period.¹⁹⁸ The first lines of the list consist of well known names of leading cities of southern Mesopotamia, beginning with those of Ur, Nippur, Larsa and Uruk (figures 25-26).¹⁹⁹ The significance of this sequence is not obvious, but, since many of the toponyms contain elements of divine names ("NANNA," [URI_{3a}], part of URI₅/Ur, UTU [U₂] part of ARARMA_{2a}/Larsa), or are coterminous with divine names (EN₅.KID₅ = NIBRU, ENLIL, AB₅.x.KU_{6a} = NINA, NANŠE), may reflect a mythological or cultic hierarchy, that is, beginning with the household of the moon god NANNA, followed by that of the earth god ENLIL, the sun god UTU and so on.

¹⁹⁷ Figure 26 and those below of individual lists (figs. 29, 30 and 32) consist of composite drawings combining the preserved entries of all witnesses and are thus artificial, but certainly representative of the form relatively complete exemplars would have taken. Compare, for example, the witness W 20266, 1 [ATU 3, pls 2-3, II] with the composite drawing of the Lu₂ A list in fig. 32, below.

¹⁹⁸ See ATU 3, 35-36, 145-151, 160-162, and the ED IIIa texts SF 23-24; OIP 99, nos. 21-22 and the Old Babylonian text UET 7, 80 (transliterated in MSL 11, 62).

¹⁹⁹ See M.V. Green, JNES 36 (1977) 293-294, with literature (Green's reading of the second line was corrected by R.K. Englund, JESHO 31 [1988] 131-133⁹); to the so-called "Atlante Geografico" s. G. Pettinato, OIRNS 47 (1978) 50-73, MEE 3 (1981) pp. 227-241, and now D.R. Frayne, The Early Dynastic List of Geographical Names, AOS 74 (New Haven 1992).

Cities 1	URI ₅		Cities 6	[ZABALA ₆]	
W 21126	O0101	URI ₅			
Cities 2	NIBRU		Cities 7	[EREŠ ₂]	
W 21126	O0102	'NIBRU'			
Cities 3	ARARMA _{2a}		Cities 8	GABURRA	
W 21126	O0103	'ARARMA _{2a} '	W 20266,74	O0103	GABURRA
Cities 4	UNUG ₆		Cities 9	UR ₂ KU _{6a} RAD ₆	
W 21126	O0104	'UNUG ₆ '	W 20266,74	O0104	UR ₂ KU _{6a} RAD ₆
Cities 5	[KEŠ ₃]		Cities 10	ŠIM ₆ RAD ₆	
			W 20266,74	O0105	ŠIM ₆ RAD ₆

An extraordinary seal impression found on a large number of texts from Jemdet Nasr and discussed in detail in a recent publication by R.J. Matthews,²⁰⁰ however, could speak for a political or economic meaning in the list, reflecting a 'league of cities'. The first and fourth entries in this city seal parallel those of the lexical series, however the second and third are reversed. The sign combination EN NUN seems in the city seal to correspond to the combination EN_o KID_o in the lexical list.

Another eleven texts can be identified as compendia of geographical names based primarily on parallels in texts from Abu Salabikh and Ebla,²⁰¹ however without in all cases forming scores which might indicate a real lexical tradition.²⁰²

5.4.2. Animals

Four of the lexical lists first composed in the archaic period are compendia of domesticated and other animals which were exploited in southern Mesopotamia, including large cattle,²⁰³ pigs, fish and birds.

The first of these lists deals with oxen (GU_a), cows (AB₂), calves (AMAR) and possibly, wild bulls.²⁰⁴ Each section of the list consists of entries representing the respective animals and a static sequence of signs which apparently qualify the animals as to their age, color, etc. A second compiles sign combinations representing fish, their forms of preservation and probably methods of preparation, as well as descriptions of fishing gear and means of transportation.²⁰⁵ Fish were as a rule represented either with the sign KU_{oo} (a pictogram of the fish, see below, section 6.3.1) or the sign SUHUR (a pictogram of a split and dried fish with its head removed). Birds are described in a third list of animals.²⁰⁶ Two texts, of which one is completely preserved,²⁰⁷ contain in 58 entries²⁰⁸ a list of pigs (ŠUBUR).²⁰⁹

²⁰⁰ MSVO 2, in particular pp. 29-36.

²⁰¹ See MEE 3, pp. 227-241; OIP 99, nos. 39-42.

²⁰² The large text W 20266,3 must derive from a standardized composition, since two further fragments (W 20266,146 and 147) contain entries running parallel to three lines in the larger text. See ATU 3, 150-151, 161, and pl. 79. For a survey of the geographical names found in administrative documents see H.J. Nissen, *OrNS* 54 (1985) 226-233.

²⁰³ The exclusion of the much more important small cattle in our witnesses is incomprehensible and presumably a consequence of the fortunes of excavation. The proto-cuneiform signs which represent small and large cattle in the lists and administrative texts are offered in fig. 51 below.

²⁰⁴ See ATU 3, 22, 89-93, and the ED witnesses SF 81; OIP 99, nos. 25-27; MEE 3, nos. 12-17, pp. 47-50, and the syllabic version MEE 3, no. 62, pp. 251-252, edited by Th.J.H. Krispijn, *JEOI* 27 (1981-82) 47-53, and J. Krecher, *OrAnt* 22 (1983) 179-189.

²⁰⁵ See ATU 3, 22, 93-98, the ED I witness from Ur UET 2, 234, and the ED III witnesses SF 9:11; OIP 99, nos. 10-12; MEE 3, nos. 27-38, pp. 91-104; an edition of Ur III witnesses of the same list (6N-T 677-680) is in preparation by M. Civil. Although Hh 18 begins with the same sign suhur, it has little else in common with the archaic list.

²⁰⁶ See ATU 3, 22, 98-100, and the ED III witnesses SF 58; MEE 3, no. 39, p. 105-118; a preliminary edition of Ur III witnesses of the same list (6N-T 681 + 6N-T 689 and ITT II, 5898 + ITT V, 9251) has been offered by G. Pettinato, *OrAnt* 17 (1978) 165-178 [cf. M. Civil, MEE 3 (1981) 275-277].

²⁰⁷ See below, fig. 63.

²⁰⁸ Documented by a numerical notation 5N₁₄ 8N₁ along the left edge of the text W12139, in full correspondence with the number of cases on the tablet.

²⁰⁹ See ATU 3, 22-23, 100-103, P. Damerow and R.K. Englund, ATU 2, 146⁷⁹, R.K. Englund, *JESHO* 31

5.4.3. Plants and manufactured products

A list of trees and wooden objects (see figure 28) is only in its first 40 lines a standardized composition and was not canonized in later cuneiform tradition²¹⁰; these first lines apparently list the designations of trees, and the larger, but uncanonized second section deals with wooden objects. The sign GIŠ in nearly all entries, apparently a pictogram of a simple planed piece of wood, seems to fulfill the function in this list of a semantic indicator, since some witnesses dispense with its inclusion in the individual entries. A very poorly preserved second list in this group contains designations of plants and of a variety of other objects, including time designations, and might represent some sort of agricultural manual.²¹¹

A third list (figure 29), one of the best represented of all archaic lexical compositions, contains three sections. The first (ll. 1-62) consists of involved designations of vessels represented by pictograms, a long series of which is qualified by various signs inscribed within a vessel graph, the second (ll. 63-84) of sign combinations which represent prepared foods, including apparent soups, porridges, and cheeses, and the third (ll. 85ff.) of designations of presumable textiles.²¹²

The pictograms of vessels in the first section of the list were drawn from an administrative repertory of impressive complexity.²¹³ Scribes differentiated vessels for apparent semi-liquids from those for liquids through the addition to the pictogram of a clay jar of a stroke which represented a spout.²¹⁴ It would appear that the first section of the list 'Vessels' dealt with containers of dairy products,²¹⁵ presumably oils, some of which were mixed with a variety of condiments and the like. Since most of these latter products, represented by the sign DUG_o and an inscribed sign which qualified the dairy product in the vessel, were not attested in the administrative texts, it is likely that their appearance only in lexical context was a matter of paradigmatic completeness, i.e., that the composers of this list included all products

(1988) 147-148²²⁻²³, and below, n. 397.

²¹⁰ See ATU 3, 23-25, 103-112, 154-159, and the ED III witnesses SF 68 and OIP 99, nos. 18-20, and compare the forerunner text of Hh 3 (MSL 5, pp. 83-142), with a similar distribution of designations of trees and wooden objects.

²¹¹ See ATU 3, 29, 120-122, and the ED IIIa witnesses SF 58 (with 'Plants' in i 1 - vi 10, 'Birds' in vi 11ff.), 67+NTSS 123 (photo join by A. Westenholz, *OSP* 2, p. 89⁸²); OIP 99, nos. 23+24, 301, 402 (?), 412 and 436; an edition of an Ur III witness of the same list (6N-T 933) is in preparation by M. Civil. Cp. also the Old Babylonian text M. Civil and R.D. Biggs, *RA* 60 (1966) 8-11, CBS 7094 (p. 9, fig. 2). For lines 11-20 (lime notations), see R.K. Englund, *JESHO* 31 (1988) 164-168.

²¹² See ATU 3, 29-32, 123-134, and the ED IIIa witnesses SF 64 and OIP 99, nos. 4, 7-9. This is the only canonized list of the Uruk III period found in a witness outside of Uruk. The Jemdet Nasr tablet MSVO 1, 242, contains the first 65 entries of the list and proves that the lexical tradition reached into northern Babylonia.

²¹³ See below, section 6.3.2.

²¹⁴ See fig. 22:1. The sign designated DUG_o (and its derived correspondent sign KAŠ_o) was the only form used for 'beer' [or, as has been recently suggested, a drink akin to kvass]; DUG_o without a spout, represented vessels for dairy products, above all butter oil. The sign NI_o in the first line of the list is of unclear pictographic meaning, but probably represented a conical vessel with a lid.

²¹⁵ See the cursory treatment of these products in R.K. Englund, 'Archaic Dairy Metrology,' *Iraq* 53 (1991) 101-104, and in greater detail for later periods, 'Regulating Dairy Productivity in the Ur III Period,' *OINS* 64 (1995) 377-429.

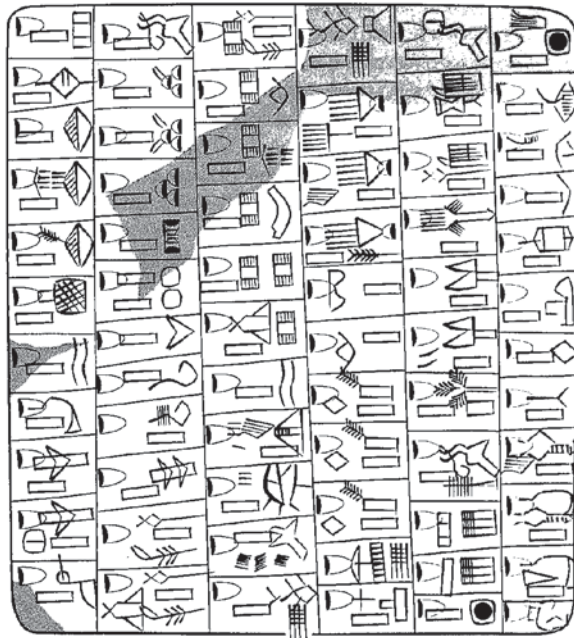


Figure 28: The "Wood List" W 20327,2 (shaded areas reconstructed)

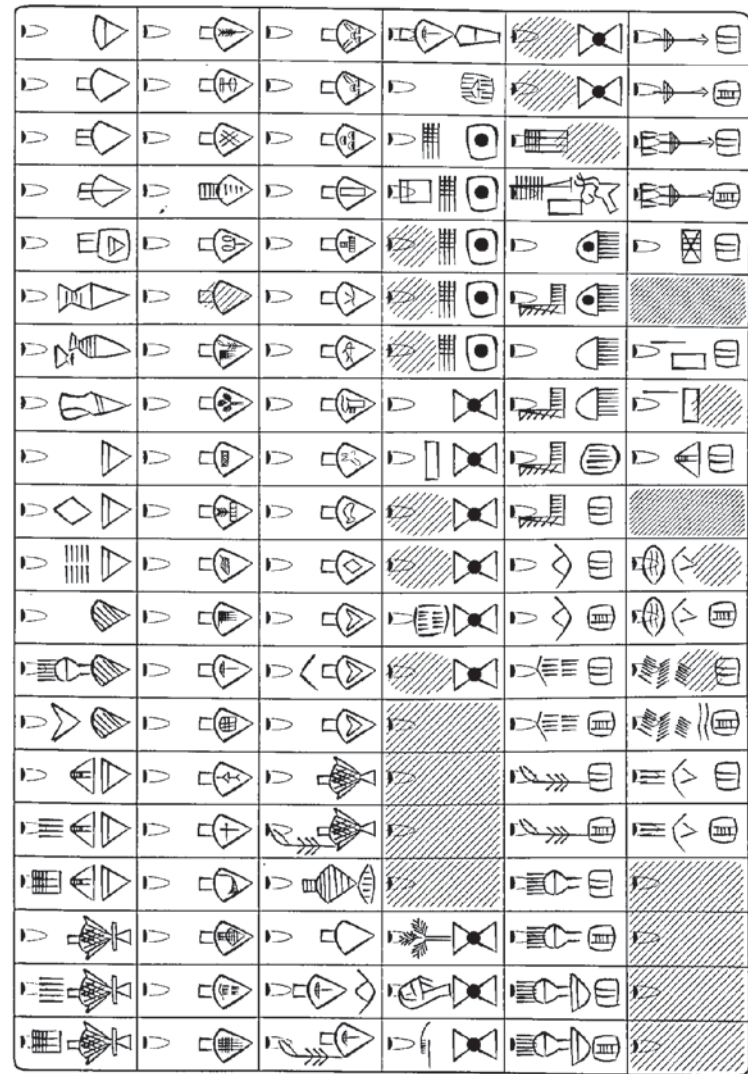


Figure 29: Composite copy of the lexical list "Vessels"

which might imaginably have been stored, but which not necessary were ever really in vessels, at least not in vessels which were the concern of the central households documented in the archaic texts.

Following the section on vessels and products kept in vessels are five entries describing an apparent foodstuff, possibly soups or stews, and then fifteen entries representing variously prepared cheeses.²¹⁶

The regular inclusion of the signs TUG_{2a} and TUG_{2a}gunū, pictograms of tied bolts of cloth, characterizes the third section of this list. Both signs are in series qualified by further signs, for example in the lines 91-98 with the signs U₂, GI₆, GI and NE₆, which represent the colors 'white', 'black', 'yellow', and 'red'.

Another well preserved list, the fourth of this group, contains signs and sign combinations which represent such objects made of metal as vessels, knives (the sign GIR₂₀) and tools (among others the sign NAGAR, 'bit').²¹⁷ The witness W 22104.0 demonstrates that after the list of metal objects a list of stone objects in the form of beads, designated by the sign NUNUZ₃₁, was appended. This section contains the earliest clear attestation of the mineral lapis lazuli, written NUNUZ₃₁ KUR₆ ('beads of the mountain [or 'man-beads']?', approx. Sumerian za₂.gin₃).²¹⁸

A fifth list of products contains designations of apparent grain measures and grain products.²¹⁹ Unfortunately, the first lines of this list are so poorly preserved and the Fara period correspondences so irregular that we are unable to make clear sense of their meaning. It is at least obvious that this part of the list offers a series of numerical notations which represent increasingly large measures of grain.²²⁰

²¹⁶ The sign GA'AR₃₁, corresponds to the ED sign LAK.490, and the neo-Sumerian combination ga HAR/UDgunū. Cp. P. Damerow and R.K. Englund, ATU 2, 152⁴³; R.K. Englund, OrlNS 64 (1995) 381 and 385 (at least the Ur III correspondence of archaic GA'AR has been shown to be a dried and more or less fat-free cheese prized in simple herding societies for its high protein level and low spoilage).

²¹⁷ See ATU 3, 32-34, 134-141, and the ED III witnesses SF 8 and 9; OIP 99, nos. 13-17; MEE 3, nos. 26+76, S. 73-76 and 275; CBS 14182 (identified by A. Westenholz), N 5034, A 3670 (identified by M. Civil) and L. Speleers, RIAA 46; and the Old Akkadian² text O.R. Gurney, Iraq 31 (1969) 3-7 + pl. I, Ashm. 1931-128. Since, unlike the list of trees and wooden objects, this list did not contain a general introduction with designations of metals, all objects which were not specifically so qualified were probably made of copper. A series of objects are qualified with the sign AN, probably denoting an alloy combining copper and another metal (tin²; see H. Waetzoldt, in: L. Cagni [ed.], La lingua di Ebla [Naples 1981] 373-378; improbably 'iron', suggested by A.A. Vajman, "Eisen in Sumar," AiO Beih. 19 [1982] 33-37).

²¹⁸ Cp. the Uruk III period (temple²)-inventory A. Cavigneaux, BaM 22 (1991) 88, W 24008.8 ii 6-9.

²¹⁹ See ATU 3, 34-35, 142-145, the ED IIIa witnesses SF 15-17; OIP 99, nos. 5-6; MEE 3, nos. 48+49, pp. 165-168, and a syllabic version MEE 3, no. 63, pp. 252-253 (edited by M. Civil, OrlAnt 21 [1982] 1-26; cf. id., ZA 74 [1984] 161-163), and the Old Akkadian texts MDP 18, 21, and MDP 27, 196.

²²⁰ Whether the text W 15895.y really belongs here (see ATU 3, 142) is a matter of debate. At least the witness W 21208.8+ seems to offer a clean progression of [1-]5N₁ followed by N₁₄. The sign KUR₆ qualifying measures represented by N₁ in this text is curious; it might denote a 'small mound' of grain, or have some other semantic or phonetic (/kur/ for /gur/ ?) meaning.

5.4.4. Literature

An archaic lexical list of 94 lines (see figure 30) contains the earliest work of written literature on earth.²²¹ This archaic composition, derived entirely from 57 witnesses of Uruk III period date and redacted down through the Old Babylonian period, derives its current name 'Tribute List' from additions to the text made in the Fara and the Old Babylonian periods which describe as 'tribute' (Sumerian gun₂) commodities listed in foregoing sections.²²²

This text has very little in common with other lists, which are characterized by their formal and simple division into entries introduced by the numerical sign N₁, by their semantically arranged contents – compositions of animals and animal products, of trees and wooden objects, etc. – in contrast to the highly complex format of administrative texts consisting for the most part of numerical notations representing commodities of varying size interspersed with hierarchically placed general qualifications. 'Tribute' in fact combines both, with blocks of quantitative entries consisting of numerical notations and signs or sign combinations representing animals, animal products and other commodities, preceded and followed by shorter sections consisting of apparent ideographic notations. These latter entries and all entries of the second half of the text are, like any other lexical list, introduced by the numerical sign N₁, and the many copies of the composition place it firmly in the lexical tradition.

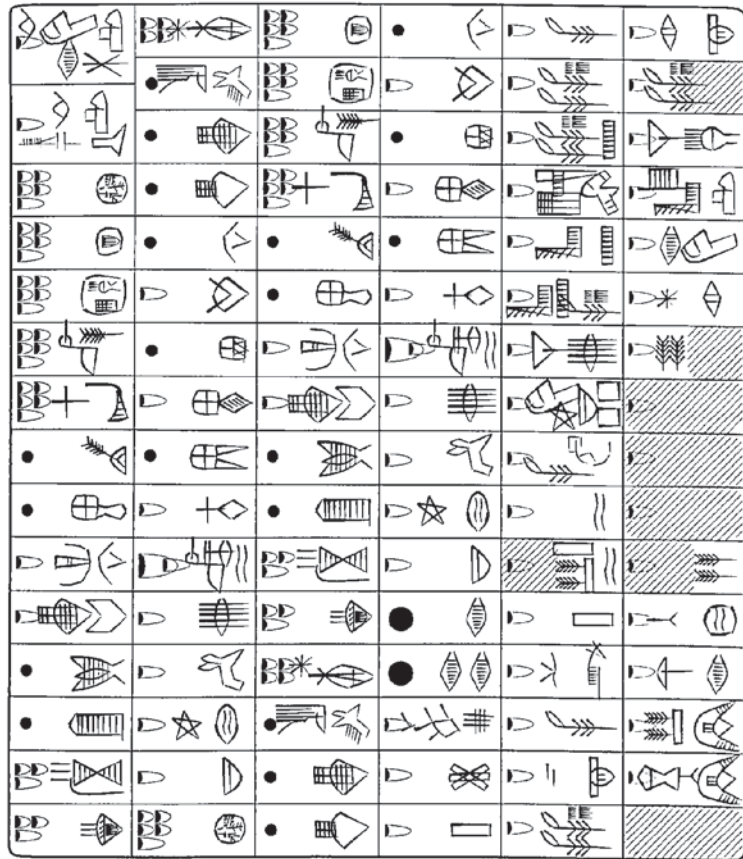
Although the text is, despite the existence of redacted copies from later periods, including a version from Old Babylonian Nippur²²³, poorly understood, the internal structure, in particular of the first half of the text, lines 1-58 in the archaic version, strongly suggests that it is a literary composition. After an introductory two-line section with ideographic notations (disregarding the entry-qualifying numerical sign N₁), the text contains a series of entries (lines 3-26) consisting of numerical notations and ideograms qualifying numbers and measures of Babylonian products and domestic and wild animals. A following four-line section consists of, again, only ideographic notations. Lines 31-58 repeat *line for line* the earlier section of numerical notations and ideograms; this passage repetition would reflect a common rhetorical technique in the oral traditions of folklore, very broadly employed in Mesopotamian literature,²²⁴ and so be a strong indication that the text is an example of early literature.

²²¹ See ATU 3, 25-29, 112-120, the ED IIIa witnesses SF 12; TSŠ 264 + SF 13; OIP 99, nos. 402 (but possibly containing the beginning of the list 'Plants'), 459 and 465; MEE 3, no. 47, pp. 153-154; MVN 3, 15; an edition of an Ur III witness of the same list (6N-T 676) is in preparation by M. Civil, and cp. the Old Babylonian version SLT 42 + Ni 1597 and the remarks by M. Civil and R.D. Biggs, RA 60 (1966) 11. J.G. Westenholz plans to publish forthcoming a commentary of this list.

²²² After the lines 30 and 58 was inserted ša₃ nam.gun₂ sum (only in the Old Babylonian version), after line 72 ša₃ gun₂ gi₄ (Early Dynastic) or ša₃ gun₂.bi nam.gi₄ (Old Babylonian). Unfortunately, even these later additions remain ambiguous; we might hazard translations 'giving (i.e., imposing) as tribute' and 'brought in as tribute', respectively, of the two insertions (compare the latter insertion to the introductory lines 5-7 [ša₃ (En.lil₂.la₂) gu₂.bi nam.gi₄] of Cylinder A of Gudea [D.O. Edzard, forthcoming, // Enki and the World Order 445-446, C.A. Benito, "Enki and Ninmah" and "Enki and the World Order", UPenn dissertation, 1969, 113, ll. 446-447]).

²²³ See above, n. 221.

²²⁴ The Shulgi hymns, for example, commonly contain a long passage with a proclamation of the heroic acts the king would perform, followed by a more or less word for word repetition of the description of these acts. The 'Tribute' list will have been based on a similar play of events: perhaps a list of goods demanded



Moreover, the first section of the text can plausibly be interpreted to conform with later traditions of literary introductions.²²⁵

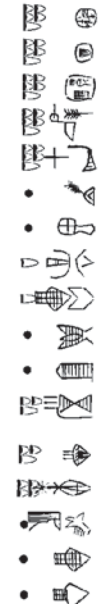
and received. The notations II. 27-30 // 55-58 (IS₂/SAHAR / NAR / UB SA₃ / GAR), albeit not understood, must have included the description of what was to happen with the goods listed. Lines corresponding to these from later periods remain, unfortunately, difficult to interpret (IS / NAR / GAR / URI IS SA₃ [ED] and IS / NAR / GAR / URI.RI IS X [Old Babylonian]). See C. Wilcke, FS Jacobsen, AS 20 (Chicago 1976) 212-13, for a concise description of the 'epic repetition' in Sumerian literature.

²²⁵ The signs U₄ in both cases might represent temporalis elements meaning "When ...". The sign AD₂ of the archaic version, l. 1, corresponds in the Fara version to a.d.gi₄, perhaps "counsel(er)"; the meaning of the combination KI₂ SAG is unclear. In l. 2, the combination AD₂ HAL could refer to the correspondence *pirištu* from later tradition, meaning "secret", as J.G. Westenholz, op.cit., suspects; ABRIG would in this vein refer to the temple administrator *abarakkum*, who was entrusted with these "secrets". Compare also the Akkadian Gilgamesh epic, tablet XI 9-10: *luptēka aGilgames amat nisirti u pirista sa ilani kasa luqbēka* (see most recently S.B. Noegel, ASJ 16 [1994] 307).

Tribute 1-2



Tribute 3-30



Tribute 31-58



10:1
10:1
10:1

Figure 30: Composite copy of the lexical list "Tribute" (on page 100) and internal structure of lines 1-58

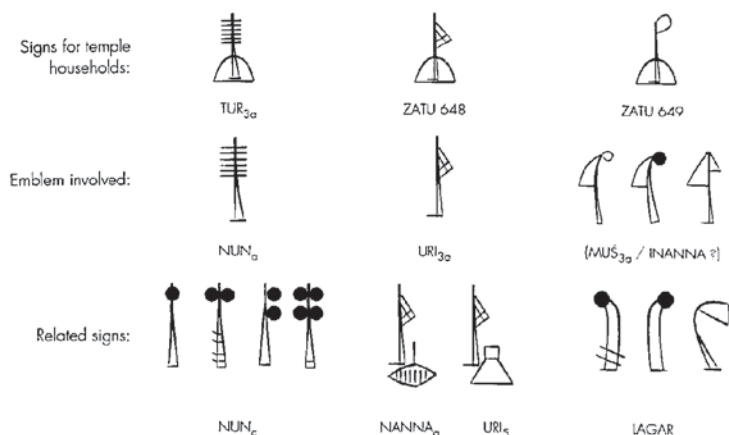


Figure 31: Signs representing archaic temple households
 Overview of signs representing probable temple households in texts from archaic Uruk (all signs have been rotated 90° clockwise to demonstrate their original pictographic position).

The section following line 58 contains notations with ideograms whose meaning is unclear. Such repetitions of certain sign combinations as GI, GI ZI_o, GI ZI_o ŠE₃, in lines 64-66 or EN_o ŠE₃, EN_o ŠE₃ ZI_o in lines 68-69, none of which are attested as personal names or object designations, suggest that the text continues with literary narratives.

'Tribute' thus assumes the role as best candidate for a literary piece hidden among the many archaic lexical texts; it remains a matter of speculation why, given the very strong impact the Sumerian pantheon exercised on scribal choice of literary and lexical themes of the Fara period, we have no evidence of gods in the archaic lexical tradition, let alone in possible literary compositions. Certainly numerous signs and sign combinations are known in the archaic material that correspond to later divine names in the Sumerian pantheon, some of which combined with a sign representing a community building to stand for apparent temple households (see figure 31)²²⁰; the discrepancy in treatment of the referents behind these signs might, again, be the result of the vagaries of excavation, but might also point to a substantially different system, or level, of religious belief.

²²⁰ See K. Szarzynska, "Some of the oldest cult symbols in archaic Uruk," *JEOl* 30 (1987-88) 3-21; cp. further A. Falkenstein, *ATU* 1, pp. 58-60, E. Heinrich, Schill und Lehm. Ein Beitrag zur Baugeschichte der Sumerer, *Studien zur Bauforschung* 6 (Berlin 1934) 1-18 + pls. 1-6; id., *Bauwerke in der altsumerischen Bildkunst* (Wiesbaden 1957) 11-38 ('Bauwerke in ländlicher Umgebung'); id., *Die Tempel und Heiligümer im alten Mesopotamien* [...] (Berlin 1982) 6-7 with figs. 15-18; and, for a detailed current treatment of an archaic toponym iconography often based on cult symbols, R.J. Matthews, *MSVO* 2.

5.4.5. Persons

The first of two lists containing designations of persons consists of an apparent mix of personal and professional names.²²⁷ An underlying structure or purpose in the composition is not obvious. After a section of 22 lines of which the first contained the sign UKKIN_o (a vessel for dairy oil, in a transferred meaning referring to an official) and including subsections possibly based on sign association (in particular lines 14-22, all with the exception of 19 including the sign EN_o²²⁸), this list contains a number of entries corresponding to the first entries from the much better attested second list of personal designations.

Certainly the most popular of the lists from the archaic period is the compendium of designations of professions found in this so-called Lu₂ A²²⁹ list (see figure 32). The 185 tablets and fragments currently known to contain witnesses of this list are rivaled only by the 91 texts with witnesses of the list with designations of agricultural products ('Vessels'). The complete composition must have numbered some 140 entries, of which over 130 are preserved in the archaic witnesses now available.²³⁰ The numerous witnesses of the list from the Fara period and later demonstrate that the list was a central text in the scholarly tradition of the later third millennium, and although it consisted for the most part of professional designations no longer current, the sequence of signs was strictly adhered to. A simple comparison of the first entries of both archaic and ED IIIa versions (figure 33) underscores the importance of these compositions in determining exact sign correspondences and in charting paleographical development in the first half of the third millennium. Indeed, this list more than others with its nearly complete Uruk IV period forerunner text²³¹ has been a substantial aid in anchoring a number of signs from the earliest writing phase into an otherwise well known, but heretofore poorly documented, paleography of third millennium cuneiform (for some examples see figure 34²³²).

²²⁷ See *ATU* 3, 19-22, 86-89, and the ED III witnesses SF 59 and MEE 3, no. 50. Related lists are known, see *OIP* 99, nos. 37, 62-71, MEE 3, no. 43, A. Archi, *SEB* 4 (1981) 177-204, id., *RA* 78 (1984) 171-174, F.M. Fales and Th.J.H. Krispijn, *JEOl* 26 (1979-80) 39-46; SF 28, 29, 44, 63, F. Pomponio, *JAOs* 104 (1984) 553-558.

²²⁸ Cp. the Jemdet Nasr administrative text MSVO 1, 112, with entries of personal designations in the same sequence as the lines 16ff. of this list.

²²⁹ See *ATU* 3, 14-19, 69-86, and the edition by E. Arcari, *La lista di professioni 'Early Dynastic LU A' [...]* (Naples 1982), based on G. Pettinato, *MEE* 3 (1981) 3-25 (compare her "Sillabario di Ebla e ED LU A: Rapporti intercorrenti tra le due liste," *OrAnt* 22 (1983) 167-178). The name derives from the Sumerian designation for 'man', lu₂, which was the first element in a lexical list from later scribal tradition known as lu₂ = ša, lu₂ = (that one) which'. The various compendia dealing with this topic known to members of the project *Materials for a Sumerian Dictionary* were listed in a presumably chronological sequence and named (so far) Lu₂ A through E.

²³⁰ The exact length of Lu₂ A remains uncertain. The colophon 1N₃₄²³¹ [] on the reverse surface of the witness W 20517, 2a + proves that the list contained 60+ lines, and the best preserved tablet W 20266, 1 contained from 90-100 entries.

²³¹ *ATU* 3, pl. 23 (and I), W 9656, h1; see *ATU* 5, p. 49). Another four fragments from the Lu₂ A list date to the Uruk IV period. The five Uruk IV witnesses do not give us sufficient material to build a canonical version for the period, and W 9656, h1, deviates substantially from the canonical Uruk III period, so that it would still appear that no archaic lists were completely standardized before Uruk III.

²³² As an exception, the original orientation of the signs is kept in this figure in order to better follow the development from pictogram to abstract sign.

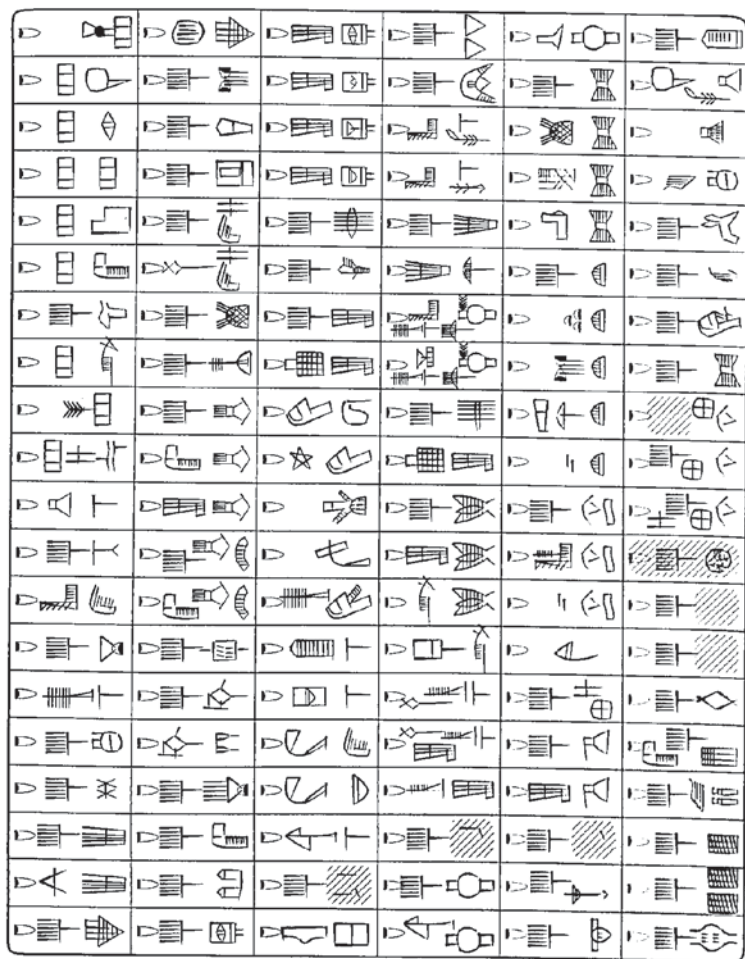


Figure 32: Composite drawing of the archaic lexical list Lu₂ A

Despite the fact that it has not been possible, based on the large numbers of administrative documents, to clearly understand the function of the professions represented in these entries, still considering the formal structure of the list we can make some general comments about such designations. H.J. Nissen has in various publications, beginning with his contribution to

	3000 B.C.	2600 B.C.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

Figure 33: The first lines of the list Lu₂ A. A comparison of parallel lists from the Late Uruk (left column) and the Fara (right column) periods established numerous sign correspondences.

a preliminary edition of the Lu₂ list,²³³ defended the theory that this list reflects in its internal structure the administrative hierarchy of archaic Uruk. Accordingly, the first entry in the list NAMEŠDA should represent the highest-ranking official in the administration of that city. While it is true that a much later lexical text offers a correspondence NAMEŠDA = Akkadian šarru, 'king',²³⁴ the designation NAMEŠDA cannot in the archaic texts be shown to have qualified a substantial office.

Nonetheless, the first twenty entries of the list include sign combinations on the whole well attested in texts from Uruk. In particular the former Erlenmeyer collection contains extraordinarily well preserved accounts with clear evidence of the high rank enjoyed by those persons or

²³³ MSL 12, pp. 4-8.

²³⁴ MSL 12, p. 93.

Uruk IV ca. 3200	Uruk III ca. 3000	ED III ca. 2400	Ur III ca. 2000	Old Babylonian ca. 1700	Middle Assyrian ca. 1200	Neo- Babylonian ca. 600	meaning of archaic sign
							SAG 'head'
							NINDA 'ration'
							GU7 'disbursement'
							AB2 'cow'
							APIN 'plow'
							KI 'locality'

Figure 34: Paleographic development of selected cuneiform signs

offices represented in these entries (figure 35).²³⁵ The large measures of grain represented by the numerical notations entered together with the officials titled NAM₂ URU₆, GAL₆ BAD+DIŠ₆, KINGAL₆ GAL₆ TE and GAL₆ SUKKAL₆, imply that these officials belonged to the upper ranks of the administrative hierarchy. Several signs, above all NAM₂ and GAL₆, are found in combinations in the Lu₂ list which suggest that they served to define the specific status of the persons qualified by the sign combinations.

5.5. LEARNING BOOKKEEPING

That the evidence from the lexical lists cannot represent the complete learning of archaic scribes is obvious, given the thousands of administrative documents from archaic levels in Uruk and other Babylonian sites. The formats, the bookkeeping procedures, and the calculations of these accounts had to be mastered with high precision, and scribes must have had occasion to write exercise sections and full accounts before they were certified capable of administering 'state property'; in fact, not a few tablets can be classified as

²³⁵ See H.J. Nissen, P. Damerow and R.K. Englund, *Archaic Bookkeeping*, in particular pp. 110-115, and P. Damerow and R.K. Englund, *MSVO 3* (Berlin, forthcoming).

school accounts due primarily to the fact that despite the apparent completeness of their text they lack all indication of an administrative purpose. For instance, the Uruk IV period tablet W 9393,d (see figure 36) was formed, and one of its faces divided into individual cases in full accord with the standard procedure of the time. The author of this text then impressed numerical notations in each of the four cases, however without apparent ideographic signs which in standard accounts would designate the object so quantified, the persons or institutions concerned with the objects, or the administrative function of the objects or organizations. The numerical notations, moreover, make every appearance of representing simple doodlings or random associations, beginning with three impressions of the rounded end of the small stylus, representing "30" in the sexagesimal system, followed in two cases by a small round impression set over an oblique impression of a large round stylus, each representing "600", and finally in the fourth case a single large oblique impression, representing "60".

It might be tempting to believe that, despite the entirely irregular sequence of large and round numbers it contains, this and comparable tablets are simply incomplete accounts.²³⁶ However, in this case another tablet found in the same locus suggests that we have in W 9393,a small collection of school accounts. Although the text W 9393,e (see figure 36) appears at first glance complete and consistent with a large number of accounts known from both the Uruk IV and the Uruk III periods, closer inspection shows that it is irregular. The sequence of entries of such commodities texts is incorrect; a list of products beginning with a measure of rough-ground grain recorded in the second case of the second column should have assumed the first place in the account, followed by the oil and textile products of the first column. Further, the entire account should be underwritten by an official acting for a unit of the Uruk administration; instead, the final two ideograms in the third column represent "sheep and goats", an ideographic combination which makes no sense in this context. For these reasons, the text is in all likelihood a school account, the more likely given the fact that it was found together with another very suspicious text.²³⁷

The three accounts W 20274,27-29²³⁸ may similarly have been school texts. Taken alone, W 20274,28 might not seem out of the ordinary. The tablet contains two columns divided into cases, each with the exception of the final cases of both columns containing a numerical notation followed by ideograms representing products from domestic animals, above all butter oil, cheese and textiles. The final notation of the second column is in the preserved

²³⁶ Consider in this connection the text W 20223 (R.K. Englund and H.J. Nissen, *ATU 7*, forthcoming) with dividing lines drawn on one surface, but with no apparent inscription, and the many so-called 'blanks', tablets which were formed in the usual, and time-consuming way, but which remained unscratched (see, for instance, *ATU 5*, pl. 53, W 9312,aa; pl. 115, W 9656,ia ff. [the first tablet of this series in fact began and ended with a short notation]; photo of W 9656,iv on pl. V). The fate of unsuccessful accounts, be they from functioning bookkeeping offices or from the hands of suffering students, can be seen in a large number of inscribed tablets which were so mashed by a human hand while the clay was still malleable that the impression of the fingers are clearly visible on the ruined tablet surface (for example, *ATU 5*, pl. 84, W 9655,aa and ,ar).

²³⁷ Another example is the text W 20517,1 (*ATU 7*, forthcoming). The account, found together with three fragments of the list Lu, A, consists of one inscribed column, the cases of which contain notations representing numbers of vessels. No ideograms qualify the function of the text or the persons or institutions involved.

²³⁸ See the copies and photos in *ATU 2*, pl. 27-28.

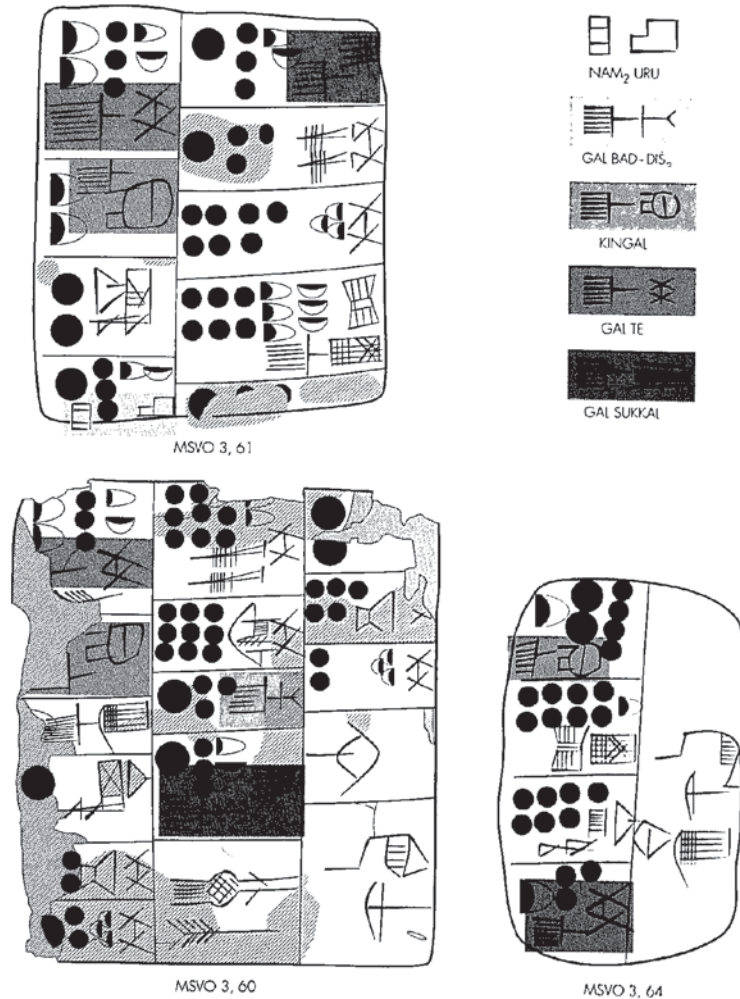
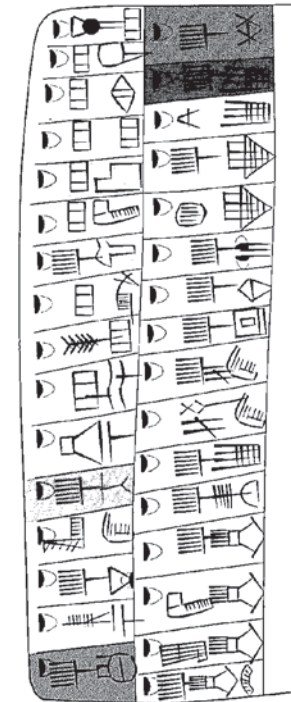


Figure 35: Administrative occurrences of lexical entries. The first two columns of the lexical list Lu₇ A (to the right, reconstructed from numerous fragments of copies) contain entries representing archaic titles and professions. The various shaded examples on page 108 are well attested in administrative context, in the three texts here concerned with the distribution of substantial measures of grain.



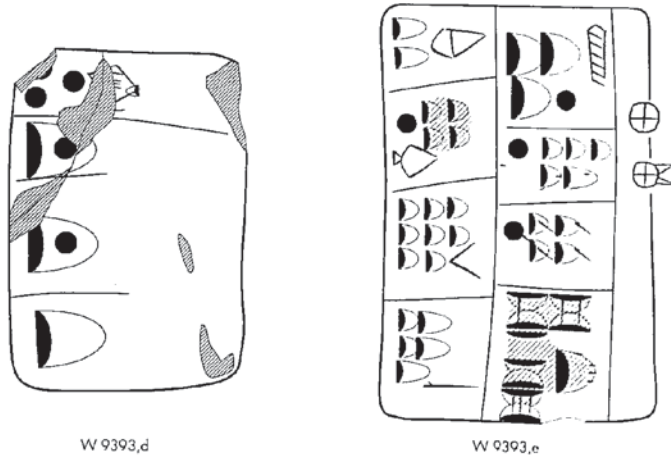
are to the contrary to be understood as simple variations of a given account template and that all three are copying exercises.²³⁹

Two other school accounts may be cited as particularly involved at the level of bookkeeping procedures. The first, MSVO 3, 2,²⁴⁰ will be dealt with below, section 6.3.4 (and see figure 77). The fact again that no ideograms in this text identify its purpose or the persons involved is evidence that the text served in the accounting office to record both accounting formats and important conversion values in dealing with grain products. The second text,

cases the sign GI, that of the first column a combination of the signs EN₆ KA and further signs. While the reoccurrence of the sign combination EN₆ KA and the sign GI in precisely the same location on three tablets found together could be explained as the result of accounts made up for the same official acting for different persons, the fact that the numerical notations of two of the cases of the tablet W 20274, 27 were left blank suggests that the sign repetitions

²³⁹ The reverse face of W 19416, a (ATU 7, forthcoming; the tablet is currently on display in the Museum für Vor- und Frühgeschichte, Berlin-Charlottenburg) might represent a copy of the inscription on its obverse face. It is impossible to say whether the known account duplicates W 20274, 33–89 (see R.K. Englund, BSA 8 [1995] 41–42, and figure 57 below) are to be ascribed to bookkeeping procedures or to the copying in schools of complete accounts. There are numerous examples known from later periods in Mesopotamia of account duplicates, and the purpose of such copies in an administrative atmosphere of distrust seems obvious, yet since we know that accounts formed a normal part of the school curriculum, these too should be reconsidered as to whether duplicates really assumed the same function as, for example, copies retained of letters.

²⁴⁰ The Uruk III period account from the antiquities market is to be provenienced to Uruk or Jemdet Nasr. See above, n. 51.



W 9393,d
Figure 36: Archaic accounting exercises

W 19408,76²⁴¹ (below, figure 85), represents a school exercise from the Uruk IV period. The poorly preserved tablet contains only numerical signs together with horizontal or vertical strokes, known to represent 'widths' and 'lengths' of measured fields.²⁴² The four entries in two columns of both obverse and reverse of the text contain notations of widths and lengths with but slight variation. The average of the two 'length' measures in the first column of each side (1200 ninda, ca. 7.2 km) multiplied by the average of the two 'width' measures in the following column (900 ninda, ca. 5.4 km) results in an unrealistically large surface area of 10 ša₂, or approximately 39 km². The documentation of two equally large fields must have resulted from taking an original artificial surface of 10 ša₂ and manipulating the side measures which would define such an area.²⁴³ No other known texts from the Uruk IV period present such clear evidence of a playful use of the new method of accounting.

²⁴¹ The importance of this text was first recognized by P. Damerow during a collation trip we undertook jointly to Heidelberg in 1986 in preparation of our Chapter 3 of the volume ATU 2 [see there p. 155²³]. It has since been dealt with by us in *Archaic Bookkeeping*, 55 and 58, fig. 50.

²⁴² The measure quantified in these notations with the sexagesimal counting system was itself in later cuneiform denoted with the sign GAR, with the reading 'ninda[n]', representing a measure of approximately 6 m. The use of this sign with this meaning is not known in the archaic text corpus, yet it should be remembered that the sign may itself have merely been a phonetic indicator of the reading of the sign DU in this metrological context. The sign combination GAR.DU known from the Fara period on is thus probably to be read ninda[n]inda[n].

²⁴³ This procedure is hardly likely to have been a coincidence. Furthermore, the largest field otherwise attested in comparable texts from the Uruk IV period measures somewhat more than 20 bur₁ (W 20044,29, with obv. i 1-3: 6N₃₄ N₅₇ / 4N₃₄ 6N₁ N₅₇ / 2N₃₄ N₅₈, leading to a calculation [(360 + 246) ÷ 2] · 120 = 36,360 šar, or 20(bur₁) 3.6(iku)). The calculations evident in W 19408,76 demonstrate, by the way, that the ancient scribe very well knew and used the later method of multiplying the arithmetical means of the lengths of opposite sides of surfaces to derive an area measure.

Despite the grave difficulties in deciphering the linguistic contents of the archaic texts, their numbers and consistent structure make them powerfully informative sources of socio-economical history. Both lexical lists and administrative accounts are in this regard important, since semantic categories signaled in the lexical material can be examined against the backdrop of the use of signs and sign combinations in administrative texts, whereas on the other hand signs and sign combinations found in similar contexts in the administrative texts can be tested against corresponding entries from lexical lists.

6.1 NUMERICAL SIGN SYSTEMS

Few Assyriologists like numbers. The treatment of early cuneiform texts has, as a result of a clear disregard for the importance of numerical notations and structures in accounts making up fully 90% of all clay tablets from this period, often been less than professional. Fortunately, the excavation and publication of the masses of administrative documents from the Ur III period, with their very involved bookkeeping formats and often impressively complex and precise calculations, have included some notable exceptions to an otherwise condescending approach of editors of administrative texts to the metro-mathematical basis of their material; the level of understanding of the accounting Sumerian recorded in those archives, of prosopography and of the administrative structures of which the accounts were evidence was as a consequence such that text analyses could be and were very successful.

An initial ordering of the written material excavated in archaic levels in Mesopotamia would not have been possible without reference to cuneiform from later periods, since analyses of proto-cuneiform signs proved that they were indeed linear precursors of abstracted cuneiform signs, and these latter signs were on the whole well understood. With this ordering, and since with few exceptions no sign sequences or even clusters seemed to correspond to sequences of signs which in later texts represented a spoken Sumerian, the contribution of early Assyriologists to the decipherment of proto-cuneiform ended.

It may surprise some that the most important recent advances in the decipherment of the proto-cuneiform documents have been made by and in collaboration with mathematicians with no formal training in Assyriology, J. Friberg and P. Damerow. But remembering that the great majority of archaic texts are administrative records of the collection and distribution of grain, inventories of dairy fats stored in jars of specific sizes, and so on, that is, documents above all made to record in time quantifiable objects, it is reasonable to expect that such documents would contain, no less than the accounts of current institutions, evidence of mathematical procedures used in the archaic period and that they would thus contain the seeds of the mathematical thinking which developed during the third millennium.

Scholars acquainted with accounting methods represented in documents from the third millennium were little impressed by the first archaic texts from excavations in southern Mesopotamia. With few exceptions, numerical signs corresponded both in form and in

apparent numerical meaning to deciphered signs from later texts. These correspondences were seen in

- 1) the form of signs impressed with styluses of different diameters. The numerical sign system best documented in the third millennium, the sexagesimal system (see figure 41), consisted of signs made by impressing the ends of two round styluses into the surface of clay tablets, either perpendicular to the surface, thus resulting in round impressions, or at an angle to the surface ranging from ca. 45° to 30°. The oblique impression of the smaller of the two styluses represented the basic unit "1"; the numerals 2-9 were inscribed by simply repeating the number of impressions representing "1". A round impression made with the same stylus represented the bundling unit "10", and the units 20-50 were in the same way written by simply repeating the impressions representing "10". The next step "60" was represented by an oblique impression of the larger of the two styluses, itself repeated up to 9 times to represent the number "540". The sign for "600" combined an oblique impression of the large stylus ("60") and a perpendicular impression of the small stylus ("10"). This latter sign could be repeated up to five times to represent "3000", and the sexagesimal bundling unit "3600", finally, was represented by a round impression of the large stylus. Exact correspondences to the graphic forms of these signs were located in the archaic texts; moreover, correspondences were seen in
- 2) the consistent adherence to the sequence of numerical signs employed in a coherent notation. A sexagesimal notation representing, for example, 1382 distinct units, could in principle be written by inscribing two "600" signs, 3 "60" signs and two "1" signs in any order, since in the sexagesimal system each of these signs was distinct and possessed a specific numerical meaning. An analogous situation would be a means of accounting using physical counters, for example clay balls, specific characteristics of which – size, form, color, for instance – served to represent the various bundling units of a numerical system. The unambiguous correspondence to specific members of a numerical system of such counters kept in a leather pouch would have to be obvious to all persons using this system. But even in this situation, when the balls were removed from the pouch the controller will doubtless have placed like counters together, both mentally and physically. Further, the meager evidence from impressions made on clay bullae from Susa²⁴⁴ not unexpectedly suggests that these groups of like counters were also understood as forming a sequence beginning with forms of high to those of low numerical order. Whether the physical reality, that is, that in all numerical notations beginning in the Late Uruk period and carrying on through the third millennium, the curvilinear, then the cuneiform signs representing 'upper case' members of numerical systems were impressed *above* those representing 'lower case' members, reflects a practice of using calculating boards or boxes so divided that counters of larger quantities were placed above those of smaller quantities, is of course not certain, but would be a reasonable assumption.²⁴⁵ Archaic

²⁴⁴ See above, section 3.

²⁴⁵ The Chinese abacus is a more modern example of the physical representation of higher and lower quantities. The referent of the proto-cuneiform sign SANGA may be a tallying board, with three compartments in an upper, and three in a lower register, and to the lower left a box to store counters.

scribes were very consistent in inscribing such notations, holding in the example cited above to a system-specific sign sequence $2 \times "600" + 3 \times "60" + 2 \times "1"$. This numerical 'syntax' reflected the same sign sequence known from later texts. The correspondence of archaic numerical signs to signs known from later third millennium accounts to be sexagesimal, finally, was seen and mathematically proven in

- 3) summations in archaic accounts. Account format dictated that totals were inscribed on the reverse face of a text, facilitating the isolation of such summations for study. The few instances in the earliest published archaic texts, from the antiquities market and from Jemdet Nasr, of sexagesimal summations, or at least summations of a bisexagesimal system which bore the same numerical structure in the signs representing "1", "10" and "60", were sufficient to demonstrate the respective values of the numerical signs attested, and the pool of these summations available for a demonstration of the existence of a sexagesimal system in the archaic texts was substantially increased with excavation and publication of texts from archaic levels of Uruk.

Possibly influenced by the attempts of V. Scheil to integrate into a 'unified decimal system' all numerical notations found in the accounting tablets excavated in archaic levels of Elamite Susa²⁴⁶, S. Langdon in his publication of the proto-cuneiform texts from Jemdet Nasr believed the texts clearly demonstrated the existence in archaic Mesopotamia of not only the sexagesimal system of counting and a complex metrological system used in notations of area measures, but also a decimal-based system used to qualify grain measures.²⁴⁷ The texts available to Langdon offered sufficient evidence to prove, or at least offered no evidence to disprove, a numerical and semantic correspondence between the former two numerical systems and those systems known from later periods to qualify discrete objects and surface measures, respectively. However, the same text archive demonstrated that in fact no decimal structure underlay the metrological grain capacity system.

This was obvious enough and partially understood by Langdon, and in 1937 well documented by Falkenstein (see below) insofar as the numerical signs were concerned which represented measures smaller than the basic unit N_1 (), and those which on the other hand represented a measure greater than that recorded with the sign N_{25} (●), presumed by Langdon and Scheil to have been a measure 100 times as large as that of the basic unit. The former units corresponded first with an oblique impression of the rounded end of a large stylus (—, N_{30}) to a measure one-fifth the size of the basic unit, then with more complex signs to a sequence of decreasing fractions $1/n$ of this measure, whereby "n" was determined by the number of oblique impressions made by the rounded end of a thin stylus around a central point in a specific sign. Thus $\bar{\bar{v}} = 1/2 N_{30}$, $\bar{v} = 1/3 N_{30}$, and so on. The first sign of the latter units, N_{36} , was shown to stand for a measure three times as large as that represented by the sign N_{45} , and larger measures were represented using the next higher bundling sign in the sexagesimal system, N_{48} .

²⁴⁶ See P. Damerow and R.K. Englund, *Tepe Yahya*, pp. 18-19.

²⁴⁷ Langdon discussed in OECT 7, 63, the "ordinary" system believed by him to be decimal in structure. He cited, however, the addition $20 + 20 + 20$ on the obverse face of the text 108 (now = MSVC 1, 96).

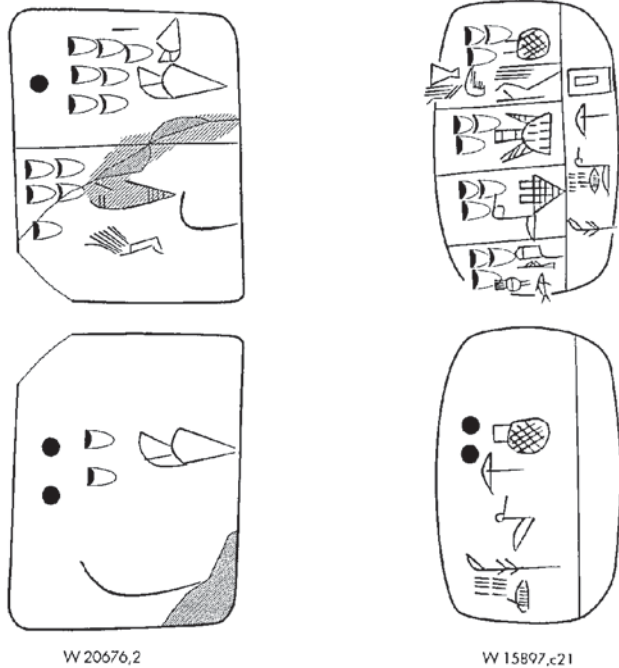


Figure 37: Dairy oil and barley accounts
 The text on the left contains an apparent addition of $7N_1 + 5N_1 = N_{14} 2N_1$ (disregarding the N_{14} in the first entry and the total), resulting in the equation $10N_1 = N_{14}$. A substitution of this value in the account to the right would be false, since there $12N_1 = 2N_{14}$, or $6N_1 = N_{14}$. This latter relationship remained hidden from editors of archaic texts for 50 years, until the Swedish mathematician J. Friberg uncovered it while examining grain accounts from the Jemdet Nasr period.

The decimal structure of the archaic grain capacity system was consequently believed by Langdon to be restricted to the sequence of the three signs N_{45} (●), N_{14} (◐) and N_1 (◑) in the relationship

$$N_{45} = 10 \times N_{14}, N_{14} = 10 \times N_1.$$

This, as it turned out, fallacious identification formed the basis of all subsequent Assyriological publications of grain accounts – certainly the large majority of all archaic texts – until the work of J. Friberg was published in the late 1970's. The Swedish mathematician first became interested in Babylonian texts when he read the quadratic equation table Plimpton 322 (MCT, text A) during a 1973-74 sabbatical in Milwaukee, and went on to read O. Neugebauer's MKT in Madison. Back in Göteborg, Friberg returned sporadically to the question of early numbers, and in preparing for a series of lectures on cuneiform mathematics

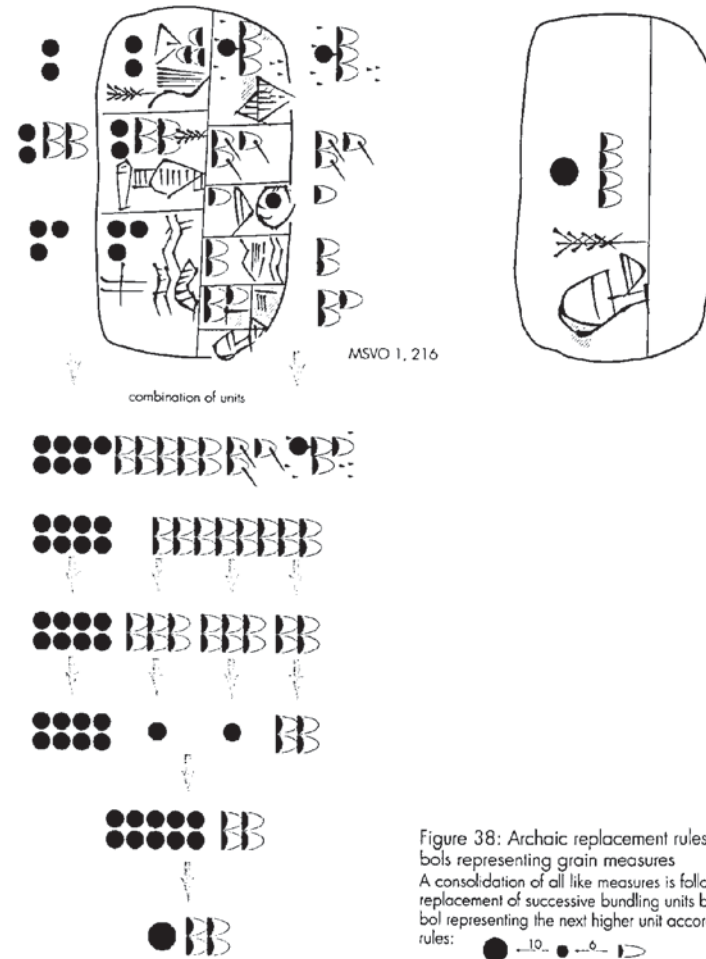


Figure 38: Archaic replacement rules for symbols representing grain measures
 A consolidation of all like measures is followed by the replacement of successive bundling units by a symbol representing the next higher unit according to the rules:
 ● → 10 ◐ ◐ → 6 ◑ ◑ →

at Chalmers Technical University he noticed that the traditional interpretation of the archaic grain capacity system, attested in a number of seemingly straightforward calculations in accounts from the Jemdet Nasr period found in scattered publications, was incorrect.²⁴⁸ His

²⁴⁸ See in particular his ERBM I, pp. 7-10, and II, pp. 19-27, to the texts BIN 8, 3 and 5.

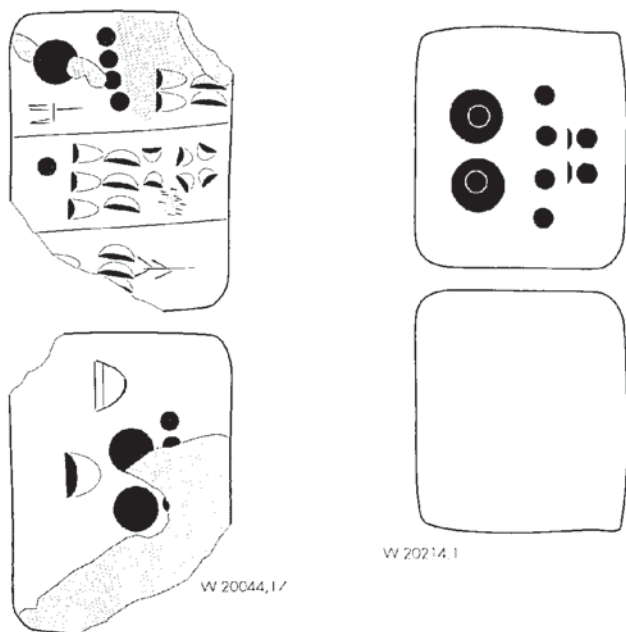


Figure 39: Determining numerical sign sequences. The numerical sign sequences contained in archaic texts such as the Uruk IV period accounts W 20044,17 and 20214,1 above were important indications of the structure of the respective numerical sign systems. The first example alone makes likely the otherwise known grain capacity system series $N_{12} > N_{12} > N_{12} > N_1 > N_{30} > N_{24} > N_{28}$ (combining the notations of the obverse and the reverse faces), the sexagesimal system series $N_{50} > N_{12} > N_{22}$.

strongest piece of evidence supporting a new interpretation of the data was an apparent grain account edited by A. Falkenstein in 1937.²⁴⁹ In a format well known in particular from accounts in the Jemdet Nasr archive, the text records discrete numbers of grain products together with the amounts of variously qualified grains needed for their production. The products themselves could be designated with numerical signs derived from the metrological system employed to quantify grain capacity units.

For instance, the first line contains the notations $1N_{14} 1N_{24} ; 2N_{14}$, which can be translated "60 of the (grain rations containing) — (of grain); (grain involved); 2 • (of ground barley)". This calculation contradicts the assumed numerical relationship $10N_1 = 1N_{14}$, since as was well known the measure represented by the sign N_{14} was $1/3$ of that represented by N_1 , so that $60 \times 1/3 = 20$ and not 20, as $2N_{14}$ would imply. Instead of relying on complicated

²⁴⁹ OLZ 40 (1937) 410 no. 6 (now = MSVO 4, 66, and see below, fig. 25).

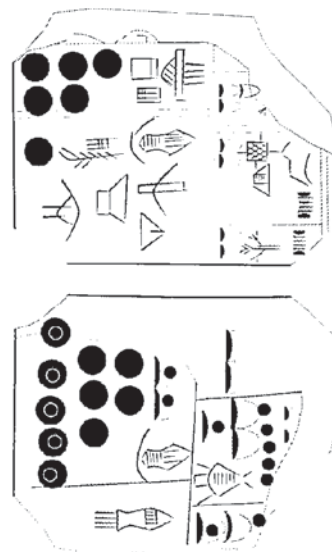


Figure 40: W 20568. Obverse and reverse of this account contain notations representing very large numbers of the product $SU_2 \cdot DUR_6$, of unclear meaning (the sign DUR_6 might denote a coil of rope, in accord with later meaning). The apparent total in the left column of the reverse represented at least 199,200 units counted with the sexagesimal system.

technological explanations to dispense with this contradiction,²⁵⁰ Friberg tested in further calculations in this and other texts the seemingly obvious hypothesis that N_{14} was not equal to $10N_1$, but rather to $6N_1$. This assumed value of N_{14} proved to be correct in all archaic grain notations (figure 37 demonstrates the use of summations to clarify the relationship between N_{14} and N_1 in the two systems in Uruk texts, figure 38 the bundling steps in a more complex grain calculation from Jemdet Nasr). This arithmetical ambiguity, namely, that identical signs can occur in different systems with different numerical meanings, is the most unusual characteristic of the archaic numerical systems.

Some five years after Friberg published the first of two volumes dealing with the results of his research on archaic texts, P. Damerow and I began a cooperative effort to order and define the numerical systems attested in the archaic texts from Uruk.²⁵¹ Although in number this group of texts was substantially larger than all other archaic texts together, the poor state of preservation of the Uruk texts was such that the numerical notations they contained could

²⁴⁹ A. Falkenstein, OLZ 40 (1937) 404-405: If we do the calculation in obverse i 1, for which the fraction is known, we see that 20 units of grain result in only 60 bread loaves each with $1/3$ of the basic unit and not, as the calculation would lead us to expect, 100 loaves. This difficulty is immediately solved if we relate the statement in i 1a (loaves of $1/3$ of the basic unit) not to grain, but to flour, and then reckon with a natural loss during grain milling. A loss of 40% during milling of the grain is well within reasonable limits.

²⁵¹ Published in ATU 2, pp. 117-166. See now for a theoretical consideration of our results P. Damerow, Abstraction and Representation: Essays on the Cultural Evolution of Thinking (Dordrecht, Boston, London 1996) 329-370.

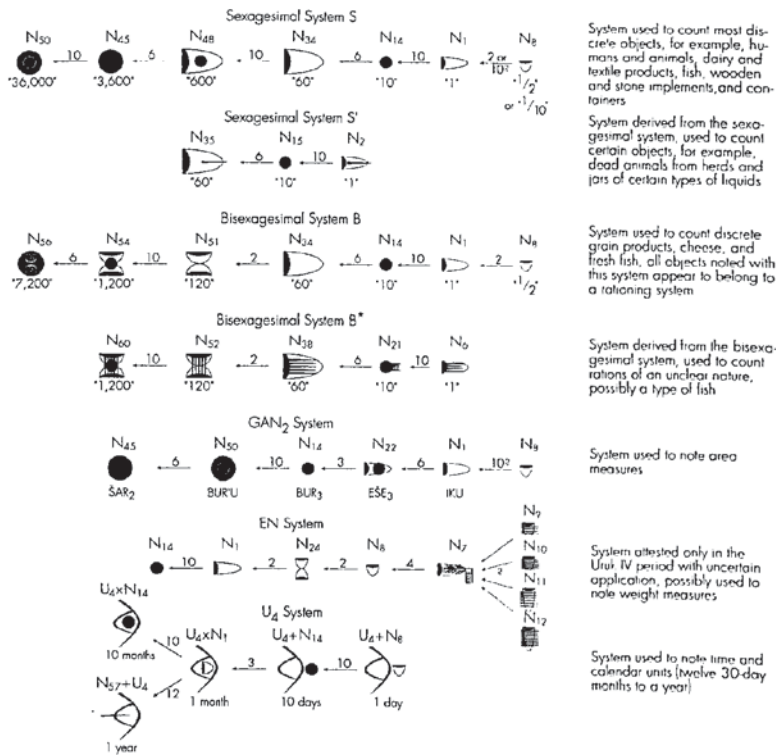
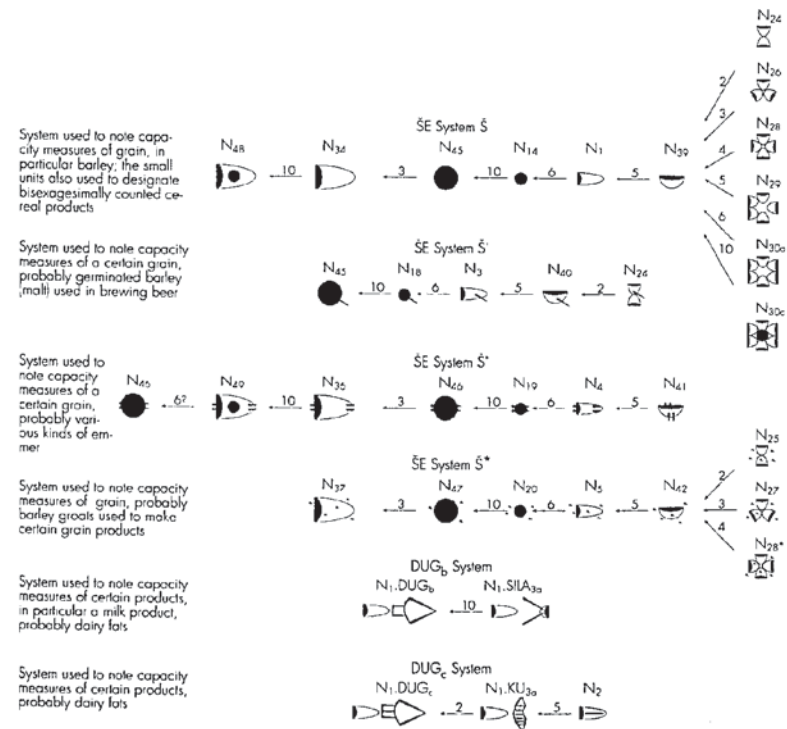


Figure 41: Numerical systems used in archaic texts

often only be understood in the light of an analysis of the better preserved accounts from Jemdet Nasr and elsewhere. Thus the work of Friberg on the grain capacity system, and that of the Russian scholar A.A. Vajman²⁵² on the two numerical systems used to qualify discrete objects, namely, the sexagesimal and the so-called bisexagesimal systems, built a welcome starting point for our work on the Uruk material. We were in this effort able to identify the use in the archaic period of no less than five basic numerical systems, from which a number of systems were derived through the addition to numerical notations of qualifying strokes and dots impressed with the stylus used to inscribe

²⁵² See "Protosumerische Mass- und Zählsysteme," *BaM* 20 (1989) 114-120 (German translation of Vajman's Russian article published in *Trudy XIII Meždunarod. Kongr. po Istorii nauki* [1974] III-IV, 6-11), and the comments of P. Damerow and R.K. Englund, "Bemerkungen zu den vorangehenden Aufsätzen von A.A. Vajman unter Berücksichtigung der 1987 erschienenen Zeichenliste ATU 2," *BaM* 20, 133-138.



Notational correspondences of archaic numerical signs, according to the sign list ATU 2:

N ₁	N ₂	N ₃	N ₄	N ₅	N ₆	N ₇	N ₈	N ₉	N ₁₀	N ₁₁	N ₁₂	N ₁₃	N ₁₄	N ₁₅	N ₁₆	N ₁₇	N ₁₈	N ₁₉	N ₂₀	N ₂₁	N ₂₂	N ₂₃	N ₂₄	N ₂₅	N ₂₆	N ₂₇	N ₂₈	N ₂₉	N ₃₀	N ₃₁	N ₃₂	N ₃₃	N ₃₄	N ₃₅	N ₃₆	N ₃₇	N ₃₈	N ₃₉	N ₄₀	N ₄₁	N ₄₂	N ₄₃	N ₄₄	N ₄₅	N ₄₆	N ₄₇	N ₄₈	N ₄₉	N ₅₀	N ₅₁	N ₅₂	N ₅₃	N ₅₄	N ₅₅	N ₅₆	N ₅₇	N ₅₈	N ₅₉	N ₆₀
----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------	----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------

ideograms. The formal graphic structure of the systems (see figures 39-40) and the consistency in the use of four of these systems in qualifying objects from specific semantic fields could then be exploited to isolate very short or only partially preserved notations in the fragmentary Uruk tablets which could be used in a statistical analysis of sign sequence probabilities. In many cases, the likelihood that the numerical sign sequences known from clear notations and summations in preserved texts did not apply to the damaged Uruk texts could be dismissed. In all others, few contradictions to the complete systems as documented above all in the Jemdet Nasr texts could be found.

The numerical systems employed in the accounts of the archaic period thus include the sexagesimal²⁵³ or the bisexagesimal²⁵⁴ system, the grain (SE) capacity system, the area (GAN₂, 'field') system and the still unclear EN system (based on the use of the sign EN with a numerical sign characteristic of the system, N₃; see figure 41). Derived systems with identical arithmetical structures, but diverging graphic representations as well as fields of application, complemented the basic systems. Further numerical sign systems, for example a system used in timekeeping notations and one used in qualifying liquid measures, combined both numerical and ideographic signs to emphasize special metrological relationships. Despite difficulties in delineating the rules behind the choice of specific numerical systems to qualify different objects, the fact that we now understand their formal fields of application has proven of some importance in our research on archaic administration. The sexagesimal and bisexagesimal systems as well as their derivatives were used for discrete, that is, countable objects. Scribes employed a strict differentiation of the systems; all animals and humans, animal products, dried fish, fruits, tools, stones, and pots were qualified with the sexagesimal, whereas all grain products, cheeses and, apparently, fresh fish, were qualified with the bisexagesimal system. These latter products are believed to derive from an archaic rationing system. Systems derived from these two were used for quite specific contexts. The S' system as a derivative of the sexagesimal system was apparently used exclusively either for the recording of slaughtered or perished cattle of a current accounting year or for denoting a sub-unit in a metrological system used to qualify amounts of dairy oil; the B* system as derivative of the bisexagesimal system might have qualified a certain type of fish product. The SE system and its various derivatives qualified exclusively capacity measures of cereals, whereby each system most probably was used in connection with a specific type of grain – botanical in the case of S⁺ representing emmer, or processed in the case of S' for malt, and S* for crushed barley. The GAN₂ system was used to record field measures.

²⁵³ The rationale behind the sexagesimal system has been widely discussed, unfortunately without issue. The name is something of a misnomer, since the system really consists of bundling steps of 10 and 6, leading to Vajman's unsuccessful attempt (see the article cited in the previous note) to introduce the terminology "ten-six counting system" into the discussion. The divisibility by thirty and the fact that in the archaic period an ideal month of thirty days was employed in administration suggests the possibility that the sexagesimal system was tied to time calculations.

²⁵⁴ A.A. Vajman was the first to differentiate between the sexagesimal and bisexagesimal systems, see the article cited above. He referred to a "modified ten-six counting system"; we have chosen the term 'bisexagesimal' to make more explicit the use of a new sign $\overline{\text{N}}$, consisting of two signs representing '60' in the sexagesimal system set back to back and rotated 90 degrees.

Administrative Systems – Timekeeping

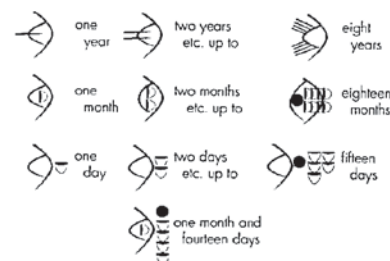


Figure 42: Vajman's timekeeping system

6.2 TIMEKEEPING

A glance at your wristwatch transports you back five thousand years. The division of the hour into 60 minutes (medieval Latin: (pars) *minuta prima*, "smallest part of the first order"), of the minute into 60 seconds ((pars) *minuta secunda*, "smallest part of the second order"), reflects the sexagesimal system of counting well developed at the inception of writing in Uruk toward the end of the 4th millennium B.C. This counting system, used much later by Babylonian astronomers in very involved time/distance measuring calculations, fascinated classical thinkers, and was carried into the modern system of time divisions first quantified and standardized by medieval clock builders.

The sexagesimal system was used in the archaic period to count discrete objects (above, section 6.1), and it may turn out to be an interesting coincidence that this method of counting was a product of a preliterate device used to reckon time – not minutes and seconds, but months and days. For the unevenness of a 29 1/2-day lunar cycle was probably corrected well before the Uruk III period, when calculations in accounts can be shown to be based on a 30-day month, and a 360-day year (figure 41, U₄ system).

The first Assyriologist to devote serious attention to the formal make-up of archaic time notations was A.A. Vajman,²⁵⁵ who, based on later third millennium tradition and on a measure of intuition, reconstructed the system of time notation for the Uruk period depicted in figure 42.²⁵⁶

²⁵⁵ No serious attempt was made by the first editors of the archaic corpora from Jemdet Nasr and Uruk to analyze the archaic time notations, although both S. Langdon and A. Falkenstein were in agreement that time divisions were expressed by use of the sign U₄, "day(light)". Langdon (commentary in OECT 7 to the sign nos. 172-177), confusing N₈ (—) and N_{30a} (—) as a division of N₁ in grain notations, believed that the notations of the form U₄+nN₈ were daily grain rations, the notations U₄+nN₁ possibly day notations; finally, to nN_{30a}+U₄ he remarked that a "comparison of [these signs] with the Sargonic form REC 236 makes the identification [with it i-month] certain". Falkenstein indicated in ATU 1, p.48, his belief that the graph N_{30a}+U₄ represented 'one day'. R. Labat incorporated these errors into his signlist Manuel d'épigraphie akkadienne.

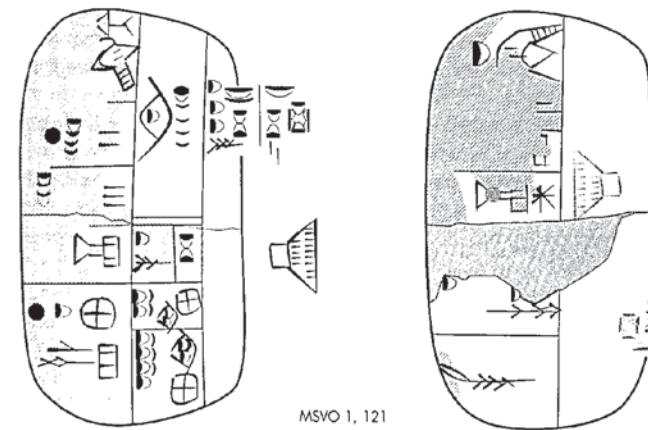
²⁵⁶ See A.A. Vajman, ActAnIH 22 (1974) 19-20; id., BaM 20 (1989) 114-120. Vajman erroneously refers to a notation (U₄.N₁).N₁₄.4N₈ in the text OECT 7, no. 84 (now MSVO 1, 121, fig. 43 here), which according to collation and contextual calculation must be read (U₄×N₁)+5'N₈.

The formal characteristics of this system based on the sign U_4 (considering the sign's later semantic range from day(light) to white to sun(god), generally assumed to have been the representation of the sun rising among the mountains east of Mesopotamia), with horizontal strokes (nN_{57}) to the left of U_4 to count years, very likely sexagesimal number signs impressed with the rounded end of the stylus within the sign to count months, and finally likely sexagesimal number signs turned 90° to the right and impressed to the right of the sign to count days.²⁵⁷

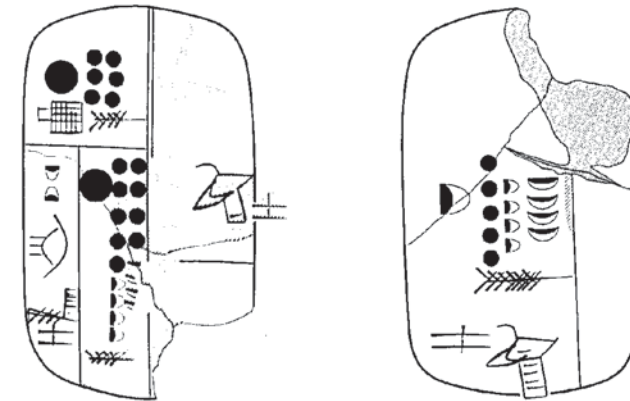
6.2.1. Cardinal time notations

The structure of the archaic timekeeping system described here has now been proven through analysis of grain calculations which turned out to have been based on units of time (figure 43). Once the relationship between the signs N_1 and N_{14} of the grain capacity system had been established, the first step in the mathematical determination of the timekeeping system was possible, namely, the decipherment of the numerical meaning of the sign TAR_0 . This sign was shown to represent the addition of $1/10$ to a given quantity in grain notations.²⁵⁸ Thus the text MSVO 1, 121 (figure 43, top), can be reconstructed in the following way:

obv. i	1a1	$[U_4 + N_{14} \cdot 8N_8 \ 1N_{57} \ T]_0$	GIR ₃ gunū	[18 days' (grain measures) for the first (period, from?) PN,
	a2	$[U_4 +]N_{14} \cdot 4N_8 \ 2N_{57}$		14 [days'] (grain measures) for the second,
	a3	$[U_4 +]3N_8 \ 3N_{57}$		3 [days'] (grain measures) for the third,
	1b	$(U_4 \times N_1) + 5N_8$		(altogether) one month and 5 days,
	1c	$3N_1 \ 2N_{30} \ N_{24} \ \check{S}E_0$		(makes) 35 N_{24} of grain,
	1d	$N_{30} \ N_{24} \ N_{30} \ TAR_0$		$1/10 : 3 \ 1/3 \ (!?) N_{24}$
	1e	UNUG		(for ?) Uruk.
	2a	[] NAMEŠDA		[...] for the NAMESDA,



MSVO 1, 121



MSVO 1, 122

²⁵⁷ See ATU 2, 145-146, and my 'Administrative Timekeeping in Ancient Mesopotamia,' JESHO 31 (1988) 121-185. We have now notations for up to $10N_{57} + U_4$ (10[th] year[s] – cardinal and ordinal usages of these time notations were not graphically differentiated); W 14731, u+, in JESHO 31, 139, up to $U_4 \times 3N_{14} \cdot 7N_1$ (37 months; MSVO 3, 29, see below, fig. 69) and up to $U_4 + 2N_{14}$ (20 days; W 20274, 90, in JESHO 31, 139). Few mixed notations of the type $(U_4 \cdot xN_1) + (yN_{14})zN_1$ for x 'months' and (10y+)z 'days' are known, and none of the type $(xN_{57}) + (U_4 \cdot yN_1)$ for x 'years' and y 'months'; instead, numerical notations representing up to 37 months were inscribed within the sign U_4 (the only candidate for a mixed 'year/month' notation known to me is the difficult $3N_{57} + U_4 \ SU \ 6(+)N_1 \dots$ in MSVO 1, 90, discussed below, section 6.3.4).

²⁵⁸ The sign, in ATU 2 under TAR (and see here fig. 43 to MSVO 1, 121), could in fact be the cuneiform character corresponding to the sign N_{24} , both = $1/10$ of N_1 in grain notations (see here fig. 43 to MSVO 1, 122). The meaning of this additional measure remains obscure, but might be related to the imposition of a tithe (Sumerian za_3 , 10 and igi , 10, gal₂, but also sag in the phrase $sag \ bari_6$, for which see K.R. Veenhof, FS Birot [Paris 1985] 294-297; see R.K. Englund, JESHO 31 [1988] 151-152?) by temples and other administrative units in later Mesopotamian tradition.

Figure 43: Key texts for the understanding of the archaic system of timekeeping. The two texts above, both from Jemdet Nasr, were instrumental in deciphering the structure of the archaic division of the year into 12 months of 30 days each. Once it was known that in certain contexts grain measures were increased by a tenth, such increases qualified with the sign TAR_0 , the calculations behind a number of texts could be deciphered. MSVO 1, 121, demonstrated in this way that the administrative month consisted of 30 days, MSVO 1, 122, that the year consisted of 360 days and thus 12 months.

2b	$N_1 \text{ ŠE}_0$	N_1 of grain,
2c	N_{24}	($1/10$ is ?) N_{24}
3a	$N_{14} N_1 \text{ UDU}_0 \text{ PAP}_0 \text{ BU}_0 \text{ NAM}_2$	11 sheep (for ?) PN,
3b1	$4N_1 \text{ UDU}_0 \text{ U}_4 \times 2N_1$	(comprised of) 4 sheep (for ?) two months
3b2	$7N_1 \text{ UDU}_0 \text{ U}_4 \times 3N_1$	and 7 sheep (for ?) 3 months.

It seems that according to the first case of the account the person designated TI GIR₃gunū is responsible for the distribution of grain over a span of $18 + 14 + 3 = 35$ days, represented by the mixed notation $(U_4 \times N_1) + 5N_6$.²⁵⁹ These 35 days are translated into a corresponding measure of grain at N_{24} ($= 1/10 N_1$) per day for a total of $3N_1 2N_{30} N_{24}$, or 35 N_{24} of grain. To this an amount equal to $1/10$ was added,²⁶⁰ qualified by the sign TAR₀.

That a grain measure corresponding to the numerical sign N_{24} was really the basis for this and other time/grain calculations,²⁶¹ and that the addition of $1/10$ was an implicit operation in consolidated accounts, can be demonstrated in the following text MSVO 1, 122. This text records in the second case of its obverse surface a time notation $3N_{57} + U_4$ equivalent to three years, followed by a grain notation corresponding to 1188 N_{24} .

obv. i	1	$N_{45} 6N_{14} \text{ DUB } \text{ŠE}_0$	960 N_{24} grain units from the (preceding) account (?),
	2a	$N_{24} 3N_{57} + U_4 \text{ EN}_0 \text{ PA}_0$	3 years at N_{24} (per day) (from the official ?) EN PA,
	2b	$N_{45} 9N_{14} 4N_1 \text{ [} 4N_{30} \text{]} \text{ ŠE}_0$	(totaling) 1188 N_{24} grain units.
obv. ii	1	$\text{PA}_0 \text{ GIR}_3 \text{gunū}$	(Responsible?:) $\text{PA}_0 \text{ GIR}_3 \text{gunū}$.
rev. i	1	$N_{34} 5N_{14} 4N_1 4N_{30}$ $\text{ŠE}_0 \text{ PA}_0 \text{ GIR}_3 \text{gunū}$	(Altogether:.) 2148 N_{24} units of grain, (responsible?:) $\text{PA}_0 \text{ GIR}_3 \text{gunū}$

The now straightforward conversion in this account of the time into a grain notation is

$$1/10 \times (3 \times 360 \times N_{24} =) 1080 N_{24} = 1188 N_{24}, \text{ or: } N_{45} 9N_{14} 4N_1 4N_{30},$$

to which the measure noted in the first case is added for the total on the reverse.²⁶²

²⁵⁹ The first N_6 of $5N_6$ is clumsily impressed, as Langdon also copied it in OECT 7. Vajman apparently read his $(U_4 \times N_1) + N_{14} 4N_6$ from a photo, and did not observe the connection with the following grain notations.

²⁶⁰ In fact $3N_1 2N_{30} N_{24} \times 1/10$ should result in $N_{30} N_{24} N_{28}$ (i.e., $35N_{24} \times 1/10 = 3 1/2 N_{24} = N_{30} N_{24} N_{28}$); $N_{30} N_{24} N_{30}$ might have resulted from the difficult calculation of $1/10$ of $2N_{30} N_{24}$, rounded off to $2N_{30}$, $2N_{30} \times 1/10 = 1/5 N_{30} = N_{20}$. N_{20} , unattested in JN, had to be changed to either N_{28} or N_{30} .

²⁶¹ Compare MSVO 1, 86 (=OECT 7, 92-93) and MSVO 4, 10.

²⁶² Compare MSVO 1, 89 (rev.: $N_{45} 9N_{14} 4N_1 4N_{30} 3N_{57} + U_4$, "1188 N_{24} grain units, 3 years"; this is presumably the account from which the entry in the second case of MSVO 1, 122, was drawn), and, calculating with a daily grain measure of N_{30} instead of N_{24} , the accounts MSVO 1, 90 ($N_{34} 9N_{14} 3N_1 3N_{30} \text{ NIGIN}_2 3N_{57} + U_4$, "1188 N_{30} grain units, total of 3 years") and 94 ($N_{37} 2N_{47} 2N_{20}$ (?) $\text{ŠE}_0 4N_{57} + U_4$, "1560 N_{30} grain units, 4 years", and $2N_{34} N_{45} 8N_{14} \text{ ŠE}_0 6N_{57} + U_4$, "2340 N_{30} grain units, 6 years"). The time/grain notations of the last text, however, document an addition not of $1/10$, but of $1/12$, for which no explanation can be offered, assuming intercalation was not involved.

6.2.2. Ordinal time notations

In addition to the proven cardinal use of the sign combinations representing days, months and years, several archaic texts demonstrate that the same combinations expressed ordinal meaning. All are closely tied to rations, primarily in grain and grain products. For instance, the ordinal nature of the time notations in the texts MSVO 1, 83-84, seems quite clear, judging from the uniform quantities of textile products (?) and dried fruits in the first text, of grain rations or products in the second. The first two columns of no. 84, for instance, record the disbursement of amounts of grain to two officials (?) during days one and two of a five day period:

obv. i	1	$[5N_1] \text{ ZATU}659$	5 units of the "grain product" ZATU659
	2	$N_1 N_8 N_{30}$	1 1/2 units of N_{30}
	3	$N_1 N_{24}$	1 unit of N_{24}
	4	$\text{ZATU}651 + \text{NINDA } 3N_{57}, \text{ A IB}_0$ $U_4 + N_8$	(responsible?:) ... First day.
obv. ii	1	$5N_1 \text{ ZATU}659$ $N_1 N_{24}$ $5N_1 5N_{57} + \text{GAR GABURRA EN}_0$ UR BA NUN_0 $U_4 + 2N_8$	5 units of ZATU659 1 unit of N_{24} 5 units of GAR ... Second day

and so forth with the notations $U_4 + 3N_8$, $U_4 + 4N_8$ and $U_4 + 5N_8$ following comparable quantities of (bisexagesimally counted) grain units.²⁶³

Two texts from Uqair (?)²⁶⁴ contain in parallel fashion ordinal notations for years, indeed, both texts record a period of eight years, and both arrive at the same total of 660 of the units N_1 .

	MSVO 4, 1		MSVO 4, 2	
obv. i	$2N_{45} 6N_{14} \text{ ŠE}_0 \dots$	$1N_{57} + U_4$	$i 2N_{45} 8N_{14} \dots$	$1N_{57} + U_4$
	$2N_{10}$			
	N_{14}			
	$N_{45} 9N_{14} \dots$	$2N_{57} + U_4$	$[N_{45} 7N_{14}] \dots$	$2N_{57} + U_4$
	$N_{45} 5N_{14} \dots$	$3N_{57} + U_4$	$[] + N_{14} \dots$	$3N_{57} + U_4$
	$8N_{14}$			
	$[4N_{14} +]$			
		$4N_{57} + U_4$	$8N_{14} \dots$	$4N_{57} + U_4$

²⁶³ J. Friberg has suggested in Scientific American 250/2 (February, 1984) 111 that the period recorded in MSVO 1, 84, represented a week of 5 days; considering however that the only other parallel text no. 83 records in like fashion a period of 4 days, and that a reasonable reconstruction of the absolute measures of the grain capacity system would, if at all, favor a week of 6 days (corresponding to the sign $N_{30} = 6N_{30} = 6 \text{ GAR}$; see below), this proposal cannot be sustained (a five-week month recalls the week-eponym *hamušums* of the Old Assyrian period!).

²⁶⁴ See above, n. 29-30, and fig. 70 below.

obv. ii	6N ₁₄ ...	5N ₅₇ +U ₄	5N ₁₄ [...	5N ₅₇ +U ₄]
	8N ₁₄ ...	6N ₅₇ +U ₄	5N ₁₄ ...	[6N ₅₇ +U ₄]
	7N ₁₉ ...	7N ₅₇ +U ₄	ii N ₄₅ 8N ₁₉ ...	7N ₅₇ +U ₄
	2N ₄₅ N ₁₄	8N ₅₇ +U ₄	9N ₁₄ ...	8N ₅₇
rev. i	3N ₃₄ 2N ₄₅ ŠE _o GU ₇	8N ₅₇ +U ₄	3N ₃₄ 2N ₄₅ ŠE _o ...	[]

Although difficulties remain with the calculations, it is clear from the size of the grain quantities that the entries of the obverse were totaled on the reverse of the tablets, therefore that the separate entries qualified with 1-8N₅₇+U₄ recorded amounts from individual years. On the basis of two parallel texts, any judgment about the meaning of an eight-year period would carry little conviction.

6.2.3. Grain and time notations

The relationship between the grain capacity system and time notations was such that they might in fact have reflected each other. Evidence is strong that, as H.J. Nissen has felt for many years,²⁶⁵ the Uruk period beveled-rim bowl with an average capacity of 0.8 liter served as the model for the pictogram GAR (later Sumerian *ninda*) and represented in general a worker's grain ration for one day. Further, the ideogram GAR can be shown to generally correspond to the numerical sign N_{30o} from the grain capacity system. In particular, the text MSVO 4, 27,²⁶⁶ proves that the quantity of grain represented by GAR // N_{30o} was a third measure employed as a general daily distribution in the archaic period. This N_{30o} is, as we know, 1/30 of the basic unit N₁, and this N₁ is inscribed within the sign U₄ to represent one administrative month of 30 days.

No administrative texts attest to a division of the day into sub-units, aside from the plausible interpretation of the signs U₄ and SIG as designations of 'morning' and 'evening', for instance, as qualifications of probable cult activities at these times, according to our sources centering around the cult of Inanna²⁶⁷; however, the lexical 'Plant List'²⁶⁸ seems to include in its section on likely time notations evidence for the division of the day into four smaller units, dividing the day and the night into two parts each.²⁶⁹

²⁶⁵ See ATU 2, 153-154⁶⁰.

²⁶⁶ Below, fig. 68. The account was first correctly interpreted in JESHO 31, 162-164. The first case reads 4N₁₄ ŠE_o U₄ × 2N₁₄ 4N₁ GAR, '720 N₃₀ grain units in 24 months: GAR[=rations]', that is, 24 months × 30 days × N₃₀ = 720 N_{30o} (=4N₁₄).

²⁶⁷ Note the attestations of the presumable morning and evening Venus (Inanna) in such texts as ATU 5, pl. 2, W 5233,b, pl. 5, W 6288; further, in W 20274,77 (unpublished) and in W 21671 (fig. 44 here) with at once both notations. An administrative use of the designations of morning and evening might be attested in the text W 20274, 1 (see below, fig. 50), which contains the summation col. i: N₄₈ 4N₃₄ U₄ GIŠten_o KAR + 9N₃₄ SIG GIŠten_o KAR = 2N₄₈ 3N₃₄ UDU_o SANGA SUKKAL SAR_o PAP, SURUPPAK_o HI E_{2o} NUN_o, that is: '840 (sheep inspected?) in the morning ..., 540 (sheep inspected?) in the evening ...; altogether 1380 sheep (inspected by) the exchequer(?; SANGA) ...'.

²⁶⁸ See above, section 5, and compare the ED IIIa list SF 7, vi 19-23 (7 × U₄ ?), 24 (U₄ U₄) and 25-27 (U₄ × N₁ ...) (undear).

²⁶⁹ See JESHO 31, 164-168, following collation of the final line of the witness W 20363. ED IIIa texts document the better known division of day and night into three parts each, altogether six, possibly corresponding to the Old Babylonian division of the night into 3 watches (*massartu*).

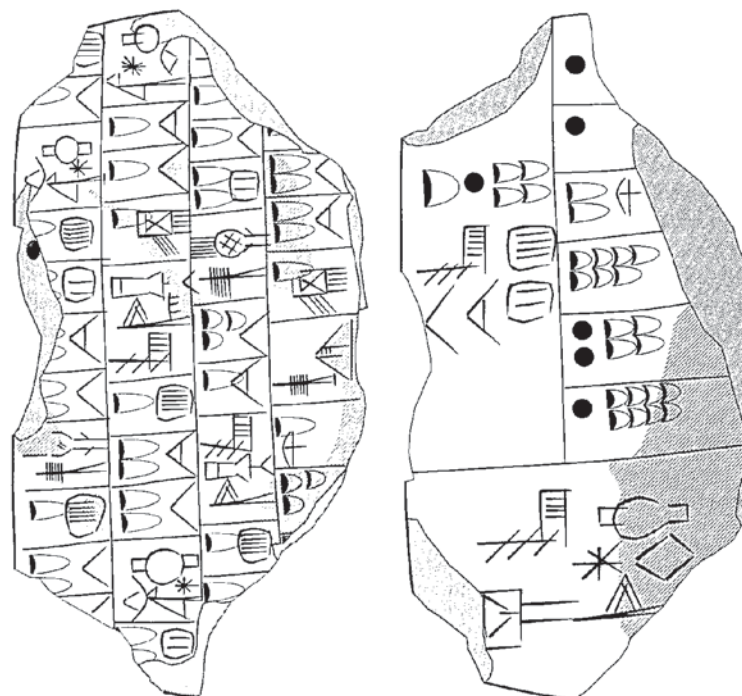


Figure 44: W 21671
This account of apparent distributions of textiles contains possible evidence of an archaic cultic calendar.

These artificial divisions of time can be documented in much the same form throughout the third millennium. First solid evidence of the cultic/agricultural calendar, which we should imagine predates by millennia the imposition of artificial timekeeping on an urban society, is found much later, beginning in the ED IIIb (pre-Sargonic Lagash) period. The Jemdet Nasr texts characterized by colophons including the notation SU_o GIBIL (discussed below, section 6.3.4), however, may be cited as possible evidence of a calendar beginning with a 'new growth' festival ('leather' sign SU_o) and 'month' might have been homophones in the uncertain archaic language of Uruk). An account of textiles from Uruk, dating to the Uruk III period, might contain evidence of a cultic calendar in the south (figure 44). The account books entries of wool, cloth, etc., subscribed in 10+ sections with notations which are in other contexts suspected to represent cultic festivals, including EZEN_o U₄ AN MUS_{3o} ('festival of the morning Inanna'), GIBIL NUN_o ('New growth (festival) of Enki'), EZEN_o SIG AN MUS_{3o} ('festival of the evening Inanna'), EN_o NAGAR_o URI_{3o} ('Lord ... (festival) of Nanna'), and SU_o NUN ('... (festival) of Enki'; all translations highly speculative).

6.3 ADMINISTRATIVE OFFICES

Following a relatively secure identification of a series of realia, including domesticated plants and animals, wooden objects, grain products and textiles, proto-cuneiform texts can be divided into broadly formal categories often closely related to the numerical systems used to quantify recorded objects.²⁷⁰ These include accounts dealing with archaic fisheries, with domesticated animals and animal products, with (presumably slave) labor, with grain and grain products, and with the administration of fields.

6.3.1. Fisheries²⁷¹

There can be little doubt that next to grain products fish played a primary role in the diet of the earliest settlers of the alluvium,²⁷² for whom the hunt in the alluvial plain promised no substantial source of protein, and whose access to meat and dairy products from domesticated animals was at all times severely limited.²⁷³ Fish, on the one hand, grow rapidly, require little care and as a rule are not fed, and can be caught with simple technologies. From the perspective of dietary science, fish are, on the other, equal to meat and milk products²⁷⁴ and are, moreover, easily digestible. The modest effort requisite to their exploitation makes fish an ideal meat substitute for the often protein-low diets of poor communities.²⁷⁵ The biotope

²⁷⁰ See ATU 2, pp. 117-156 + plates 54-60, and above, section 6.1. For lack of textual sources which might make the production of metal, wooden, stone and clay objects more understandable, these products are not dealt with in the following. Note in particular the treatment of such products in the commentary volume to the publication of the archaic lexical lists, ATU 3 [in preparation; K. Reiter, Berlin, is currently preparing a commentary to the 'Metal' list with an edition of the Uruk administrative texts dealing with metals].

²⁷¹ See generally A. Salonen, *Die Fischerei im alten Mesopotamien* [...], AASF B 166 (Helsinki 1970), and for a more detailed description of the organization of fisheries in the third millennium my Ur III-Fischerei.

²⁷² This belief derives not only from our understanding of the exploitation of the waters of southern Babylonia documented in administrative archives from later periods, but also from studies of developing countries whose technology and environment in many ways reflects that of archaic Babylonia. The basic problems of fish exploitation, in particular in developing countries, were last dealt with at the World Conference of Fisheries Management and Development in Rome sponsored by the FAO (Food and Agriculture Organization of the United Nations) from 27 June through 6 July 1984. Cf. FAO News Feature WFC/NF/84/2.

²⁷³ For a general introduction into these early developments see D. and J. Oates, *The Rise of Civilization* (Oxford 1976), in particular pp. 11-18, 96-109, and the bibliography after p. 136; H.J. Nissen, *Grundzüge einer Geschichte der Frühzeit des Vorderen Orients* (Darmstadt 1983) 18-70. The one-sidedness of grain diets [see K. Butz, 'Landwirtschaft,' in RIA 6 [1980-83] 471-486, with extensive literature] could only be alleviated by consumption of fish.

²⁷⁴ FAO WFC/NF/84/2, p. 1: 'Fish contains some 18 to 22 percent easily-digested protein and in common with other animal proteins, essential amino acids that the human body cannot manufacture.' Compare B. Watt and A. Merrill, *Composition of Foods, Agricultural Handbook No. 8* (Washington, D.C., 1975) pp. 6-67, table 1. R. Ellison, 'Diet in Mesopotamia [...],' *Iraq* 43 (1981) 35-45 [and again in *Iraq* 45 [1983] 146-150], has pointed to the lack of the vitamins A and C in the Babylonian diet; fish liver is, however, a powerful source of vitamin A; fish contain also some amounts of ascorbic acid. Natrium is of course contained in fish in high levels, particularly when it has been salted after the catch.

²⁷⁵ And naturally of the great majority of ancient Babylonians, for whom meat was in all periods only seen on festive occasions. Pre-war Iraq still offered a dietary structure in its non-urban regions comparable to that of third millennium Mesopotamia. According to the FAO Food and Nutrition Paper 1/2: *Review of Food Consumption Surveys (Household Food Consumption by Economic Groups; Rome 1979)* 181, to fig. 52,

stretching from the Persian gulf into the swamps, lakes and canals of Sumer offered an extraordinary potential in fish, crabs and turtles.²⁷⁶

A major problem in the exploitation of fish resources rests, however, in the fact that they easily spoil. In arid regions, this means that fish cannot be transported over great distances, and of course cannot be stored, without being preserved in some form. Thus together with fish exploitation, archaic fishermen must have developed a technology of preservation – parallel to the necessity of new storage technologies which presupposed the expanded exploitation of dairy products discussed below, section 6.3.2. While written documents from the archaic period offer but very sparing information, material finds from archaeological excavations, historical reports²⁷⁷ and ethnographic studies do act to bridge some gaps in our knowledge about the nature of this exploitation.

the poorest Iraqis on average consumed just 570g of fish and 430g of meat, while the richest consumed 830g fish and 2.8kg of meat, that is, marginally more fish, but more than six times as much meat.

²⁷⁶ Travel reports from the 19th century already made this point, for example "Aus einem Briefe des Dr. Socin an Prof. Nöldecke, 29. April 1870. An Bord des 'Mosul' auf dem Tigris," *ZDMG* 24 [1870] 471: 'Fish are so abundant in the Euphrates, that these animals cost nearly nothing; while I was underway to the Muntefic camp, a 2 1/2 - 3 foot long binni, that is, a fish of the highest quality, jumped of itself into the boat.' Most recent available data on fishing in the inland waters of Iraq [see A. al-Hadithi, *Optimal Utilization of the Water Resources of the Euphrates River of Iraq* [Diss. University of Arizona, University Microfilms, Ann Arbor 1979] 120] estimate a yearly catch of 20,500 tons:

Water	Source	Catch in tons
Hammar Lake	Euphrates and Tigris	9,200
Schatra Lake	Euphrates and Tigris	1,320
Abu-Dibbis	Euphrates	6,400
Kurna marsh	Euphrates and Tigris	2,000
Schamiya	Euphrates	420
Hobbaniya reservoir	Euphrates	960
Euphrates		160
		20,460

Clearly, the lakes fed by rivers and canals provided the main sources of the catch, 60% of which derived from the carp family. These are unfortunately now artificial figures, since, aside from the short-term upheavals in Iraqi fisheries due to decades of war conditions, long-term damage to the main breeding grounds between the Syrian border and Hit are being guaranteed by dam construction with no consideration of fish locks.

²⁷⁷ Compare, for instance, Herodotus I 200 (according to J. Feix [ed.], *Herodot Historien I* [Munich 1963]): 'Three Babylonian tribes live entirely from fish, which they catch and dry in the sun.' The dried, apparently unsalted fish were ground and eaten in the form of a sort of porridge, or baked into bread cakes. The Greek historian Diodorus Siculus, who traveled through Egypt from 60 to 57 B.C., described the methods of saltwater fishing employed by dwellers of the gulf coast south of Babylon who built walls of woven reed baskets in the water close to the beach. Doors on these baskets opened during high tide, catching with the oncoming low tide the fish, that had swum into them with automatically closing doors. Other coastal dwellers dug canals from the beach up to their settlements, which again with the low tide caught in reed installations the fish that had entered them. The catch was simply removed by hand [Bibliotheca historica 3:21, cited according to F.S. Bodenheimer, *Animal and Man in Bible Lands* [Leiden 1960] 72; see below, n. 315, for a description of modern fishing methods in Bahrain].

One of the most important, but unfortunately most neglected sources for a better understanding of archaic fishing techniques is, of course, the identification of fish remains from urban centers. There is little doubt that careful gathering and analysis of these remains from excavations of archaic settlement levels in Mesopotamia, beginning in the Ubaid period in the fourth and continuing through the entire third millennium, would have been of great assistance in analyzing our difficult archaic textual material. S. Lloyd in his first report of Ubaid period levels of Eridu, for instance, spoke of "the fish-offerings, of which there were such ubiquitous traces,"²⁷⁸ and F. Safar discovered that in Temple VI of the settlement "by far the greater part of the pavement-debris consisted of the bones of fish and small animals, evidently brought to the shrine as offerings."²⁷⁹ Beyond very cursory identifications of some fish families, however, no detailed analysis of these bones was ever conducted,²⁸⁰ and they were apparently all discarded during excavations, so that it is not possible to determine the origin of the fish or the type of bones represented in these earliest levels representing a period of interregional expansion, in particular into the Persian Gulf.²⁸¹ Equally frustrating are reports of fish finds from the Uruk IV-III period. Lloyd and Safar report again the finds of large numbers of fish bones,²⁸² and G. Cros uncovered an Uruk III period level 3.35 m below the surface behind the "Maison-des-fruits" of Girsu which contained whole yellow bundles of fully preserved fish skeletons, complete with skins and scales.²⁸³

²⁷⁸ S. Lloyd and F. Safar, "Eridu [...]," *Sumer* 3 (1947) 94.

²⁷⁹ *op.cit.* 104 and see *Sumer* 4 (1948) 119: "It was in the niche [behind the Temple VIII altar] created by one of the false doors that we discovered a large intact pointed vessel of the 'tortoise-shaped' type with a long spout at the shoulder, several examples of which were found at Tepe Gawra, the jar itself was full of fish-bones and plentiful traces of the usual fish-offerings were found in both niches." See further F. Safar et al., *Eridu* (Baghdad 1981) 101; 107-110: "Since the complete skeleton of a fish was never found, and coherent groups of bones seldom appeared, it occurred to us that the fish might subsequently have been eaten."

²⁸⁰ S. Payne, "Partial Recovery and Sample Bias: The Results of Some Sieving Experiments," in: E.S. Higgs (ed.), *Papers in Economic Prehistory I* (Cambridge 1972) 49-64, has demonstrated just how skewed faunal identifications have been in past excavation reports, particularly discouraging in the case of small fauna which are often entirely lost when fine sieving is not employed (see fig. 45 here). See further Payne in A.T. Clason (ed.), *Archaeozoological studies [...]* (Amsterdam, Oxford, New York 1975) p. 13, and for the potential information to be had from the smallest finds of careful excavations R. Casteel, "Estimation of Size, Minimum Numbers of Individuals, and Seasonal Dating by Means of Fish Scales from Archaeological Sites," in A. Clason, *op.cit.*, 70-86, with extensive literature.

²⁸¹ Continuing work by excavation teams in Bahrain and the United Arab Republic promise more information in this regard. See for an early treatment of contacts between Mesopotamia and the gulf J. Oates et al., "Seafaring merchants of Ur?," *Antiquity* 51 (1977) 221-234; the authors proposed that short-lived colonies may have been established along the coast for the purpose of exploitation of the marine resources. Oates' identification p. 234 of the Eridu fish bones as those of sea bass has not been substantiated.

²⁸² F. Safar et al., *Eridu* p. 84.

²⁸³ G. Cros, *Nouvelles fouilles de Tello [...]* (Paris 1910) 81-83, "Dépôt de poissons". Cros attempted p. 82 to explain the origins of these great numbers of fish remains: "There were thus very certainly two or more rooms, possibly below ground level, in the annex of the ancient Maison-des-Fruits, between the building and the exterior wall supporting the artificial terrace, serving as provisions magazines in particular for dried fish. In the configurations, the destructions and pillagings, examples of which are not lacking in the golden age of Sirkourla [=Lagash, city Girsu], these masses of fish were subsequently scattered and dispersed by the collapse of the mud walls; then, with rebuilding on higher levels, they remained buried in successive layers of debris."

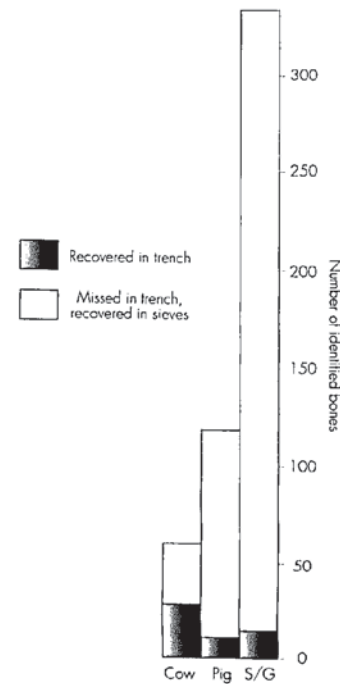


Figure 45: Bone recovery in excavations. Chart demonstrating the low efficiency of unsieved trench recovery (after S. Payne, in: E.S. Higgs [ed.], *Papers in Economic Prehistory I* [Cambridge 1972] 61, fig. 6). The results shown would be much worse in the case of small mammals, fish and birds.

Fish bones from the Uruk III period are also known from the settlement Farukhabad close to Susa, including bones of the family *Pomadasydae* (grunters), which according to R. Redding were not found in fresh water.²⁸⁴ Such data and other identifications from Mesopotamia strongly suggest that fish must have been conserved before their transportation from the gulf.

²⁸⁴ R.W. Redding, "The Faunal Remains," in: H.T. Wright (ed.), *An Early Town on the Deh Luran Plain. Excavations at Tepe Farukhabad, Memoirs of the Museum of Anthropology, University of Michigan, no. 13* (Ann Arbor 1981) 234-235, with reference to H. Blegvad, *Fishes of the Iranian Gulf. Danish Scientific Investigations in Iran, pt. III* (Copenhagen 1944) 121-127, and K.T. Khalaf, *The Marine and Freshwater Fishes of Iraq* (Baghdad 1961). F. Hole in: F. Hole et al. (eds.), *Prehistory and Human Ecology of the Deh Luran Plain [...]*, *Memoirs of the Museum of Anthropology, University of Michigan, no. 1* (Ann Arbor 1969) 327, reported that in the region from ca. 5000 B.C. demand for or trading sources of fish went into a severe decline (possibly because of consumption in Mesopotamia?). See H.E.V. Crawford, "Mesopotamia's invisible exports in the third millennium B.C.," *World Archaeology* 5/2 (1973) 235: "It seems possible that a land-locked area such as central Iran would have welcomed salt fish as an addition to the diet in exchange for their stones and minerals."

The strongest archaeological evidence for the exploitation of fish resources in Uruk should have come from that city itself. E. Heinrich reported the existence of complete fish skeletons in Uruk III-dated floors, all of which were apparently discarded together with nearly all of the pottery in the same context which might have gone far in dating the archaic tablets from this area.²⁸⁵

Assuming fish and fishing techniques remained more or less constant in the third millennium, identifications of bones from later, Early Dynastic levels made by experts using bone atlases offer now a much better picture of the types of fish which were being brought into urban centers, so into Girsu,²⁸⁶ Uruk,²⁸⁷ Lagash (al-Hibba)²⁸⁸ and Abu Salabikh.²⁸⁹ Of four identified families in Lagash, two – the grunters (*Pomadasydae*, also found in proto-Elamite Farukhabad) and the sea-bream (*Sparidae*) – were saltwater fish from the Persian Gulf, the other two – catfish (*Siluridae*) and carps (*Cyprinidae*) are freshwater fish found in practically all Babylonian fish remains. The Abu Salabikh finds made by the Chicago team in 1963 and since 1975 by British excavators included, next to the expected carp, two sea-bream, two mullet (*Mugilidae*), and one each of herring (*Clupeidae*), catfish, grunter, and of a Persian Gulf barracuda (*Sphyræna jello*) with a reconstructed length of 120-130cm.

The importance of these fish to consumers in southern Babylonia is clear from written documents. The archaic fish list²⁹⁰ is a compendium of ca. 80 entries representing those few types of fish caught and preserved in the waters of Mesopotamia and presumably in the Persian Gulf, consumed and possibly traded in urban and administrative centers of southern Babylonia, together with a series of designations of implements for fishing and for the transportation and storage of the catch. These objects are in a number of cases represented by apparently quite pictographic signs, as for instance the best attested sign SUHUR, which seems clearly to have designated less the type than the state of preservation of the fish.²⁹¹ The sign is best

²⁸⁵ UVB 6 (1935) 12 and pl. IV. Discussing a dump in the excavation square Od XVI 4/5 dated to 'Uruk IIIc', the author noted that "many impressions of complete fish skeletons could be seen in the area of the rooms 195, 196 and 198 in the mud flooring."

²⁸⁶ G. Cros, NFT 81-82.

²⁸⁷ H.J. Lenzen, UVB 11 (1940) 17, discusses a large room or courtyard in the square Oa XVI,3, whose whole floor "over many square meters is covered with the remains of fish. The layer had a nearly golden-yellow color, the bodies of the fish with scales, bones and vertebrae were clearly recognizable." Early Dynastic catches in Uruk are also documented textually (M.W. Green, ZA 72 [1982] 176, W 17917 iv 2-4: 15;0,0 ku₂ gur sag.gal₂/ku₂.bi 10 gin₂/ku₂.A.lap¹.kom, '15 'head-gur' [ca. 3600 liters] of fish, its silver: 10 shekels, fish of Alap").

²⁸⁸ A series of identifications of fish remains from excavations directed by D. Hansen in 1970-71 were published by K. Mudar, "Early Dynastic III Animal Utilization in Lagash: A Report on the Fauna of Tell Al-Hibba," JNES 41 [1982] p. 29. Six bones of heads of *Sparidae* are recorded (a *maxilla*, and five *opercule* fragments of large *Apanthopagrus*); the heads were thus not removed.

²⁸⁹ A. von den Driesch, Iraq 48 (1986) 31-38. See the preliminary reports by J. N. Postgate, "Excavations at Abu Salabikh, 1975 [...]," Iraq 38 (1976) 133-61; id., "Early Dynastic Burial Customs at Abu Salabikh," Sumer 36 (1980) 65-82; J. Clutton-Brock and R. Burleigh, "The Animal Remains from Abu Salabikh: Preliminary Report," Iraq 40 (1978) 89-100.

²⁹⁰ See above, section 5.

²⁹¹ The later Sumerian reading suhur of the sign, corresponding after the Old Babylonian period to Akkadian *puādu*, 'carp', might have resulted from the type of fish generally delivered in this state of preservation by fishermen, namely the carp native to Mesopotamian waters. The large species called by the Iraqis *bizz* (*Barbus esocinus*), but also by some the 'ass fish' (see D. de Rivoire, Les vrais Arabes et leurs pays [...]

understood as a representation of a fish which has been split, headed²⁹² and gutted, and dried, before it was delivered to urban administrators who drew up the accounts in archaic Uruk (figure 4c).²⁹³

Whereas the objects designated SUHUR as well as all other probable designations of fish and fish containers were qualified with the sexagesimal system (figure 47),²⁹⁴ the object

[Paris 1884] 193: "The river dwellers are wont to call it the 'fish of the donkey', because, placed across the back of a donkey of normal size, its head and tail should touch the ground on both sides of the animal"; see further the depiction of the *bizz* in F. Delitzsch, Handel und Wandel in Altbabylonien [Stuttgart 1910] 8). Later designations of split and dried fish were simply ku₂ or suhur dar.ra (dar = *leū*, 'to split', cut in half; see, for example, the pre-Sargonic Girsu texts DP 303 iv: 390 suhur ku₂ dar.ra gal.gal; DP 328 i: 170 didli.bi suhur ku₂ dar.ra, etc.; cf. M. Civil, OrAnt 21 [1982] 24 to gir₂ ku₂ dar uru.da, "knife for splitting fish", in the Kish witness of the ED metal list and compare the entry GIR₂ KU₂ in the archaic Fish List I. 90 [ATU 3, p. 97]). In the pre-Sargonic Lagash period, suhur were delivered primarily by fishermen active on inland waters: šuku, gu₂.edin.na, a.du₁₀, and GAN₂ fieldname, 'fishermen of the Cu'edina', 'of the sweet water' and 'of the field so-and-so', so that the referent carp of the sign is likely. A comparable lexical development can be followed in the Akkadian *nānu*, 'fish,' which in Arabic means 'large fish', 'whale' (Arab. fish is *samak*).

²⁹² Note that head bones from fish have very rarely been recovered from Mesopotamian excavations.

²⁹³ Some practical considerations, however, might question the feasibility of drying easily spoiled fish in the hot and often humid climate of the southern Mesopotamian marshlands and the Persian Gulf. Reports on fish drying come primarily from countries with temperate climates, for example, from Canada and Norway. Although according to these reports the ideal temperature for this method of preservation is ca. 27° Celsius with low humidity, recent experiments in Brazil and Cambodia have proven that very good results can be had with well cleaned and lean fish at temperatures of 40° and a humidity of 70% (J. Waterman, The Production of Dried Fish, FAO Fisheries Technical Paper Nr. 160 [Rome 1976] 8-14; 18-32). A reduction of the water content of a typical fish from 80 to 25% eliminates further bacterial action, and at 15% water content (for pickled fish 40%) fungal growth ceases. See further O. Willie, Handbuch der Fischkonservierung (Hamburg 1949; German production); J. Smith, Historical Observations on the Conditions of the Fisheries Among Ancient Greeks and Romans, and on Their Mode of Salting and Pickling Fish, U.S. Commission on Fish and Fisheries, Report of the Commissioner for 1873-4 and 1874-5 (Washington 1876); J. Böttner, "Konservierung," RIA 6 (1980-83) 191-97; C. Cutting, Fish Saving: A History of Fish Processing from Ancient to Modern Times (London 1955). For ancient Egyptian practice see R. Forbes, Studies in Ancient Technology III (Leiden 1955) 193-194 (p. 193: "The large stoves shown in pictures of ancient houses and the fact that Wen-Amon and others tell us of export of cured fish to Syria go to prove the efficacy of the process [of preservation]"; R. Forbes, op.cit. 194, fig. 37, contains an Egyptian relief of preparation for fish preservation with a depiction of the fish denoted H+SUHUR in the archaic fish list and called now *fissif*, prepared by modern Egyptians by rubbing salt into the gills, mouth and scales of fish which had already been gutted and cleaned; further J. Dumont, "La pêche dans le Fayoum hellénistique [...]," Chronique d'Égypte 52 [1977] 125-142. The process of drying can be facilitated by first placing the gutted fish in a saline solution, as a result of which a part of the water content is drawn off by the salt; when the fish are then laid out or hung up to dry, they lose 62-67% of their water within a day (Waterman, ibid. 15-17; 25). The fish designated MUN in the fish list, I. 50 (ATU 3, p. 96; probably the precursor of LAK 56, not 55 [DIM-ŠE]) might refer to the practice of salting fish in this way (for the salt containers and sources in the ancient Near East see D. Potts, "On Salt and Salt Gathering in Ancient Mesopotamia," JESHO 27 [1984] 258-267; K. Butz, JESHO 27, 272-316). Fatty fish are not amenable to drying in hot climates due to higher susceptibility to rancidity. The herring *Hilsa ilisha*, a well attested find in Mesopotamian excavations, for example, has a fat content of ca. 20% and so cannot be successfully dried. This fish must therefore have either been consumed fresh, or more probably have been converted to fish oil or to a sauce like classical garum (or Thai *nuoc-mam*) for use.

²⁹⁴ The notation N₅₁ SUHUR, '120 SUHUR', in the Uruk IV period text W 7227.b obv. i 4 (ATU 5, pl. 26) refers to a probable grain product ration given an official designated SUHUR (possibly 'fishery worker', see below to GAI SUHUR).



Figure 46: Dried fish
A modern representation of dried fish, corresponding to the archaic pictogram SUHUR [after J. Waterman, *The Production of Dried Fish*, p. 43, fig. 10].

represented by the sign KU_{60} (the simple pictogram 'fish') was apparently qualified with the bisexagesimal system. Although very few administrative notations including KU_{60} contain numbers which would make clear the numerical system used, this fact seems sufficiently demonstrated by the entry sequence SUHUR, KU_{60} and ZATU759+ KU_{60} in the account W 21107 obv. i 3-6 (see figure 47), in which only KU_{60} is recorded with a bisexagesimal notation.²⁹⁵ Since the use of the bisexagesimal system to qualify above all grain and dairy products suggests it was an administrative means of controlling the distribution of rations, we may surmise that KU_{60} represented a rationed fish. Whether this was a fresh or a processed fish cannot be determined with the texts presently available, although it should be noted that the container represented by the sign ZATU759 may have corresponded to the later Sumerian sa ZI×ZI.a used exclusively in the delivery to pre-Sargonic temple households of freshwater, and thus more likely of fresh fish, and that only the sign KU_{60} or derivatives of this sign were inscribed within the sign ZATU759 (see below).

Similarly, signs derived from the sign KU_{60} through a simple rotation (KU_{60} tenū, conventionally transliterated SUKUD), through a doubling of the basic sign form (KU_{60} + KU_{60} , SUKUD+SUKUD) or through the addition of stokes to the fish's dorsal section (GIR_{60} ²⁹⁶) are attested in the archaic text corpus with some frequency, but as a rule in low numbers, making difficult a determination of the numerical system which was used other than that it must have been either sexagesimal or bisexagesimal. At least two Uruk IV period attestations of a unified form of SUKUD with clear bisexagesimal notations²⁹⁷ support their inclusion in the rationing system with KU_{60} . The bisexagesimal notation qualifying fish represented by the sign GIR_{60} in an ED I period text should also be noted in this regard.²⁹⁸

²⁹⁵ A similar use of the bisexagesimal system with KU_{60} in the texts W 21375.2 (unpubl.), MSVO 3, 43, and MSVO 4, 72, lead to the conclusion that all numerical notations qualifying KU_{60} are to be considered bisexagesimal (and that the questionable reference to a sexagesimal notation together with KU_{60} in the text W 17879.e obv. ii 2, made in ATU 2, 152⁴⁴, is to be disregarded).

²⁹⁶ Pre-Sargonic Girsu fishery documents record with greatest frequency the fish called gir and UBI (=SE+SUHUR), which without exception derived from the sea (ab.bo) or hor (? - a.DUN, 'lagoon').

²⁹⁷ The fragments W 6705.c (ATU 5, pl. 12) with the notation [] 4N₅₁ SA₃₆ SUKUDgunū, and W 9656.b (ATU 5, pl. 95) with N₄₅ 2N₅₄ [] 2N₅₇ SUKUDgunū, may refer to quantities of fish, but their poor state of preservation leaves room for doubt. The numerical sign N₄₅, here proven to be a borrowing from the sexagesimal system probably representing 6 · N₃₄ = '7200' (2 · 3600) and in the Uruk III period replaced by the sign form N₆₀, is also found in the Uruk IV period notation N₄₅ N₃₄ X SUKUD in the text W 9655.z (ATU 5, pl. 81); the notation 9N₃₄, erased on the small tablet before N₄₅ N₃₄ was written, however, suggests that the notation was intended to be sexagesimal.

²⁹⁸ UET 2, 19 obv. ii 7: 5N₅₁ GIR₆₀.

Although the administrative documents from Jemdet Nasr contain no identifiable records of a fishery unit of that household, a series of presumable rationing texts contain, in a standardized sequence of products, entries representing as many as 120 units of the fish SUHUR. In nearly all of these texts, the following entry contains a numerical notation drawn from the derived bisexagesimal system.²⁹⁹ This numerical system might then have replaced in Jemdet Nasr bookkeeping bisexagesimal notations representing numbers of KU_{60} in texts from Uruk.³⁰⁰

There is a possibility that the 'discrete' numbers qualifying these fish are only discrete on the surface, that is, that the basic unit N₁ in each of the notations represents some measure or conventional number of (possibly processed) fish. This might seem most obvious in the case of 'double-fish' signs, since the pictogram would correspond to the common practice of binding the tails of paired fish and hanging them over horizontal poles to dry. Considering, further, the relative equivalence values of fish in the later third millennium in Babylonia, the correspondence of 1 DUG_c vessel of dairy fat and 12 SUHUR attested in the Uruk III period text W 20494, 1 (see figure 47) suggests that SUHUR might have represented some number of dried fish, since the estimated eight liters of dairy oil believed to have been held by the vessel DUG_c should have been value equivalent to some hundreds of fish.³⁰¹ Evidence from Jemdet Nasr seems to suggest that the SUHUR was divided into 10 sub-units of fish.³⁰²

Some metrological division must be assumed in the case of the numerous containers of fish recorded in the Uruk documents, without exception qualified with the sexagesimal system. These containers are represented by the signs GA₇₀ and ZATU759, which according to the text W 19408,40 formed a semantic category together with the sign AK, an apparent pictogram of a container made of matted reeds.³⁰³

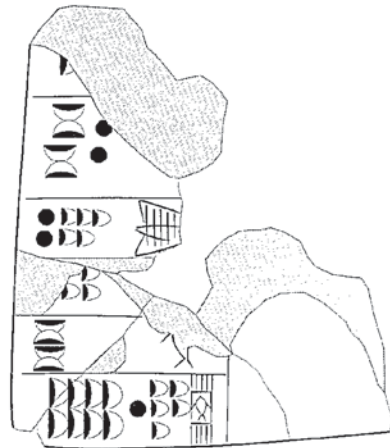
²⁹⁹ See section 6.1 above. The texts include MSVO 1, 93, 103, 108, 109, 111 (sic!), 160, 179 (unclear due to a break, but see the numerical notation in the first case of the tablet's third column); note the inversion of this sequence in the text MSVO 4, 14, possibly from Uqair. Only the receipt MSVO 1, 116, can be excluded from this list; the small numbers of SUHUR (altogether 7) suggest all the same that the tablet represents partial receipts of goods which when consolidated in an account could well have included objects represented by a B₁ notation.

³⁰⁰ The Uruk III period account W 17879.e obv. ii 4 contains the only clear notation of this system together with a probable object designation, the unidentified sign ZATU676₆₀.

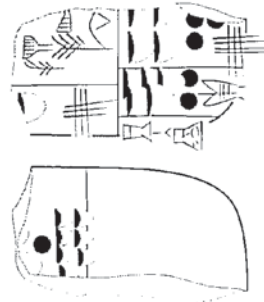
³⁰¹ Confer Ur III-Fischerei, p. 192, table 20, assuming an approximate relationship of 10 liters of butter oil per shekel silver. For the identification of containers used for butter oil, see below, section 6.3.2.

³⁰² I am referring here to the parallel and possibly duplicate accounts MSVO 1, 146 and 150, the entries rev. ii 2b and 3b, respectively, of which contain the notation 5N₈ SUHUR. All evidence suggests that when the division of the basic unit N₁, represented by the numerical sign N₈ (= N₁ rotated 90° clockwise) did not refer obviously to 1/7 (either in number or, in the case of young animals, in rough value), then it referred to 1/10 (see most recently my remarks in N.A.B.U. 1995:38) and thus that the notation 5N₈ SUHUR should refer to 3/10 of the metrological unit SUHUR (note that this entry follows and is followed by entries including the fish signs KU_{60} , KU_{60} , and SUKUD+SUKUD₆ which may have explained the source and function of the recorded SUHUR).

³⁰³ The standardization of such containers into sizes compatible with the capacity system used to qualify measures of grain and liquids was documented in later periods by the use in fisheries administration of both baskets of understood capacity and the grain capacity system to record deliveries and transfers of fish (see Ur III-Fischerei, 142-155). The best attested fish documented in this metrological system was qualified se₆ (NE), meaning either 'cooked' or 'smoked' (op.cit. 217-219). The same designation might be attested in line 14 of the archaic fish list (ATU 3, p. 94) and in the account W 21864 (ATU 7, forthcoming); the only other administrative attestation of the sign combination KU_{60} NE₆ is found in the grain account W 15897.c21 [above, fig. 37] obv. i 4, there probably not referring to fish).



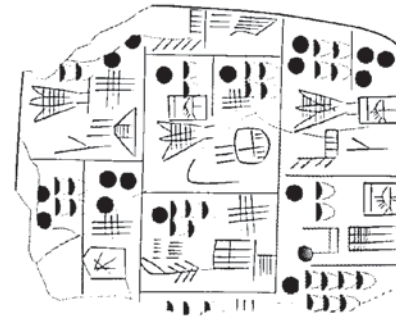
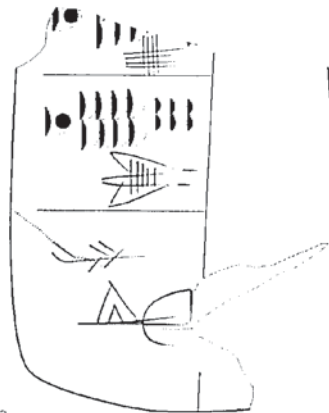
W 21107



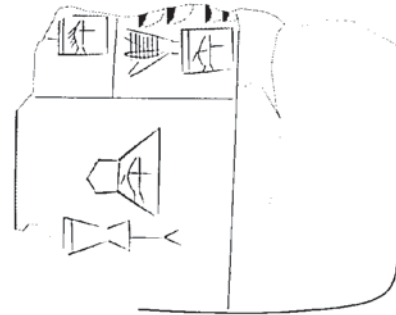
W 20274.110



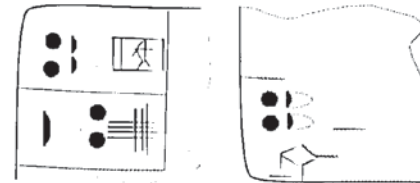
W 20494.3



W 20367.1

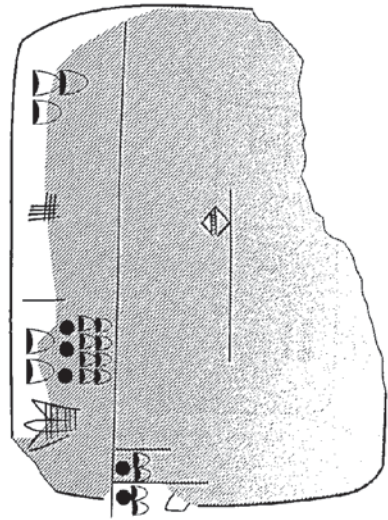
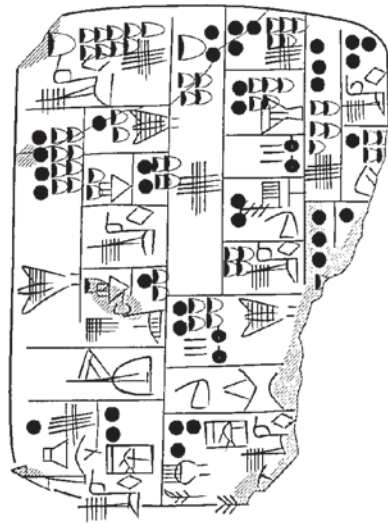


W 20274.5



W 20274.117

Figure 47: Administrative documentation of the archaic fisheries.
The texts shown here and on the following page record the deliveries of archaic fishery offices, consisting of the split and dried fish SUHUR (𒍪), of fresh fish KU₂₀ (𒍪), and of containers of presumably fresh fish GA₂₀+KU₆₀, GA₂₀+U₄ (𒍪), (𒍪), and of products represented by the sign U₂₀ (𒍪), probably reed mats. The relation of 12 SUHUR per DUG_c (a container of dairy fat) documented in the text W 20494.1 on page 138 is unclear.



W 20494,1

The former sign GA₂₀ represents a type of basket, in all likelihood also made of reed³⁰⁴; signs representing fish inscribed in the sign thus indicated, as is generally true of the pattern 'sign within sign', that these baskets contained fish of the quality indicated by the fish sign employed. Nearly all known fish pictograms are found within the sign GA₂₀, including that of the dried fish, SUHUR, but in larger numbers with the signs KU₆₀, GIR₀ and SUKUD. Beyond sign combinations of GA₂₀ and fish pictograms, signs which may have some abstract meaning but which are probably designations of processed fish were inscribed within GA₂₀. These include U₄ ('sun', 'day', 'white'³⁰⁵) and HI (?³⁰⁶) and are found in accounting contexts which secure their identification as fisheries products.³⁰⁷ The meaning of the sign ZATU728, also found exclusively in a context of fishery deliveries but not attested lexically, is unclear, but its referent is likely to have been some kind of container.³⁰⁸

The sign ZATU759, counted sexagesimally, was written with and without an inscribed sign KU₆₀, but always in connection with fish.³⁰⁹ Despite the dangers inherent in purely graphical identifications, it seems difficult to imagine that this sign is not related to the so ZI.ZI.A, the presumed fish traps of the accounts of pre-Sargonic Girsu³¹⁰ which were apparently used to

³⁰⁴ The sign is then also the natural precursor of the baskets represented by the signs pisan (g₀₂) and pisan₀ (GA₂₀+GI) recorded in fisheries accounts of the pre-Sargonic Girsu period, which according to such texts as DP 291 (ii 3-4: 1 pisan₀ 0; 1,0 mun ku₆₀ / 1 pisan₀ 0; 1,0 ku₆₀ GAR.KI) and VS 14, 143 (i 3: 1 pisan₀ 0; 1,0 mun ku₆₀) had a capacity of one Old Sumerian barig (36 sila₃, ca. 54 liters).

³⁰⁵ The sequence SU₀ KU₆₀ U₄ KU₆₀, 2N₅₇+U₄ KU₆₀ in the list witness W 20266,49 (ATU 3, pp. 97-98) places the sign in a clear context of time reckoning. 2N₅₇+U₄ represents 'two years' or 'second year' (above, section 6.2), and SU₀ seems in Jemdet Nasr accounts to represent a time unit less than a year, possibly a month or season.

³⁰⁶ Attested in the fish list l. 94 (ATU 3, 97), in the broken Uruk IV period account W 9656,bo (ATU 5, pl. 94) and the Uruk III period account W 19584,c (unpubl.; according to the Iraq Museum register of April 1986, this text was in the Nasiriya Museum prior to the Kuwait war, but H. Baker, R.J. Matthews and J. N. Postgate, *Last Heritage: Antiquities Stolen from Iraq's Regional Museums*, fascicle 2 [London 1993] p. 150, reported the text stolen from the Basra Museum [reference kindly provided by C. Jones]). The meaning of HI is here not obvious; the sign is also found in the fish list l. 19 (ATU 3, 95; HI KU₆₀) and in l. 40 as a part of the sign HI+SUHUR (ATU 3, p. 96; compare the variant HI+SUHUR of SUHUR in l. 4, p. 94, W 21916,2 obv. i 4), where it seems to represent a fish head, as a part of the sign composition MUD, probably representing a bird's egg, and inscribed within a form of the sign TA (LAL₃, a type of syrup), assuming its later meaning of 'sweet'. Later tradition of fish deliveries would make a better case for an interpretation of the sign as 'egg', since birds' and turtles' eggs (and not fish heads) were delivered from the marshes by fishermen.

³⁰⁷ See in particular the texts W 19584,c, 20274,5 and 20274,50.

³⁰⁸ The notations 2N₃₄ 5N₁₄ ZATU728 in W 17879,e obv. i 1 and 2N₃₄ ZATU728 in W 20274,5 rev. i 2 (a summation of obv. i 2a and 3) prove that the object represented by this sign is, like other fish containers, counted sexagesimally.

³⁰⁹ See, for example, the accounts W 15195 (unpubl.) obv. i 3-4, 20500+20500,b passim (this unpubl. account records in each of eight cases a relationship of 20 ZATU759+KU₆₀ per 1 UR₂+N₅₇; this might suggest that the unidentified latter sign was related to a yearly [ration?; with N₅₇ = 'one year'] of the fish represented by 20 ZATU759+KU₆₀, for which compare the textile account W 24024,1 [BaM 22, 115], in which 20-120 ZATU759 SAG correspond to recorded numbers of apparent textile industry tools) 21005 (unpubl.) obv. i 1 (940 ZATU759+KU₆₀), 21107 (fig. 47 here) and MSVO 4, 11.

³¹⁰ Up to 600 such fish containers were recorded in single accounts (DP 328 i, from the Gu'edina). The fish gu₄, NI, nun, GAM+GAM, and suhur TUR.TUR were delivered in the sa ZI.ZI.a, all by freshwater fishermen.

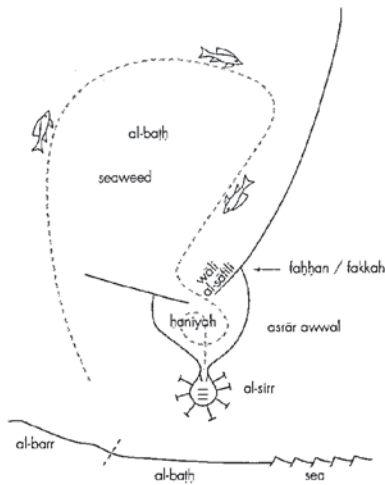


Figure 48: Plan of the lbzür fish-trap. The dotted line indicates the movement of the fish feeding upon the seaweed of the flat sea-bed (al-bath) uncovered at low tide. Wind and receding water slowly drive the fish into the sirr chamber (after R. Serjeant, BSOAS 31 [1968] 492).

transport fresh fish³¹¹ from the waterways and marshlands of Lagash into the city.³¹² Fish delivery accounts suggest that the container like the pisan was of normed capacity.³¹³ It is unlikely to have been a common fishing net – although there is otherwise no indication in the archaic administrative texts of the use of nets in fishing, net sinkers from all archaeological levels suggest they too must have been in use in the archaic period – since the sign ZATU759 also represented a category of containers including the GA₂₀, but was more likely an 'open' basket, which would have been of particular use in the canals.³¹⁴

³¹¹ Such fish were often characterized as a.de₂, 'pouring water', presumably referring to their containers being delivered in temple households.

³¹² The fisheries accounts in many cases include notations recording the delivery of often large numbers of an object represented by the sign U₂₀ (for example, W 19799, 20274, 71, 88, 110, 117, 131, 20367, 1, 20494, 1 and ,3; see fig. 47 here), in later Sumerian tradition referring to [green] plants. Assuming the object was delivered by fishermen and remembering that the texts W 19948, 3, 20274, 71 and 20511, 8 qualify the object with the sign GU₇, 'ration', it would be reasonable to assume the object is an edible plant available to the workers on their fishing expeditions. The fact, however, that GU₇ could also refer to non-edible goods such as textiles (for example, in W 20274, 95 rev. ii 1) leaves open the possibility that U₂₀ represented simply an object which was distributed regularly, for example, reed mats from local tribes in the marshes (compare the u₂ ninni₂ [=asum, a type of reed, also used in making cord] recorded in the Fara period texts TSS 369 i and WF 142 together with the fisheries product si.NU-U).

³¹³ DP 332 ii offers a general idea of their size: 10 sa Zi-Zi.a gu₁ ku₆/ku₆ sa Zi-Zi.a 1.a/se 0; 1,0,1a / 3e.bi 2,2,0, "10 Z-nets of 'oxen' carp, per Z-net of fish, one barig of barley each, the grain involved: 2 gur 2 barig." Assuming a rough value equivalence of grain and fish in the pre-Sargonic period in Girsu, we would have 1 sa Zi-Zi.a = 1 barig (ca. 54 liters).

³¹⁴ The Sumerian 'Home of the Fish' relates a song praising the welcoming qualities to interested fish of such a trap; see M. Civil, Iraq 23 (1961) 154-75, corrected by M.-L. Thomsen, JCS 27 (1975) 197-200, and H.L.J. Vanstiphout, "An Essay on 'The Home of the Fish';" OLA 13 (1982) 311-19 (compare W. Römer, Einführung in die Sumerologie [Nijmegen 1982] 104, and id., Die Sumerologie [...], AOAT 238 [Neukirchen-Vluyn 1994] 174). The fisherman will have attached his trap to a canal lock, catching fish in the

It seems given the value of metals unlikely that spears were ever more important in fishing than simple nets and traps (figure 48),³¹⁵ the existence of which, though they themselves decay and so are seldom found in excavations, is proven by numerous finds of sinkers (also serving as anchors for traps).³¹⁶

The designation for fishermen, later Sumerian ŠU+KU₆ (literally 'hand-fish'), is not obvious in the archaic texts. The meaning of the sign combinations GAL SUHUR and SANGA SUHUR in the professions list, which should contain the designation of fishermen, remains a matter of speculation.³¹⁷ We may assume that the sign GAL ('large') represented in professional names a foreman of some kind and so the GAL SUHUR might correspond to the ugula šuku₆ of Sumerian tradition.³¹⁸ The sign SANGA might represent a counting board and so the title

water flowing through (see Nik 1 277 iii 3-4: 9 sa Zi-Zi.a ti(?) ku₆ / NAG.KA [in parallel texts always ku₆] NI.U₆.ka.kam, "9 Z-nets of arrow? fish, from the reservoir ... (?)" [G.J. Selz, ASJ 16, 1994, 225: NAG.ka.no₂.ka.kam, unclear; M.A. Powell, ASJ 3, 1981, 144, citing A.P. Riffin, Publications de la Société Egyptologique à l'Université d'État de Leningrad 1, 1929, 16: nag-düg-ià-ud'-ka-kam]). The fishing methods of the Iraqi marsh dwellers were comparable (S. Westphal-Hellbusch and H. Westphal, Die Ma'dan [...], Forschungen zur Ethnologie und Sozialpsychologie 4, [Berlin 1962] 84):

1. Two fences are erected at right angles to one another in the water. At the open corner, they fasten a net, in which the fish are caught which are swimming along the weir. It is said that they thereby cause a bell to ring. A man waiting next to the net in a boat takes the fish out of the net.
2. You close off a river or a part of a lake with a fence, leaving an opening to one side. The fisherman stands at this opening on a raised platform of reed and mud and spears the fish swimming through it.
3. A fence completely closes off a river or a part of a lake. The fish swimming within the enclosure are caught with bare hands.

Professional fishermen of the Ma'dan formed a particular caste called 'Barbara' and were despised by the other tribes. According to F. Bartz, Die großen Fischereiräume der Erde [...] II (Wiesbaden 1965) 19-26, they used no spears, but only nets.

³¹⁵ Against M. Roof, Paléorient 2 (1974) 501, who suspects that the late Ubaid use in Bahrain of traps and nets to catch big fish was supplanted in the Uruk period by fishing with spear and hook. Compare R.B. Serjeant, "Fisher-Folk and Fish-Traps in al-Bahrain," BSOAS 31 (1968) 486-514: "The long shallow shore waters of the Persian-Arabian Gulf, with sandy beaches extending distances of a mile or two under the sea before meeting deeper water, are specially suited for the catching of fish in permanent traps (hadrah), or tidal weirs as they have been described, such as may be seen all the way from Iraq along the Arabian coast. At high tide these traps are largely submerged, but as the water recedes the fish are left stranded within their fences (p. 489)." Fig. 48 shows the author's schematic drawing of this device.

³¹⁶ A. Salonen, Fischerei pl. XI, 11-12; P. Delougaz, OIP 53 (Chicago 1940) 55-56 with figs. 53-55; R.McC. Adams and H.J. Nissen, The Uruk Countryside [...] (Chicago 1972) 213; F. Safar, Sumer 6 (1950) 29-30 (late Ubaid); J. Jordan, UYB 3 (Berlin 1932) 31 and pl. 20d (Ubaid, together with many herring remains); V. Christian, Altertumskunde des Zweistromlandes [...] I (Leipzig 1940) 120, 158, 205-6, 225. Remains of bindings which will have been fastened to nets and traps were found attached to some of these sinkers.

³¹⁷ See above, section 5, and ATU 3, 71 to lu₂, A 71-72 (for the Early Dynastic version, see E. Arcari, La lista di professione 'Early Dynastic IUA' [...], 23).

³¹⁸ The sign combination GAL₁ SUHUR is attested in but few administrative documents. In the Uruk IV period text W 9578,m (ATU 5, pl. 60) the combination occurs obv. ii 2 in a context suggestive of an inventory of personnel, there following an entry including the combination GESTU₆ SUHUR. GESTU₆ is itself attested in the list of officials, line 13 (s. ATU 3, p. 20; ED correspondence ama.(ar,ime), and in the lu₂ A forerunner W 9656, h1 together with the signs UKKIN₆, GA₆ and KISAL₆, in all cases indicating that the former sign like GAL₁ represented a hierarchical designation in professional names. GAL₆ GA₆ also known from the list lu₂ A (l. 20), is, in fact, also attested in the account W 9578,m obv. iii 2. GAL₁ SUHUR is further attested in the accounts W 21086 (unpubl.) obv. i 2, W 22118,5 (ATU 7, forthcoming) obv. i 1 (and W 24008, 12 [BaM 22, 89] obv. ii 2 ?) in unclear context.

SANGA SUHUR an administrator or bookkeeper of the fisheries.³¹⁹ Other designations of persons or institutions found in administrative documents dealing primarily with fish apparently include only those referring to receiving agents; indeed, the one account which lists probable fish traps and transportation containers, W 19408,40 (unpublished), has no apparent personal designations.

Judging from later tradition as well as from osteo-archaeological remains, the fishermen will have exploited both the inland waters of southern Babylonia, and the rich marine resources of the near Persian Gulf (Sumerian a.ab.ba),³²⁰ returning to their administrative units with their catch including fish, mollusks,³²¹ birds³²², wild pigs³²³ and, probably, turtles³²⁴. We

³¹⁹ Only attested in the accounts W 9656, ep (ATU 5, pl. 103; unclear whether SANGA₉ forms a sign combination with SUHUR) and MSVO 4, 10 obv. i 1, in the latter text immediately preceding an entry including the possible 'fish title collector' ZA₃ (later Sumerian e nku, s. M.W. Green, JCS 36 [1984] 93-95) SUHUR. Both attestations include sexagesimal notations which would at least not exclude the counting of SUHUR.

³²⁰ Finds of both bones of saltwater fish and of shells of gulf crustaceans make clear that the fishing grounds were not limited to inland waters (to be noted to H. Waetzoldt, "Zu den Strandverschiebungen am Persischen Golf und den Bezeichnungen der Hörs," in: J. Schäfer, W. Simon [eds.], *Strandverschiebungen in ihrer Bedeutung für Geowissenschaften und Archäologie*, Ruperto Carola Sonderheft 1981, Heidelberg, 159-81).

³²¹ See for example K. Mudar, JNES 41 (1982) 33-34 (excavations of al-Hibba, 121 shells of molluscs, 104 of them from salt water varieties); J.G. Evans, "The exploitation of molluscs," in: P.J. Ucko and G.W. Dimbleby, *The domestication and exploitation of plants and animals* (London 1969) 479-484.; M. Tosi, *Catalogue to the exhibition of the Museo Nazionale d'arte orientale*, 14.5-19.7.1981: "Conchiglie, il commercio e la lavorazione delle conchiglie marine nel medio oriente dal IV al II millennio a.C.," with shells from Girsu, Mari, and Susa, among other sites; P. Delougaz, OIP 53 (1940) 54, 96 (Khalofe); F. Safar, *Sumer* 6 (1950) 29: "Great quantities of the shells of freshwater molluscs were found on the floor" [of the 5/H building; Eridu].

³²² The account W 21005 stands with its entries including ZATU759+KU_{ep}, SUKUD+SU_{ep}, and NAM_c, at the beginning of a long documented tradition of the delivery and distribution of fish together with birds, both deriving from the same fishing grounds. Similar archaic fish/bird accounts are found in the texts MSVO 4, 11, and UET 2, 19 (photo pl. B); see the late Old Akkadian text G. Cros, NPT 184 for the delivery of fish by bird-trappers.

³²³ W 12015 (ATU 6, forthcoming) and 20572,2 (unpubl.) conclude with entries of SUHUR and ŠUBUR ('pig') and so recall the pre-Sargonic Girsu account J. Marzahn, VS 25, 42, which contains, following a notation representing 60 turtles, an entry recording delivery by a fisherman of 2 boars (ša_h, š_hgi), probably deriving from the marsh (see, for archaic depictions of probable fishermen hunting wild pigs, above, fig. 10, and below, fig. 62; further for Ur III references Ur III-Fischerei, 176-177, 502).

³²⁴ Although not explicitly identifiable in the archaic texts, later textual references and physical remains from excavations indicate that turtles were at all times brought in by fishermen (compare K.T. Khalof, *Reptiles of Iraq* [...] [Baghdad 1959] 83-86). Third millennium Sumerian and Akkadian account entries of the turtles called ba-a-qualification, ba.a.l.gi and ni.g₂.bu.n₂.na (see Ur III-Fischerei, 222-224 and the literature cited there) will have referred to the following osteo-archaeologically identified animals:

- 1) Euphrates soft-shell turtle, *Trionyx euphraticus*, see R.W. Redding, in: H.T. Wright (ed.), *An Early Town on the Deh Luran Plain* [...], *Memoirs of the Museum of Anthropology, University of Michigan* no. 13 (Ann Arbor 1981) 236 (Uruk III period, but possibly later entries); J. Boessneck, in: McG. Gibson et al., *Excavations at Nippur: Twelfth Season*, OIC 23 (Chicago 1978) 162 (Old Babylonian: "the meat from these large river turtles is considered tasty"); id., in: B. Hrouda, *Isin-Isan Bahriyat I* [...] (Munich 1977) 127 (Old Babylonian); id. and M. Kokabi, in: B. Hrouda, *Isin-Isan Bahriyat II* [...] (Munich 1981) 149 (neo-Babylonian, as a burial good?).
- 2) Caspian water turtle, *Clemmys caspica*, see J. Boessneck, in: McG. Gibson et al., OIC 23, 162 (Old Babylonian Nippur; "today common in the canals surrounding Nippur"); F. Hole et al. (eds.), *Prehistory and Human Ecology of the Deh Luran Plain* [...], *Memoirs of the Museum of Anthropology, University*

have very limited information about the types of boats they used.³²⁵

6.3.2. Domesticated animals and animal products

It is likely that from the archaic period throughout the third millennium two sectors always enjoyed a dominant position in Babylonian household economies. Clearly the most important resource available to the archaic state was the agricultural land surrounding growing cities, from which sufficient grain was harvested to supply the basis for urban development. The second most important resource was that of domestic animals, and above all of the small cattle sheep and goats, followed by large cattle and pigs.³²⁶

Sheep and goats [UDU]³²⁷

Large numbers of medium-sized herds of sheep and goats were exploited for their wool and hair, for their dairy products,³²⁸ and for their meat.³²⁹ We may assume that according to traditional practice, the herds moved seasonally between the summer pasture lands located in the Zagros mountains and winter pasture lands, but above all the administrative control, and shearing centers, of the Mesopotamian alluvium. The demand for textiles from non-

of Michigan no. 1 (Ann Arbor 1969) 325 [ca. 7000-6000 B.C.]; J. Boessneck, in: B. Hrouda, *Isin-Isan Bahriyat I* [...], 127 (Old Babylonian).

3) Tortoise, *Testuda graeca iberica*, see J. Boessneck and M. Kokabi, op. cit. 149-150, shell from an Achaemenid grave, with symmetrically drilled holes suggesting its use as lute [compare Latin *testudo* = turtle and lute], probably imported from the north (according to Boessneck; see however R.J. Braidwood, SAOC 31 [1960] 48, Jarmo ca. 6750+250 B.C., and 59, Paleogawra ca. 10.000 B.C.; further P.F. Turnbull and C.A. Reed, *Fieldiana Anthropology* 63/3 [1974] 81-146, fauna from Paleogawra).

4) Caspian terrapine, *Mauromys caspica*, see R.W. Redding, op. cit., 236 (s. fig. 64, p. 237); J. Boessneck and M. Kokabi, op. cit. 149 (Kassite).

The very spotty recovery of the remains of small animals may explain the missing evidence for salt water turtles, of which over 4000 bones were unearthed in excavations at Umm an-Nar (third millennium, see E. Hoch, "Reflections on Prehistoric Life at Umm an-Nar [...]", in: M. Taddei [ed.], *South Asian Archaeology 1977*, vol. 1 [Naples 1979] 601-606). All but of the pre-Sargonic Girsu fishery accounts were apparently delivered by the gulf fishermen šuku, ab.ba.

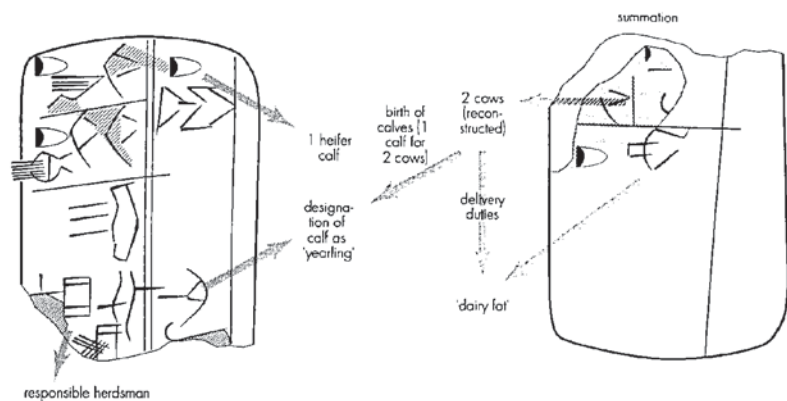
³²⁵ See A. Salonen, *Fischerei* 71-72 and pls. 5-8, 12; id., *Die Wasserfahrzeuge in Babylonien* [...], *StOr* 8/4 (Helsinki 1939); id., *Nautica Babyloniaca* [...], *StOr* 11/1 (Helsinki 1942); M.-C. de Graeve, *The Ships of the Ancient Near East* (c. 2000-500 B.C.), *OIA* 7 (Leuven 1981); C. Qualls, *Early shipping in Mesopotamia* [Columbia dissertation, New York 1981]. Compare the pre-Sargonic fishing boat logs DP 334 and DP 344-6.

³²⁶ No texts are known from the archaic corpus which document the breeding and exploitation of equids; the signs which presumably represented these animals, ANŠE and possibly KIS, are found only in isolated context of possible inventories.

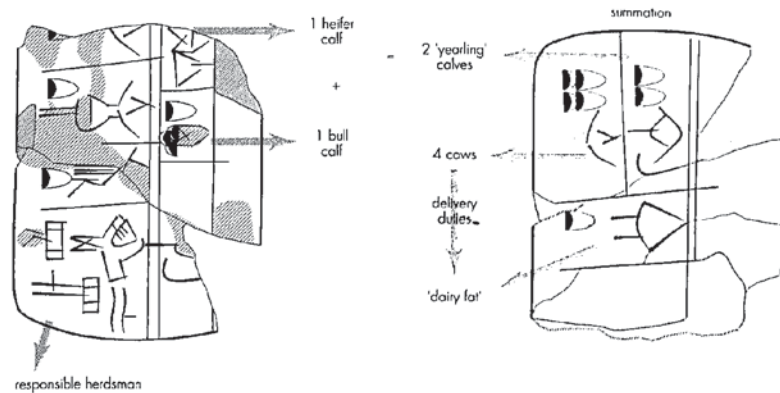
³²⁷ The organization and administration of small cattle in the archaic period was first adequately treated by M.W. Green, JNES 39 (1980) 1-35; cf. *Archaic Bookkeeping*, pp. 89-93.

³²⁸ The primary dairy products butter oil and cheese are dealt with separately below.

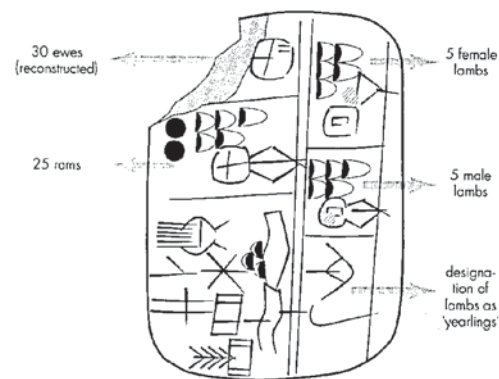
³²⁹ Animals represented by the sign UDU formed a standard entry of lists of possibly sacrificial offerings in accounts for the archaic period, best documented in the texts from Jemdet Nasr dealt with by the author in J. Hayerup and P. Damerow (eds.), *Changing Views on Ancient Near Eastern Mathematics* (Berlin, forthcoming). Note also lines 67-68 of the lexical list *Metul* (see above, section 5, and ATU 3, pp. 139-140) with the entries GIR₂, UDU₉, and AN GIR₂, UDU₉, both representing a 'sheep and goat knife' used in butchering and flaying the animals. Corresponding entries follow, recording butcher's knives for large cattle, and gutting and filleting knives for fish (ll. 69-72).



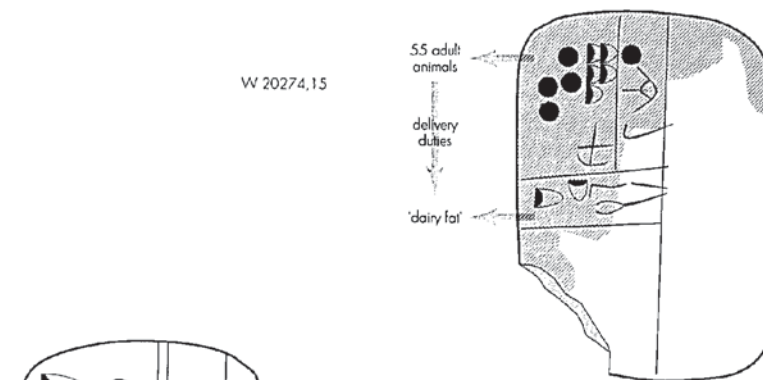
W 20274,12



W 20274,63



W 20274,15



W 20274,55

Figure 49: Uruk III accounts of herds of milk cows and sheep. The two texts above contain accounts of small herds of cows (3-6 animals), and a notation representing delivery duties of dairy fat calculated according to the number of milk-producing cows in the herd, were inscribed on the reverse face of the accounts. Two comparable accounts of herds of sheep are found on page 145. Note that in both cases the responsible shepherds were to deliver one KISIM₆ of dairy fat per twenty ewes ($\text{𒀭} = '1'$, $\text{𒀭} = '1/2'$).

agricultural populations in cities was almost exclusively met by textiles woven from wool, to a lesser extent from goat hair. Wool also constituted the most heavily traded commodity in the commercial exchange with the periphery of Mesopotamia. Dairy products too may have entered this interregional trade market.³³⁰

Although we have no recourse to a lexical compendium listing the signs representing small cattle,³³¹ the administrative texts are sufficiently informative and consistent in their terminology to allow us to construct a typology of signs which differentiates between age, sex, and possibly also race of the sheep and goats they represent. A group of some 30 Uruk III period accounts, all from Uruk, are the main sources for the identifications made in figure 51 below.³³² Nearly all of these texts represent inventory accounts drawn up once each year to assess the size of the herds, the number of offspring, and the amount of presumable butter oil³³³ the herders were expected to deliver as a norm based on the number of ewes or nanny goats in their herds.

For instance, the two texts W 20274,15 and 55, displayed in figure 49, offer a very representative view of the herd sizes and text formats involved. Both of the accounts consist of individual entries inscribed over two columns of the obverse face, and summations of those entries in the left column of the reverse. The first column of the obverse of each contains notations recording the numbers of ewes and rams belonging to each flock. In the following, third case, the responsible shepherd is named. It seems likely that the sign combination $\text{ŠE}_6 + \text{NAM}_2$ at the bottom of this case is a professional name designating a 'feeder' (?). In the second column the lambs were separately registered according to their sex. The qualification of both male and female lambs with the notation $1\text{N}_{57} + \text{U}_4 \text{BAR} (\rightarrow \leftarrow)$, literally 'one year, outside',³³⁴ indicates that the animals were born and survived into viability during the accounting year.³³⁵ It is thus likely that these accounts were made at the time of year when the herds were driven down to winter pasture in Babylonia, and so unconnected with the shearing season.

³³⁰ See the discussion below of possible trade in dairy oil into Syria and down the Persian gulf.

³³¹ The lexical list denoted 'Tribute' does include several entries dealing with sheep and goats (see above, section 5, and ATU 3, pp. 25-28 and 113-117). Aside from the isolated entry 1. 9 [//37] with the notation $1\text{N}_{14} \text{GUKKAL}_6$ (possibly '10 fat-tailed sheep'), ll. 22-25 record in a four line sequence the two couplets '10 ewes / 1 ram' and '10 nannies / 1 billy goat'. Although the meaning of this lexical list is unclear, the ratio of 10:1 is suggestive of the service ratio for beginning herds of small cattle.

³³² Most were discussed in M.W. Green, JNES 39 (1980) 1-35.

³³³ I have attempted to gather the pertinent textual material from the third millennium bearing on the question of the products being delivered by herders to state agents in three articles: 'Archaic Dairy Metrology,' Iraq 53 (1991) 101-4, 'Late Uruk Period Cattle and Dairy Products: Evidence from Proto-Cuneiform Sources,' BSA 8 (1995) 33-48, and 'Regulating Dairy Productivity in the Ur III Period,' ONS 64 (1995) 377-429.

³³⁴ See above, section 6.2, for a detailed discussion of time notations in archaic texts. $1\text{N}_{57} + \text{U}_4$ represented an administrative 360-day year. BAR might instead refer to those juveniles weaned from their mothers or culled from the herd and given over to the official $\text{ŠE}_6 + \text{NAM}_2$. See the following note.

³³⁵ We learn in these texts that the number of lambs recorded in the accounting year corresponded to approximately one third of the ewes. Since the accounts represent herd inventories with normed delivery expectations of butter oil (see below), it is impossible to say what precisely this relationship means. It seems most likely that the lambs registered are those which had to be delivered to the herds' owners (either physically delivered to the owners, or simply added to the accounts and thus becoming, on paper, adult members of the flocks in the following year, for which the herders continued to bear all responsibility).

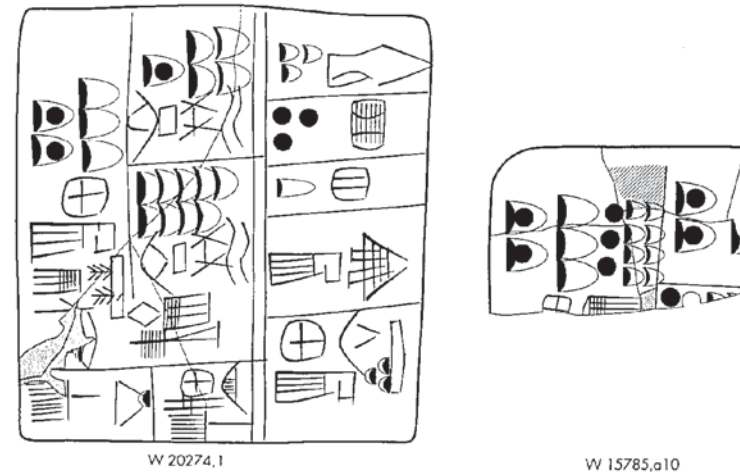


Figure 50: Accounts of large sheep herds

W 20274,1 might represent the accounting of two large herds of sheep, together totaling 1380 animals (note the inclusion in the second column of signs representing dairy fat and wool). The poorly preserved account W 15785,a10 records in a reverse corner a notation representing 1418, and thus the largest number of sheep known from the archaic texts.

The reverse of the texts contains summations of both adult and juvenile animals followed by an entry which records an apparent amount of a dairy product. We have, based on later tradition in Babylonia, interpreted the pictographic sign KISIM_6 ($\leftarrow \rightarrow$), a clay vessel, to represent a standard amount of butter oil which that vessel held.

The less well preserved second text contains an entirely parallel account of a herd of sheep. Note that in both texts and in a number of others the vessels KISIM_6 stood in an even relationship to the ewes respectively recorded, namely, in a relationship of one KISIM_6 to 20 ewes. These 'nice numbers' are as a rule always to be understood as an indication of administrative norms and not as records of real deliveries. In this case, $1/20 \text{KISIM}_6$ would then represent the amount of butter oil, derived from sheep milk, which the herders in these two accounts were expected to deliver to the real owners of the sheep, reckoned per year and bearing ewe.³³⁶

In a precisely parallel fashion, the accounts of goatherds record numbers of nannies and male goats together with yearlings on their obverse, summaries on their reverse faces, the

³³⁶ To be noted to M. Stol, BSA 7 (1993) 100, and RIA 8/3-4 (1994) 194. Butter oil from ewes was not recorded in accounts from the later third millennium; $13.nun$ (pre-Sargonic Girsu and Old Akkadian) and $13.nun(HA)$ (Ur III) represented that of goats. Archaic shepherds recorded in the text considered here were required to deliver the capacity equivalence in milk fat of one of the oil vessels represented by the sign KISIM_6 per 15 (JNES 39, 21, no. 3, W 20274,74), 20 (JNES 39, 22, no. 6, 21, no. 4, 23, no. 7, 20, no. 1, 22, no. 5 and 24, no. 9 [W 20274,3, 15, 38, 55, 60, and 61, respectively; see fig. 49 to W 20274,15 and 55]) or 30 (JNES 39, 20, no. 2, W 20274,85) ewes.

LARGE CATTLE: COWS AND BULLS	Sex		Females	Males
	Age			
AB ₂ GU ₄	Adults		AB ₂ 	GU ₄
		Juveniles	SAL AMAR 	KUR ₃ AMAR

Figure 51: Archaic signs for large and small cattle and for pigs. The figure above provides an overview of the signs found in lexical and administrative texts representing large cattle (a series of signs in the same case presents paleographical development, with Uruk IV period signs to the left, Uruk III period signs to the right). Juveniles were differentiated according to sex with the signs SAL (▷) and KUR₃ (◁), originally designations of female and male laborers. On page 149 is a table with corresponding signs for the small cattle sheep and goats, and for pigs.

only difference being the use of the sign KISIM₆ to qualify the container of apparent dairy fat to be delivered to central offices by the herders.³³⁷ This 'gunified' form of KISIM₆ presumably serves to differentiate the two types of oil, but may also reflect some physical characteristic of the jars used, such as incisions or coloring strokes on their outer surface.

Summarizing accounts covering a certain accounting period are particularly informative concerning the general features of economic organization in the archaic period. Unfortunately, such texts are extremely rare. Two tablets from Uruk (W 15785, a10 and W 20274, 1, figure 50) nevertheless provide a good glimpse of the scale of the flocks controlled by the state. These accounts record a total of 1,418 and 1,380 sheep, respectively.

The signs which in these accounts represented sheep and goats had no apparent pictographic, but rather an abstract character (figure 51). They have certain common features: the cross, the circle and the lozenge barred by a diagonal line (as a qualification of male animals). Again, young animals are specified by adding certain qualifying strokes or complete signs to the basic signs representing the species referred to. Because of their abstract form, D. Schmandt-Besserat has understood the signs to be two-dimensional representations of three dimensional complex tokens (see above, section 3), that is, of small clay objects inscribed with the design – a cross with possibly further qualifying dots and strokes – that in

³³⁷ The delivery norms for nanny goats may have been five to ten times as much as that of ewes – between 3 and 3 2/3 goats per vessel KISIM₆, recorded in the texts W 17879, ad, 20274, 41, 65 and 148 (JNES 39, 28-29, nos. 22-25). For comparison, goatherds in the U: III period were expected to deliver between 1/3 and 1/2 sila₃ (liter) of butter oil per nanny goat (see R.K. Englund, OrNS 64 [1995] 398-399⁴⁵).

SMALL CATTLE: SHEEP AND GOATS	Sex		Females	Males
	Age			
Wool Sheep	Adults		U ₈ 	UDUNITA
		Juveniles	SIL ₄ 	KIR ₁₁
Fat-tailed Sheep (?)	Adults		GIKKAL 	
		Juveniles	ESGAR 	MAŠ ₂
Goats	Adults		UD ₅ 	MAŠ ₂
		Juveniles	ESGAR 	MAŠ
PIGS	Adults		SUBUR 	ŠAH ₂
		Juveniles		

the corresponding proto-cuneiform sign was incised within a drawn circle, itself representing the small clay ball. This is one of the many appealing theses in her published work; it might further be considered that one of the Uruk IV period variants of the sign UDU ('UDU₆'³³⁸) was made by first impressing the butt end of a large numerical stylus or possibly cylinder seal into the surface of the tablet, upon which the conventional cross of the sign was inscribed. A numerical stylus impression would itself be the proto-cuneiform correspondence of a large token used in a numerical system. P. Damerow and I have, moreover, discussed elsewhere³³⁹ the probability that a cross in the proto-Elamite texts, formed with two oblique impressions of the 'large number' stylus (𐎠), corresponded entirely to the UDU₆ sign in proto-cuneiform accounts. This would suggest that at the time of withdrawal of Babylonian influence from Persia at the end of Uruk IVb (?), this sign belonged to a common repertory, including most of the numerical signs, used by accountants from both regions. It would thus not be surprising to find within one or more of the many unopened late Uruk clay envelopes examples of the complex token Schmandt-Besserat has posited to refer to sheep, assuming this information was not made sufficiently clear simply by the office the envelopes were kept in.

Textiles

Art-historical analysis of excavated finds from the ancient Near East has played the leading role in discussions of the production and design of textiles: descriptive publications of costumes rendered on statues, seals and reliefs meant to allow above all the chronological sequencing and esthetic judgment of particular works of art.³⁴⁰ The wealth of information not only about the costumes worn by elites, renderings of which may be expected in the type of heroizing art produced for the ruling class active in palace and temples, but also about simple garments of non-elites, for instance soldiers depicted on Old Sumerian and Old Akkadian steles, aids in our understanding of the types of clothing available and sought in ancient Mesopotamia, given the fact that with but very few exceptions no other physical trace of ancient textiles has survived the millennia since they were worn.³⁴¹ For the historian of the third millennium, however, the value of textiles lies less in their constitution than in their exploitation by complex administrations.

³³⁸ In the Uruk IV period text W 20820, 1 (unpubl.). Note that the 'circle' of the sign TUG₂ was inscribed in the same fashion in the text.

³³⁹ Tepe Yahya, 53-54.

³⁴⁰ See, for instance, W. Reimpell, *Geschichte der babylonischen und assyrischen Kleidung* (Berlin 1921); M. Tilke, *Studien zur Entwicklungsgeschichte des orientalischen Kostüms* (Berlin 1923); E. Strommenger, 'Mesopotamische Gewandtypen von der Frühsumerischen bis zur Larsa-Zeit,' *Acta Praehistorica et Archaeologica* 2 (1971) 37-55; id., 'Kleidung. B. Archäologisch,' *RIA* 6 (1980-83) 31-38.

³⁴¹ Graves may be expected to offer the greatest opportunities for the retrieval of textiles, and there are scattered reports of the finds of some remains. The extraordinary difficulty in recovering such remains, both in terms of necessary technical expertise and of the high investment of time and resources, tends to hamper, if justifiably or not, the interest of archaeologists in pursuing such work. Occasional impressions of fabrics on preserved artifacts do give us an idea of the type of weave used in textile production. For instance, the weave pattern of a piece of cloth apparently used to wrap and possibly keep moist an archaic tablet from Uruk is clearly visible on the tablet's surface. The pattern on the text W 15776, s (unpubl.) exhibits a weave using coarse wool, presumably that used to produce the simple garments distributed to state dependents and traded outside of Mesopotamia.

The nature of this exploitation must be deduced from administrative records, of which the greatest numbers derive from the Ur III period. The textile industry centered in the capital city of the Ur III state was intensively organized and run at a grand scale, requiring the labor of some thousands of workers to produce the small numbers of the extraordinarily labor-intensive costumes worn by the king and other elites and the great numbers of garments needed to clothe thousands of dependent laborers in the province of Ur, and to supply state controlled trade agents with large supplies destined for internal and external exchange, through which luxury goods could be secured for the ruling family and for state agencies.³⁴² All third millennium texts dealing with domestic production distinguish between the raw material wool (Sumerian *siki*) and finished products (*tug₂*). While both articles were distributed as rations according to unclear rules of disbursement, complex accounts prove that state controlled exchange mechanisms dealt primarily in wool.³⁴³

The practical necessities of provisioning a growing urban population, and the easy transportability of wool, suggest that the same general importance will have attached to wool products in archaic Mesopotamia, that is, wool and textile production were at all times after grain production the second most important productive sector of the Babylonian economy. In judging the nature of this sector of the archaic economy and the textual evidence available to us, it is important to note, first, that textile and wool production is unmistakably meshed with domestic sheep herding, and, of much lesser importance, with the production of flax. There must in fact have been a direct relationship between the size of the population and the number of sheep needed to keep it clothed, since an average wool-producing sheep was expected to produce 2 manā (ca. 1 kg),³⁴⁴ and dependent workers required from 2-4 manā (1-2 kg) of wool per year. Second, signs and sign combinations representing objects in textile accounts often function as ideograms and as implicit designation of measures. A garment '*tug₂*' signifies in administrative context a bolt of cloth with understood measurements. Qualifications of such garments will doubtless have also had metrological significance, for instance, the closeness of mesh and subsequent weight will have been known to administrators

³⁴² See Th. Jacobsen, 'On the Textile Industry at Ur under Ibbi-Sin,' *Studia Orientalia Ioanni Pedersen* [...] *dicata* (Copenhagen 1953) 172-187; H. Waetzoldt, *Untersuchungen zur neusumerischen Textilindustrie* (Rome 1972); id., 'Kleidung. A. Philologisch,' *RIA* 6 (1980-83) 18-31. The account UET 3, 1505, for instance, documents a yearly wool production of at least 19,275 gu₂ (ca. 630 tons). This amount of wool would be sufficient to clothe more than 300,000 workers at the standard rate of 3-4 pounds per worker. Since, however, the population of the province of Ur at this time must have been substantially smaller (H. Wright in R. McC. Adams, *Heartland of Cities* [...] [Chicago 1981] 330, estimated the total to be no more than 21,400) the majority of this wool must have gone into exchange channels, and precisely this assumption is proven in numerous accounts from Ur and other provinces of the period which document large transfers of textiles both into foreign markets and into the so-called *bala* system of internal exchange within the Ur III state.

³⁴³ Only the simple cloths *tug₂ guz.za.gin* and *tug₂ (sag) us.bar* were also dealt into the exchange markets; cf. H. Waetzoldt, *UNT*, pp. 71-72. Wool was likely the product of greatest value that left state agencies through the offices of the exchange agents *dam.gar₃*, as is demonstrated by an analysis of consolidated *dam.gar₃* accounts.

³⁴⁴ See F.R. Kraus, *Stallische Viehhaltung im altbabylonischen Lande Larsa* (Amsterdam 1966); K. Butz, 'Zur Terminologie der Viehwirtschaft in den Texten aus Ebla,' in: L. Cagni (ed.), *La lingua di Ebla* (Naples 1981) 321-353.

charged with controlling the value both in raw materials and labor of textiles leaving and entering their agencies.

A major difficulty in assessing the organization of textile production in the archaic period is the fact that there is no obvious bookkeeping chain between the sheep herds, the wool shearing, and the production of wool from fleece, of garment from wool.³⁴⁵ Further, we are faced with unpleasant difficulties in identifying the various types of wool and garments recorded in the accounts with a variety of signs and sign combinations, many of which have at least formal graphic correspondences in later Sumerian periods. However, even these correspondences may be fortuitous, given the fact that the archaic texts do not show a clear link between producers – the herds and herders on the one hand, the spinners and weavers on the other – and consumers.

Of course the archaic lexical list of vessels and textiles³⁴⁶ clearly documents a continuation in the understanding of these and related signs throughout the third millennium, since this list was written in literate centers of Mesopotamia not only outside of Uruk during the archaic period,³⁴⁷ but also in Fara and Abu Salabikh³⁴⁸ in the Fara period. The section of this list (above, figure 29) containing references to textiles begins with entries consisting of two undeciphered signs with and without the sign EN_o, 'chief administrator'. The correspondence between the unclear signs ZATU662 and ZATU662+N₁₄ in the archaic period and LAGAB_{gunū} (šiki_x) and LAK30, respectively, in the Fara period is unfortunately of little help in identifying the referents of the archaic signs, since their later counterparts are undeciphered, and did not exist following the Fara period. The next two entries contain the combinations EN_o SIG_{2b} and EN_o TUG_{2a}, respectively, and might be translated 'wool/textile (fit for the) EN'.³⁴⁹

³⁴⁵ The only documented relationship of product to sheep is that of lambs and dairy fat to ewes found in the herding texts discussed above. However, the account W 20274, 1 (fig. 50) seems to imply a connection. Whereas the first column of the text contains a possible inventory of state-owned sheep, the second column contains a standard series of 'sheep products' 3N₁ KISIM_o / 3N₁₄ DARA_{4c1} / N₁ TUG_{2a} '3 KISIM_o [-containers of sheep's butter oil], 30 [units of] wool, 1 garment,' which were accounted for by the SANGA_o GA_o and SANGA_o UDU_o AB₂ ŠURUPPAK_o, 'chief accountant(?) of milk [products]' and 'chief accountant(?) of large and small cattle from Šuruppak'.

³⁴⁶ See above, section 5.

³⁴⁷ The large tablet fragment MSVO 1, 242 (see ATU 3, 66, with pls. 67 and X), was unearthed during the 1928 excavations of L.Ch. Watelin in the northern site of Jemdet Nasr. It certainly contained the entire text, of which only the first half is preserved. The thickness of the fragment at its break suggests that the original tablet was more than two times as large as the preserved section.

³⁴⁸ SF 64 and OIP 99, 4, 7, 8-9, respectively.

³⁴⁹ Whether we are justified in characterizing the qualifying ideograms as 'adjectives' or rather as relative substantives (in genetical relationship to the listed objects) cannot be determined. In the case of the sign combination EN_o TUG_{2a}, it seems apparent that EN_o cannot represent a personal designation, since the sign accompanies the object designation TUG_{2a} in individual cases of texts, persons standing in some relationship to which are recorded later in the accounts in cases containing no numerical signs. This suggests that EN_o TUG_{2a} in such cases is to be understood as 'textile (fit for the) EN'. The sequence of these signs is, by the way, static in the available witnesses and might indicate a spoken nominal chain of qualifier – qualified, which would be incompatible to the Sumerian/Akkadian norm. Comparable sign sequences are listed in the following note.

The rest of this section of the vessels list consists of entirely formalized double entries: 'qualifier' TUG_{2a} / 'qualifier' TUG_{2a}gunū. Neither this list nor attestations of these signs in administrative documents offer sufficient context to allow a judgment of the difference in meaning the two garment categories TUG_{2a} and TUG_{2a}gunū imply. The qualifications of the categories include signs representing colors,³⁵⁰ apparent designations of the type of weave used in cloth production,³⁵¹ and signs of unclear meaning.

Preserved summations of several administrative accounts³⁵² prove that the signs SIG_{2b}, TUG_{2a}, DARA_{4c}, ŠU₂, GADA_o and TUG_{2a}+BAD+BAD qualify objects of a single semantic category, since totals of numbers of the objects represented by these signs were expressed as a grand total qualified by some or all of the signs.³⁵³ The collective designations of these objects allow both the construction of semantic categories and the isolation of qualifying signs such as those used to designate colors.

Textile products were counted using the sexagesimal numerical system and so were considered discrete units comparable to humans and animals, to pots and baskets, and to products of wood and metal.³⁵⁴ Whether in fact a textile-specific metrology is implicit in signs representing textile products is for the time being unclear. It is, however, difficult to imagine that for instance sexagesimally counted units of wool would not have had metrological meaning to accountants of a bureaucracy otherwise so exacting in its recording of the movement of goods. Moreover, the clear evidence of metrological significance in the ideograms representing beer and other grain products, dairy oils, and probably those representing fish baskets,³⁵⁵ proves that sexagesimally counted discrete units were in fact further divided into smaller units.

³⁵⁰ The standard sequence of colors white (U₄), black (GI₄), yellow (GI) and red (NE_o) is well attested both lexically and in administrative context. For instance, the sections of the list 'Cattle' begins with the sequence E_{2a} NE_o U₄ GI₄ + cow/bull/calf (ll. 1-4, 27-30, 53-56, ATU 3, 89-92), the 'Piglist' ll. 37-38 has GI₄/U₄ SUBUR (ATU 3, 102, and below, fig. 63), and 'Wood' ll. 27-28 has GI₄ U₄/GI₄ MES (ATU 3, 105-106, and above, fig. 28); such accounts as W 21662, 1 contain a particular format with entries representing various qualifications of textile products, in this case of DARA_{4c2}, including the color qualifications U₄, NE_o, GUN_{2a} ('checked'?) and GI₄.

³⁵¹ So for example lines 99-100 with GAR NE_o BUR₂ ([+] TUR) in the lines 101-104, and LUM A in lines 113-114 (a connection to later Sumerian gu.z.za seems, however, excluded by the use of the sign A instead of expected NUNUZ₇ = ZA₈).

³⁵² For example, W 20274, 21 (ATU 2, pl. 25), W 20274, 80+ (unpubl.) and W 21671 (above, fig. 44).

³⁵³ It may at least be assumed that the signs ŠU₂ as well as GADA_o designated measures of specific textiles, since the objects they represent belonged to a semantic category together with those represented by the signs TUG_{2a} and SIG_{2b}, all included in a summation on the account W 21671. However, the signs GADA_o and, often associated with GADA_o, ME_o, give the pictographic impression of representing tools used in the production of textiles, for example, in the production of yarn; in the case of GADA_o, the sign might represent a device used to hang and dry retted and cleaned flax – remembering that iconographic identifications are highly speculative.

³⁵⁴ P. Damerow and I first indicated in ATU 2, p. 129, that the signs DARA_{4c} and SIG_{2b}, both representing types of wool, were counted using the sexagesimal system. It is thus highly probable that all objects represented by related signs were as discrete units counted using the same numerical system. Alone this categorization makes impossible the identification of a number of sign forms (SIG_{2b1.4}) under the lemma SIG_{2b} in the sign list ATU 2 as variants of SIG_{2b1.4}, since they are qualified with the bisexagesimal system and are thus to be connected to the complex of signs representing dry grain products collectively qualified by the ideogram GAR (cp. ATU 2, 133-134).

³⁵⁵ GA_{2a} and ZATU759; see above, section 6.3.1.

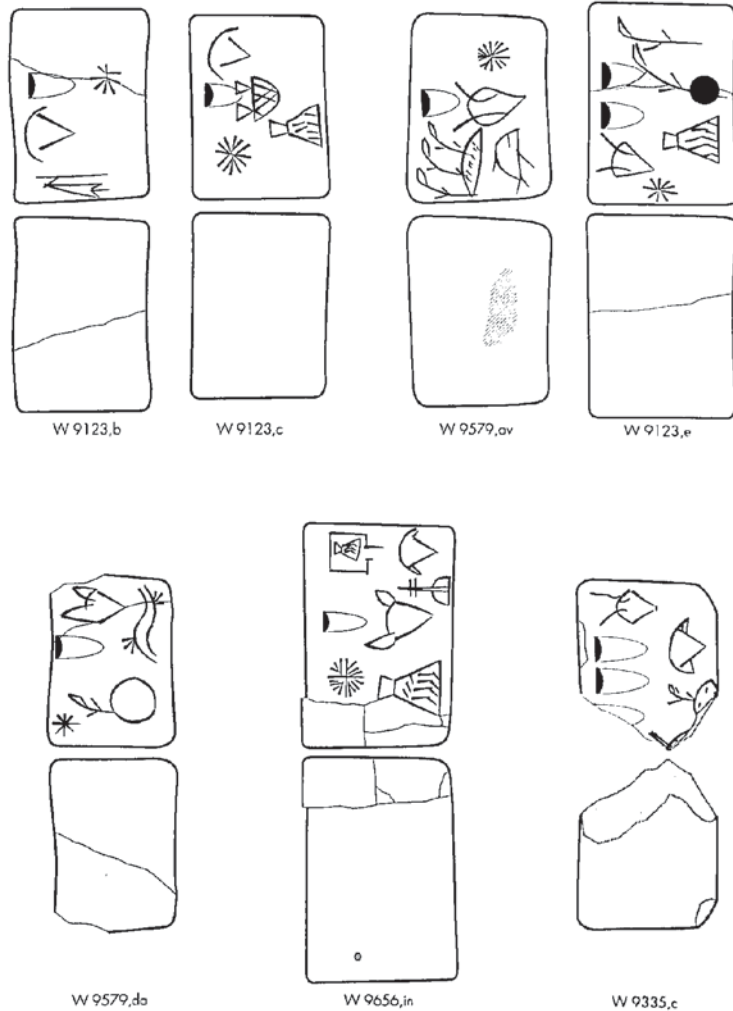


Figure 52: Simple receipts for cattle
 The upper series of tablets contains apparent notations representing receipts for one cow (sign $\langle \rangle$) and one or two bulls (sign $\langle \rangle$), the lower series notations representing receipts for one calf (sign $\langle \rangle$) and for mixed cattle (?; sign combination $\langle \rangle$).

Cattle [cows, bulls, oxen; AB₂ GU₄]³⁵⁶

Cattle, in the general sense of the term including bulls, oxen, cows and calves, were summarized under the sign combination AB₂+GU₄ ($\langle \rangle$; figure 51). The signs were clearly pictographic: the sign GU₄ was the representation of the head of the bull or ox with horns upturned³⁵⁷, the sign AB₂ was the representation of a domesticated female *Bos* with downturned horns, and the sign AMAR was the representation of a head of a hornless calf with ears held upright.³⁵⁸ The age and the function of an animal was expressed by adding to these ideograms specific qualifying signs. The signs designating the gender of young animals AMAR, namely KUR₃ ($\langle \rangle$) and SAL ($\langle \rangle$), might represent the male and female sexual organs.³⁵⁹ Later third millennium accounts record large cattle used as draft animals and as producers of meat and dairy fats. Several proto-cuneiform accounts register together the existence of both the plow represented by the sign APIN₆ and oxen represented by the sign GU₄, and thus offer meager evidence of the former use of cattle.³⁶⁰ Meat, too, is poorly attested, or at least poorly recognizable in this period.³⁶¹ As sources of dairy fats and cheese, however, cows were clearly prized and closely controlled. Accounts document cattle herd sizes of between 50 in the Uruk IV period and possibly 100-200 in the Uruk III period.³⁶² The earliest texts record numbers of cattle apparently assigned named officials or institutions, to the near exclusion of records of dairy produce, whereas among the texts dating to the Uruk III period, exceedingly few accounts of groups of cattle are found, but large numbers of records of dairy fats and cheeses, complemented with the existence of an involved metrological system seemingly developed to afford greater control of these products.

³⁵⁶ See R.K. Englund, BSA B (1995) 33-48, and cf. Archaic Bookkeeping, pp. 89-93.
³⁵⁷ No graphic differentiation is obvious between breeding bulls and castrated oxen, both apparently = GU₄ (the few bulls kept for breeding in pre-Sargonic Girsu were called simply gu₄ a b₂, "bull of the cow").
³⁵⁸ A. Falkenstein noted in ATU I, p. 52-5-53¹, the paleographic development, beginning in the Uruk IV period, of the signs AB₂, GU₄ and AMAR. There is some resemblance between the sign GU₄ and several tokens found in context with clay envelopes; see above, n. 101.
³⁵⁹ See also above, section 5, to the lists "Cattle" and "Tribute". In the latter composition, cows and oxen or bulls were recorded in a relationship of 10:1; if GU₄ here represented bull, the numbers might represent an ideal service ratio employed in archaic cattle breeding.
³⁶⁰ See, for example, the two texts ATU 5, pl. 86, W 9656,f, and pl. 100, W 9656,dr, with counted APIN GU₄ apparently assigned to temple households. The inscription of the latter text is duplicated in the second column of the obverse of the former. See generally F.R. Kraus, Staatliche Viehhaltung im alt-babylonischen Lande Larsa (Amsterdam 1966); K. Butz, "Zur Terminologie der Viehwirtschaft in den Texten aus Ebla," in: L. Cagni (ed.), La lingua di Ebla (Naples 1981) 321-353, to large herds of sheep and cattle owned by palace economies in Mesopotamia.
³⁶¹ The very meager bone remains from Uruk of *Bos taurus* identified by J. Boessneck, A. von den Driesch and U. Steger, BaM 15 (1984) 170-172, were almost entirely of adult animals. Although the authors believed the crushed remains indicated the exploitation of cattle for meat, the numbers of bones – only 30 of the 73 specimens were from late Uruk levels – permit no more than speculation as to whether the animals were selected for meat or were simply butchered in old age or after having died from some other cause.
³⁶² The former number is derived from the Uruk IV period accounts, the latter extrapolated from an estimation of the absolute size of the delivery norms recorded in the dairy accounts in fig. 49 above transposed to the presumed year account W 20274,97 in fig. 55.

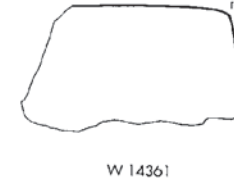
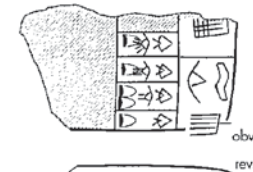
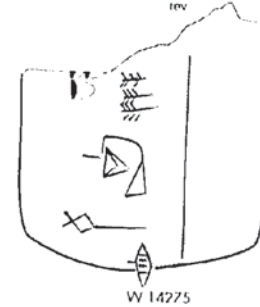
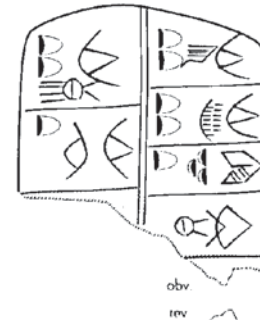
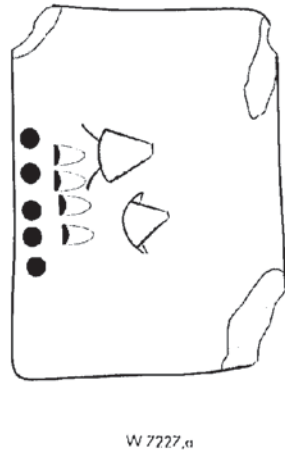


Figure 53: Examples of complex accounts of cattle
The three texts depicted above and on page 157 top date to the Uruk IV period and register numbers of animals totaled on the texts' reverse faces; W 7227, a books a total of 54 cows and bulls. The two Uruk III period texts on page 157 bottom contain accounts of small numbers of cattle qualified with signs known from the lexical list 'Animals' (W 14275), and with sign combinations known to represent the ages of the animals (W 14361); two- through five-year-old bulls).

Cattle as discrete objects were as a rule registered in proto-cuneiform texts in the sexagesimal system.³⁶³ Small, characteristically cushion-shaped Uruk IV period tablets record the receipt by a named individual of one or as many as several head of cattle (figure 52). Inscriptions in these accounts consist of numerical notations, one or more signs representing heads of cattle and one or more signs to designate receiving individuals or officials. Reverse faces of the 'receipts' remained uninscribed.

With up to five columns on their obverse face, larger accounts in a format represented by the two tablets W 9656, ev and W 7227, a in figure 53³⁶⁴ contained thirty and more individual entries, each of which corresponded to one of the simple receipts. The numerical total of the cattle recorded in these entries was entered on the reverse face of the account (rotating the tablet around its 'horizontal' axis). Complete herds of adult and young cattle, probably separated according to the function of the individual animals, were recorded in other accounts (figure 53, W 9656, ex). In accounts from the Uruk IV period, the calves could, just as is true of lambs and the children of dependent laborers who were probably too young to be put to work, be qualified using the sign N_8 (=) which in sexagesimal notations generally designated $1/2$ of a discrete unit.³⁶⁵ Thus the fourth case of the text's second obverse column contains a notation $N_1 N_8$ representing one cow and one calf.³⁶⁶

Uruk III period accounts of herds of large cattle are very rare and register only modest numbers of animals. The preserved sections of the text W 14275 in figure 53 contain notations representing just 8 head. The age of animals was recorded in some accounts; the text W 14361 (figure 53, bottom right) registers in three cases of its second column notations representing oxen in their fifth, fourth and second years, respectively (sign combinations $5N_{57}+U_4$, $4N_{57}+U_4$ and $2N_{57}+U_4 GU_4$).³⁶⁷

Related herding accounts from the Uruk III period, of which only two are preserved well enough to permit a reconstruction of their contents (above, figure 49),³⁶⁸ record small numbers of cows together with their offspring, qualified SAL+AMAR and KUR₉+AMAR ('heifer calf' and 'bull calf') from the accounting year of the text. Both texts record a ratio of two adult cows per recorded calf.³⁶⁹

³⁶³ The exceptional use of the sign N_8 (=) in the Uruk IV period to designate immature animals is discussed below.

³⁶⁴ The largest attested total of adult animals is '54' contained on the reverse of W 7227, a.

³⁶⁵ See A.A. Vajman, "Die Bezeichnung von Sklaven und Sklavinnen in der protosumerischen Schrift," *BoM* 20 (1989) 121-133, and the comments of P. Damerow and R.K. Englund, *BoM* 20, 137-138.

³⁶⁶ The latter animal was included on the text rev. i 3 among a group of four animals qualified as AMAR.

³⁶⁷ For a description of archaic designations of years see above, section 6.2. The standard age sequence for Ur III bulls/oxen attested, for example, in the theoretical account TCL 2, 5499 (l. J. Gelb, *JCS* 21 [1967] 64-69; see *Archaic Bookkeeping*, 97-102), was $gu_4 amar.ga, gu_4 mu.1 | AS, sign -$, $mu.2, mu.3, gu_4 gal$, 'milk bull-calf, one-year bull, two-year bull, three-year bull, large (full-grown) bull.'

³⁶⁸ W 20274, 12 and 63 were first published by M.W. Green, *JNES* 39 (1980) 32, nos. 35-36; see now *Archaic Bookkeeping*, 89-93 with fig. 71.

³⁶⁹ Based on just two small accounts, it is impossible to derive a rule of 'return' for the archaic period similar to the ratio 2:1 known from the Ur III dairying manual discussed above, n. 367.

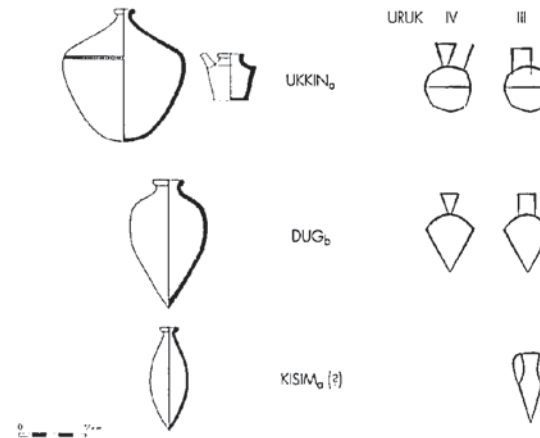
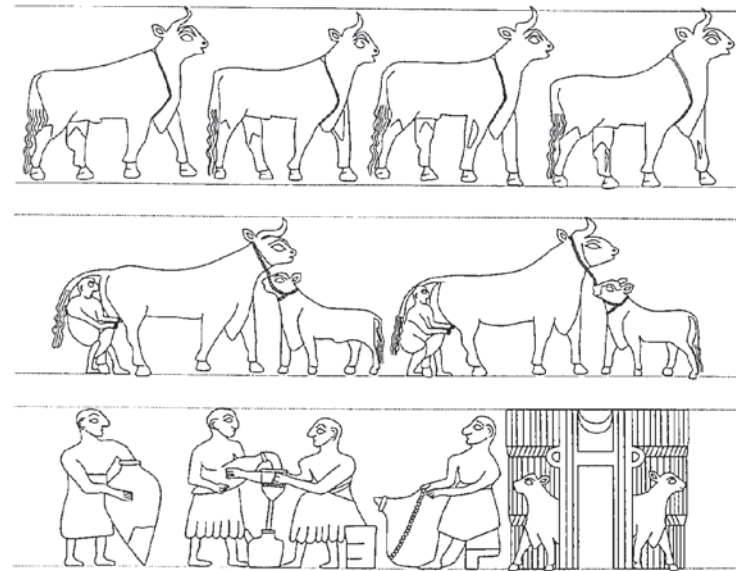
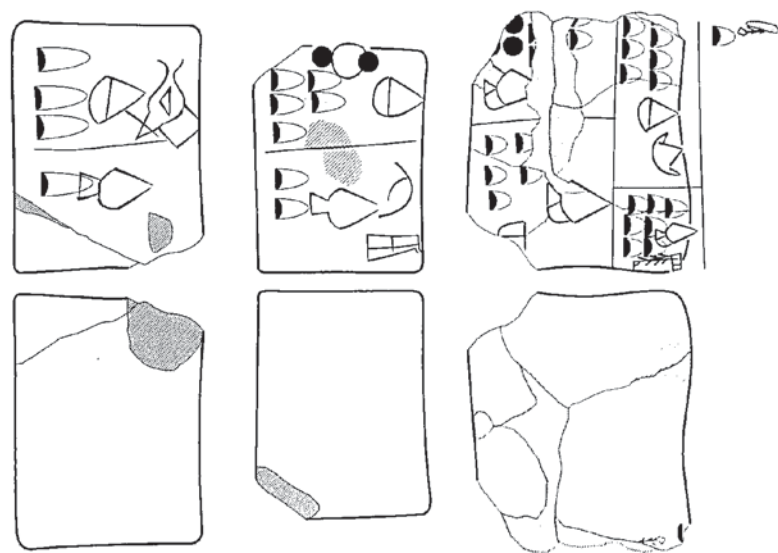


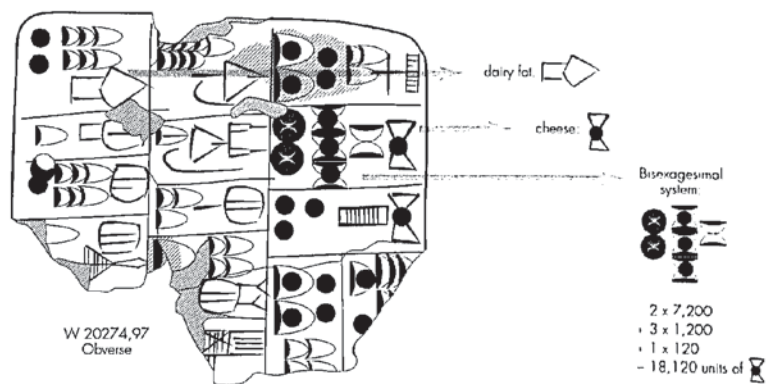
Figure 54: Containers of dairy products in the Late Uruk and Early Dynastic Periods. Above: the Ubaid Frieze (after: P. Gouin, *Iraq* 55 [1993] 136-137). Below: ceramic jars depicted in the Ubaid frieze (the scale is merely an approximation based on the humans and animals found in the frieze) and possible proto-cuneiform correspondences.



W 9206,c

W 9579,ah

W 9656,eq



W 20274,97
Obverse

2 x 7,200
3 x 1,200
1 x 120
= 18,120 units of

Figure 55: Accounts of dairy products
Simple accounts of dairy products from the Uruk IV period (above) and a large account from the Uruk III period (below [reverse unscripted]; see ATU 2, pl. 55, and Archaic Bookkeeping, p. 94) of products from animal husbandry, including the signs for dairy fat (DUG_b) and cheese (GAAR₁).

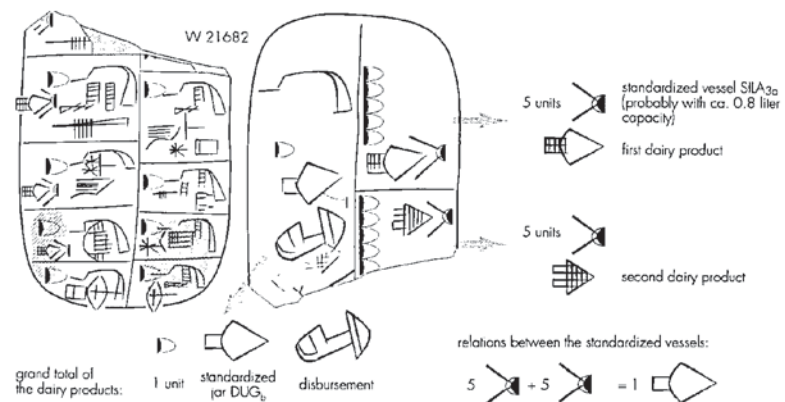


Figure 56: Metrological relationship between SILA_{3a} and DUG_b

Dairy products

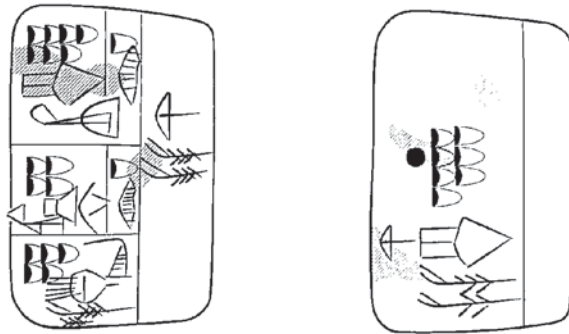
The two dairy cattle accounts depicted in figure 49 book in the totals on their reverse faces one jar of dairy fat³⁷⁰ (sign DUG_b) per two (W 20274,12) or four (W 20274,63) milk cows, that is, of possibly 2-5 liters per animal. The first eight lines of the archaic lexical list 'Vessels' in fact consist of entries with the signs DUG_b³⁷¹, KISIM_{a/b} and other signs which represent containers of fats used in the administration of archaic dairies.³⁷² These signs, including NI_b, DUG_c and UKKIN_b; NI_a³⁷³ are often found inscribed together in administrative documents

³⁷⁰ Third millennium accounting tradition and technical considerations make this identification relatively secure. See the articles cited above, n. 333.

³⁷¹ The sign DUG_b, representing a ceramic jar without a spout, was consistently distinguished from the sign DUG_a including the representation of a spout. This fact and the contextual usage of both signs suggest that the former jar will most likely have contained semi-liquids, the latter liquids, above all beers. A large number of signs were impressed in DUG_b in archaic lexical texts, to a lesser extent attested in administrative texts, to specify the product contained in the jar represented by the sign, including among others ŠE_a ('barley'), NAGA_a ('an alkaline plant'?), TI(?)?, MAS ('male goat'), KUR ('a plant related to the grapevine?'), GIS ('wood'), KU_{oo} ('fish') and SAH₂ ('pig'). See ll. 21-61 of the archaic lexical list 'Vessels', fig. 29 above.

³⁷² See below, fig. 61.

³⁷³ See below, fig. 60, for a table of the pertinent signs in the periods Uruk IV-III. Of the proto-cuneiform signs representing ceramic vessels, only NI_a may have been a two-dimensional depiction of clay objects found in the pre-literate clay envelopes; see above, section 3. The 'oil tokens,' believed themselves to have represented concrete containers, have been found in clay envelopes from Uruk and from Habuba Kabira in Syria. It may be noted in passing that few chemical analyses on the inner surfaces of Late Uruk pottery vessels have been performed and thus little hard evidence is available which would either support or refute the functional typology implied in fig. 60. The methods used to recognize organic elements, in the case of milk products amino-acids typical of animal proteins, are time-consuming and expensive (see generally Rheinisches Landesmuseum Bonn (ed.), Proceedings of the 18th International Symposium on Archaeometry and Archaeological Prospection, Bonn 14-17 March 1978, Archaeo-Physika 10, 1978 [Cologne 1979]; M. Frangipane has reported some preliminary identifications of these elements in shards from Late Uruk levels of Arslantepe [personal communication]).



W 20274.6

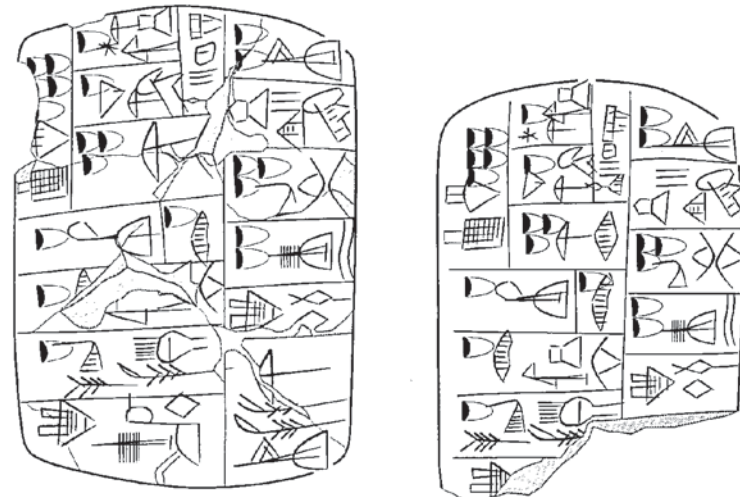
Figure 57: Accounts concerning dairy fat stored in the jar DUG_c. The obverse of the account shown above contains three entries recording numbers of containers of dairy fat; assuming the notation N₁ KU₃₀ [DUG_c] represents one-half of the basic unit, the addition is: 7 1/2 + 4 1/2 + 5 = 17 DUG_c. The two accounts on page 163 contain similar additions including notations representing one-half jar; they are rare examples of duplicate administrative texts from the archaic period.

beginning in the Uruk IV period, and may find correspondences in the famous Early Dynastic Ubaid Frieze (see figure 54).

The association of the sign NI₀ with DUG_b in such texts as W 9206,c and W 9579,ah, and of NI₀ in the same case with AB₂ and with DUG_c in the text W 9656,eq (all figure 55), demonstrates that this sign should represent a container of dairy fat from its first use in the Uruk IV period.³⁷⁴ Only indirectly associated with the sign representing dairy fat, DUG_b, is on the other hand the sign GA'AR in such texts as W 20274,97 (figure 55). This sign, found as a general object designation in a section of the archaic vessels list following a long section on containers of fats and other products,³⁷⁵ is, as a clear precursor of the Fara and pre-Sargonic Lagash sign LAK 490 – itself replaced in Ur III documents by the sign combination ga HAR/UDgunū – , posited to represent a unit of cheese. Whereas oil vessels were counted with the sexagesimal system, cheese was reckoned in discrete units using the bisexagesimal system and so may be associated with the objects represented by GAR (dry grain products) and KU₀₀ (fresh² fish) as another product central to the archaic rationing system.

³⁷⁴ The sign, the real referent of which is unknown, is in later cuneiform documents the general designation of oils of all kinds.

³⁷⁵ See above, section 5 with fig. 29.



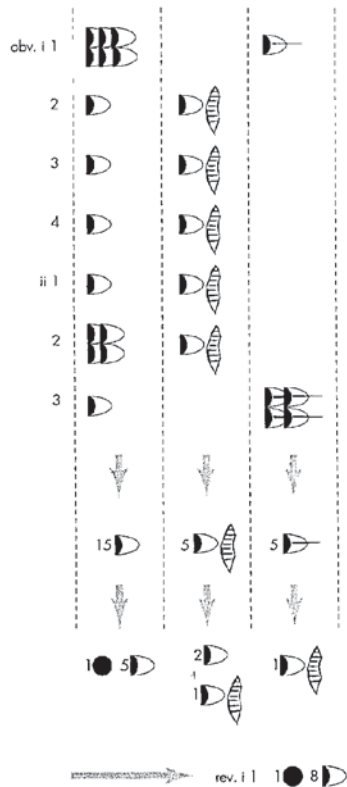
W 20274.33



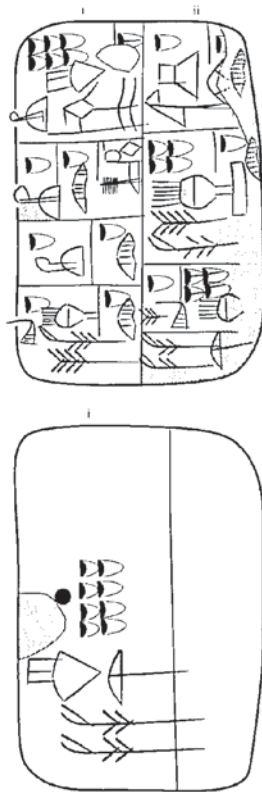
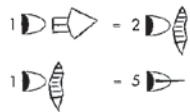
W 20274.89



reconstruction of the summation:



metrological relations:



W 20274.35

Figure 58: Account concerning dairy fat stored in the jar DUG_c. This partially reconstructed account of dairy fat stored in jars demonstrates the metrological relations in the system DUG_c.

Containers of dairy oil and other (semi-)liquids were not only as discrete objects counted in the late Uruk period using the sexagesimal system, but were also as members of a liquid capacity metrological system divided into smaller units using one of three numerical conventions (below, figure 61).

In the first place, the sign N₈ (=) discussed above as a designation of immature cattle in the sexagesimal system as a rule qualified 1/2 of some discrete unit, above all the contents of vessels and baskets.³⁷⁶ Notations in a number of Uruk IV period texts suggest that the sign N₈ in the sexagesimal system could also represent a smaller fraction than 1/2 of an object, probably 1/10; the objects so qualified in these notations are, unfortunately, not always clear, although DUG_c seems attested in at least two of the accounts.³⁷⁷

A second means of designating fractions of oil jars is fully documented in the Uruk III account W 21682 (figure 56). The text contains on its obverse face two columns with 5 entries, each of which consists of the numerical sign N₁ together with the sign combinations SILA₃₀-GARA₂₀ or SILA₃₀+GA₀ – the former³⁷⁸ explicitly written in the first four cases of the first column, the latter³⁷⁹ probably only in the last first case of the second column – representing units of a dairy product, the sign SI (meaning unknown) and further ideograms probably representing receiving individuals.

The reverse face of the tablet contains in the right column subtotals of each of the obverse columns, numerical notations representing five units qualified by the sign combinations SILA₃₀+GARA₂₀ and SILA₃₀+GA₀, in the second column the final total N₁ DUG₆ qualified with SI and the sign GU₇, 'ration'.³⁸⁰ SILA₃₀ can thus be identified as a pictographic representation of the mass-produced 'Blumentopf' which followed and for some time in Late

³⁷⁶ ATU 2, 128 c.

³⁷⁷ W 19466,a and W 20652 (both unpubl.). The notation 3N₁ 9N₈ in ATU 5, pl. 111, W 9656,g1 (cited ATU 2, 129 d, as ATU 1, no. 490) refers to an object not preserved in the second case of the tablet, and this and the preceding two notations could in principle derive from a number of other numerical systems. Clearly sexagesimal, however, is the notation 1N₄₈ 3N₃₄ 2N₁ [] 4N₉ in ATU 5, pl. 64, W 9579,u rev. 1 (cited ATU 2, 129 d, as ATU 1, no. 352); the apparent object represented by the sign combination SUHUR KAS₆, literally 'jar of dried fish meal oil,' must at least be admitted as a weak reference for the use of N₈ = 1/2 in a sexagesimal notation of oil jars.

³⁷⁸ A unguined variant of the sign DUG_c is attested in the archaic Ur (ED III) version of the lexical list lu₂ A, l. 20, as a variant of GA₀ in the combination GAL₀ GARA₂₀, 'head of GARA₂₀', and representing a product among notations for domestic animals and other agricultural products in the list 'Tribute'. See ATU 3, pp. 73 and 114-116, respectively; in 'Tribute' followed by a notation of '10 cows'.

³⁷⁹ The Uruk IV period form GA₀ is apparently the representation of a flat basket, the inner surface of which was probably coated with bitumen to be used in the milking of dairy animals.

³⁸⁰ The sign combination SAG+GAR = GU₇ is extremely common in archaic texts from Jemdet Nasr and Uruk. While SAG seems, pars pro toto, to represent a human in general and not, as in later usage, a chattel slave, its use together with a number of qualifying signs or simply (so-called *gunû*-) strokes apparently served to create abstract concepts. This must be the case with GU₇, since it is in no way obvious that this sign designated 'rationed persons,' but rather rationing in the abstract. A differentiation between this sign and the common BA is not obvious in texts known to me; they were, however, not interchangeable, since only objects qualified with BA and not those qualified with GU₇ could be subsumed in a total with objects qualified with GI.

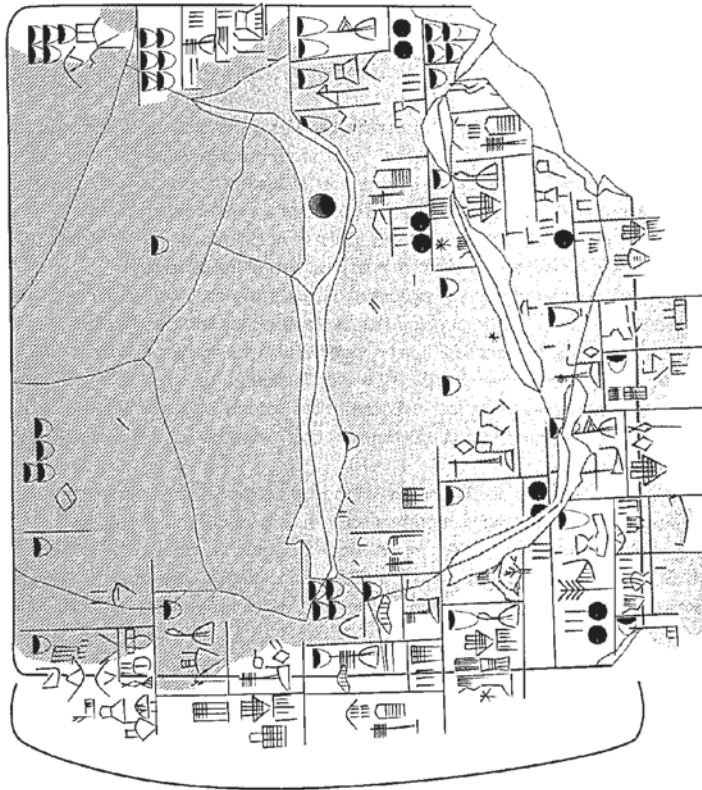

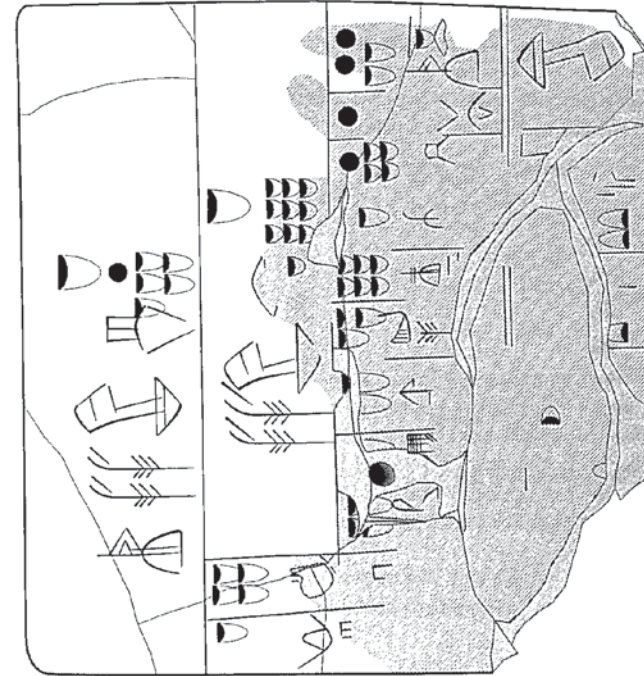


Figure 59: W 20274,39
The largest administrative document in the archaic sources from Uruk contains an involved account of the deliveries of dairy fats to a temple household denoted by the sign .

Uruk levels coexisted with use of the beveled-rim bowl GAR; it represented a measure equal to $\frac{1}{10}$ of the amount of liquids or semi-liquids contained in the vessel DUG₆.³⁸¹ The third, Uruk III period convention used in qualifying measures of dairy fats seems on its surface substantially more complex than the first two, yet shares the basic structure of $\frac{1}{2}$ and $\frac{1}{10}$ of the unit 'jar'. A large number of accounts, including the largest of the archaic Uruk corpus (figure 59), contain notations in this metrological system which exhibits the structure

³⁸¹ The text W 20274,72 (unpubl.) seems to contain an addition $2N_1[] + 2N_1 \text{SILA}_{30} \text{GARA}_{20} + 1N_8 = 1N_1 \text{DUG}_6$, implying that, as might be expected, N_8 also served in this system to represent both $\frac{1}{2}$ of a basic unit and $5 \times N_1 \text{SILA}_{30}$.



$1 \times N_1 \text{ vessel (DUG}_6/\text{UKKIN}_6 + N_1) = 2 \times N_1 + \text{KU}_{30}$ (figure 57),³⁸² $N_1 + \text{KU}_{30} = 5 \times N_2$ (corresponding to the basic unit N_1 , crossed by a horizontal stroke; see figures 58, 61)³⁸³. The full structure of this metrological system (figure 58) may represent a development from the Uruk IV system with, dependent on context, N_8 equal both to N_1 , KU_{30} and to N_2 . The meaning of KU_{30} in this connection is, aside from the fact that it indicated a half measure, not obvious.³⁸⁴

³⁸² W 20274,6 in fig. 57 offers a simple summation of three entries with numbers of a container of fats represented by the sign DUG₆. The only known duplicate administrative texts from the archaic text corpus, W 20274,33 and W 20274,89 (figure 57), contain somewhat more involved accounts, yet the reckoning steps exhibited by both are easily recognizable as simple additions of whole numbers and fractions from the same metrological system. Including only the 3 units qualified as BA K₁ in the second sub-case of the first case of each text's obverse face, the addition is: $3 + 1\frac{1}{2} + \frac{1}{2} + 1 + 2 + 3 + 2 = 13 \text{ (DUG}_6)$.

³⁸³ No dairy accounts known to me contain a notation with five or more N_2 , in compliance with the expected replacement of $5N_2$ with $1N_1 \text{KU}_{30}$.

³⁸⁴ I might draw attention to the fact that tokens often related to this sign have been found in clear association with sealed clay envelopes in Uruk and possibly within still complete envelopes from Susa (see above, section 3).

Texts from the Late Uruk Period

Uruk IV	Uruk III	sign name	meaning	Uruk IV	Uruk III	sign name	meaning
		DUG _a	beer			KAS _b	dairy fat mixed with crushed barley?
		KAS _c	beer			KAS _c	dairy fat mixed with crushed barley?
		KISIM _b	butter fat from sheep's milk			NI _b	dairy fat ?
		KISIM _b	butter fat from goat's milk			GA _a	milk ?
		DUG _b	dairy fat				
		DUG _c	dairy fat				
		UKKIN _b -NI _a	dairy fat			GARA _{2a}	cream ?

Figure 60: Probable archaic designations of liquid and semi-liquid products

Administrative Systems – Administrative offices

The numerical and metrological systems used to qualify measures of dairy products mirrored in their complexity the pictograms designating the different products themselves (figure 60). According to data derived from excavations, above all measurements conducted on the masses of beveled-rim bowls found in Late Uruk settlements, and in accordance with textual analysis, the most plausible current working hypothesis of the absolute capacities of these various units is the following:³⁸⁵

$$\begin{aligned} \text{GAR} &= 1\text{N}_8 \text{ (?; Uruk IV)} = \text{SILA}_{3a} = 1\text{N}_2 = && \text{ca. } \frac{4}{5} \text{ liter} \\ 1\text{N}_8 &= 1\text{N}_1 \text{ KU}_{3a} && = \text{ca. 4 liters} \\ 1\text{N}_1 \text{ DUG}_{b/c} \text{ etc.} &&& = \text{ca. 8 liters} \end{aligned}$$

Pigs (ŠAH_{2a}, ŠUBUR)³⁸⁶

That pigs represented an important facet in the social and economic lives of archaic Mesopotamia is obvious from archaeological and textual evidence. Of the former, seals dated to Uruk IVb-a present the best evidence, consisting of various depictions of the hunting of boars both by apparent professionals and by administrative elites.³⁸⁷ Similar hunting scenes are known from a relief on a stone bowl from the Late Uruk period, and from incised and painted depictions on Early Dynastic ceramic vessels from the Diyala region as well as from a small alabaster relief from Ur (figure 62³⁸⁸).

Although archaic cylinder seals and reliefs depicted only wild pigs, osteo-archaeological identifications³⁸⁹ as well as proto-cuneiform tablets demonstrate that the exploitation of

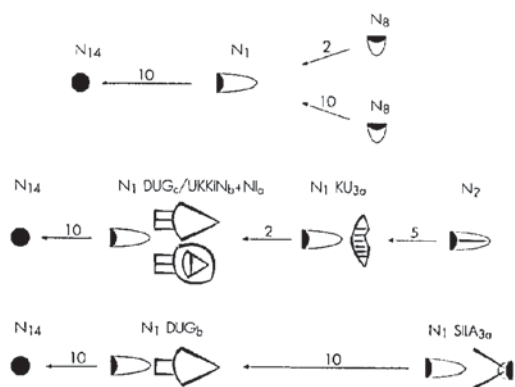


Figure 61: Metrological systems employed in dairy notations. The application of the upper system with dairy products is not proven, the lower two systems are only known from the Uruk III period.

³⁸⁵ Cp. ATU 2, 153⁶⁰; see also R.K. Englund, JESHO 31 (1988) 160³², and P. Damerow and R.K. Englund, Tepe Yahya, 24-27.

³⁸⁶ See R.K. Englund, 'Late Uruk Pigs and Other Herded Animals,' FS Boehmer (Mainz 1995) 121-133.

³⁸⁷ See above, fig. 10. Impression 10c depicts two boars standing or running amongst conventionally drawn reed thickets, confronted by what may be the vaunted ruler of Uruk ('Stadtfürst') accompanied by two dogs. According to later sources, pigs were delivered by fishermen, certainly from their fishing grounds in the marshlands of southern Babylonia. See Ur III-Fischerei, 174-177 + 177⁵⁶⁴.

³⁸⁸ 62a: H.R. Hall, La sculpture babylonienne et assyrienne au British Museum, Ars Asiatica 11 (Paris-Brussels 1928) pl. 1, no. 2, BM 118466, and id., The British Museum Quarterly 2 (1927-1928) 12-14 + pl. VI (probably from Uruk); 62b: P. Delougaz, Pottery from the Diyala Region, OIP 63 (Chicago 1952) pl. 80c (from Khafaje; kindly drawn to my attention by U. Moortgat-Correns). In their habitat in the reed thickets of the southern marshes, wild pigs were particularly menacing and certainly no easy bag for ruler or professional hunter. Aggravated boars, feared for their strength and phenomenal charging power, or disturbed sows protecting young, can easily bring men to the ground and with violent bites or a whipping action of their tusks inflict grave and, unless rendered harmless, fatal injuries to internal organs. Wild pigs trapped on islands during the flooding season, on the other hand, were easily killed by spear from boats once the animals were forced into the water. See W. Thesiger, The Marsh Arabs (London 1964) 34-43, 167-169; A. Blunt, A pilgrimage to Nejd [...], vol. 1 (London 1881) 122-128; R.T. Hall, The Mammals of Iraq, University of Michigan, Museum of Zoology, Miscellaneous Publications no. 106 (Ann Arbor 1959) 57-59; D.L. Harrison, The Mammals of Arabia, vol. 2 (London 1968) 372-375.

³⁸⁹ See R.J. Matthews, 'The World's First Pig Farmers,' Pig Farming 33 (March 1985) 51-55; K.V. Flannery, 'Early Pig Domestication in the Fertile Crescent: A Retrospective Look,' FS Braidwood, SAOC 36 (Chicago 1983) 163-188; P. Charvat, 'Pig, or, on Ethnicity in Archaeology,' ArOr 62 (1994) 1-6; and most recently my contribution to the Festschrift Boehmer (cited above, n. 386).

domesticated races, and probably as later also of wild animals kept for purposes of breeding, was closely controlled by the early administration.

Indeed, the importance of pigs and pigherding to archaic bookkeepers is most clearly underscored by a lexical composition described above, section 5, of 58 designations of pigs and their keepers. All entries in this unique Uruk III period list from Uruk (VV 12139, figure 63) include the sign ŠUBUR (𒍪), 'pig',³⁹⁰ and, with the exception of the first entry, one or more ideograms representing apparent qualifications of this animal such as age, color or provenience. Since P. Steinkeller has stated that "this source is hardly a 'swine' list,"³⁹¹ it may be worthwhile to review the reasons behind the identification ŠUBUR = 'pig' made by P. Damerow, H.J. Nissen and myself.

Not only the clear graphic relation of this sign to the sign ŠAH₂₀ – it is the same sign minus the gunification of the back of the depicted animal's neck, i.e., its bristly mane – but above all the sequence ŠUBUR, 1N₅₇+ŠUBUR (𒍪) and 2N₅₇+ŠUBUR (𒍪) of the first three cases of the text³⁹² present a clear correspondence to the age qualifications of pigs attested in later periods.

The identification of this list with designations of pigs seems justified, moreover, by a number of qualifications of the sign ŠUBUR in the text which would be incompatible with other interpretations, for instance, ŠUBUR = "dog".³⁹³ The lines rev. i 2-3 and 7-8 with AB₂ ŠUBUR, NE₆ ŠUBUR and GI₆ ŠUBUR, U₄ ŠUBUR, i.e., "cow"/reddish ŠUBUR" and "black/white ŠUBUR", for example, contain adjectival pairs particularly characteristic in lexical lists and administrative texts dealing with livestock, namely, with large and small cattle. A further example is the entry rev. iii 5 with ŠE₃ ŠUBUR; the sign 𒍪 seems to represent a product delivered by herders, best attested together with sheep and goats – possibly dung, a highly desirous fuel used in cooking and heating in antiquity.³⁹⁴ The entries iii 6-7 with ŠE₆ ŠUBUR and GURUŠDA ŠUBUR also provide hard evidence, since it would be difficult to imagine the purpose of fattening a dog (assuming a correspondence of ŠE₆ ŠUBUR to later šah₂ nigā) or of a fattener (gurušda) of dogs – or of humans for that matter.³⁹⁵ Finally, it may be

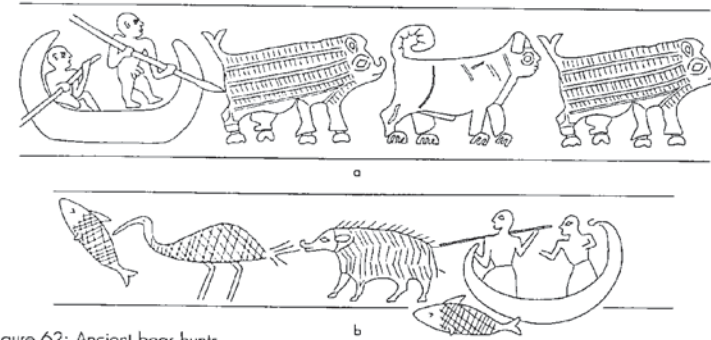


Figure 62: Ancient boar hunts
Reconstructed depictions of boars being hunted with a spear from skiffs in the marshes, in one case a relief on a stone bowl from the Jemdet Nasr period (a; note the use of a hunting dog), in the other an incised drawing on the shoulder of a clay jar from the Diyala region, dated to ED IIIa (b; pig together with the other major food resources of the marshes, birds and fish) (after original drawings by U. Moortgat-Correns; scale: ca. 1:4).

noted that the archaic entry GAL₆ ŠUBUR of line 7 of the lexical list ED Lu₂ A is apparently in all witnesses from later periods, beginning with the witness from ED I-II Ur, replaced by GAL₆ ŠAH₂₀.³⁹⁶ It is thus probable that the two signs coalesced during the hiatus between the Late Uruk and the Early Dynastic periods.

While evidence for a so involved terminology of pigs and organization of pig herding as would seem to be implied by the existence of a lexical pig list including 58 entries is not known from later periods,³⁹⁷ still the nature of archaic lexical lists as often fanciful paradigmatic

4, and 58, obv. i 2b1, i 5 and rev. i 1) or UB (ii 10), does not assist in identifying the meaning of the sign, but would certainly not exclude the meaning 'pig'. Cp., for instance, MSL 8/2 (Rome 1962) p. 20, ll. 165-166: sah, Ma₂.gan.nal.sig₃.ga. (line [possibly in the sense of unfattened]) Magan-pig' (and see the Old Babylonian correspondence in SLT 51 v 2); l. 171: sah₂ Si.mur.ra, 'Simurū-pig'.

³⁹⁰ See below, n. 390.

³⁹⁷ The fact that the list was so long seems most to have motivated Steinkeller in AIO 42/43, 212-213, to doubt our identification – although swine are recorded in ll. 158-183 of the 14th tablet of the lexical series HAR.ra = *hubullu*, that is, in fully 35 entries (including insertions) representing pigs of different colors (white, black, red, speckled, yellow), habitat (reed thicket), quality ('lordly', 'royal'; fattened) and origins (see B. Landsberger, Die Fauna des alten Mesopotamien nach der 14. Tafel der Serie HAR-RA = *HUBULLU*, ASAW 42/6 [Leipzig 1934] 12-15, 100-103 and id., MSL 8/2, 19-21). This section of Hh 14 implies that pigs were indeed dealt with in earlier lexical lists in the same paradigmatic and artificial completeness (note that most of the Hh pig designations are not attested in the contemporary administrative texts), and, of course, the administrative importance of pigs throughout the third millennium makes their exclusion from the lexical record unthinkable. A number of other mistakes in Steinkeller's argument can be corrected here:

- 1) The idea of a list of dogs derives from Falkenstein and not from Green (see above, n. 390).
- 2) Steinkeller does not know the meaning of most of the sign combinations accompanying ŠUBUR in the list and so cannot contend that they were not 'even remotely connected with pigs or pig products' (p. 212). In fact, the combinations listed above unquestionably represent qualifications of domesticated animals and are fully consistent with 'pigs'.
- 3) ZATU539 is not 'undoubtedly ŠUBUR'. The reading of this sign was, in fact, only determined by opting for one of the two signs which in the Fara period seemed to have replaced it in line 7 of the lexical list

³⁹⁰ A. Falkenstein mentioned the text in ATU 1, pp. 45-46, equating the sign 'ŠUBUR' with UR = 'dog'; he did not, however, state that the text contained a list of designations of dogs, rather "a list of animal names ... comparable to ab₂, 'cow', gud, 'steer', and a mar, 'calf' in the Fara tablet VAT 12806 (=SF 81)." The improbable identification of the text as a dog list nevertheless was assumed in M.V. Green's signlist of ATU 2 s.v. ŠUBUR, and has since been corrected in ATU 2, 156^o; ATU 3, 22-23 and 100-103 + pl. IV, and my "Late Uruk Pigs [...]" FS Boehmer, pp. 121-133.

³⁹¹ In his review of ATU 3 in AIO 42/43 [1995-96] 212.


³⁹² The entry 3N₅₇+ŠUBUR in rev. iii 4 = line 54 (fig. 63) may or may not belong to this progression; the sign 3N₅₇ is known in other combinations to be a graphic variant of the sign KUR₆ (𒍪), designating a male animal or possibly an animal from the eastern mountains.

³⁹³ An interpretation ŠUBUR = 'human' was considered and rejected by A. Falkenstein, in ATU 1, 46, reading UR, since no parallels from Sumerian prosopography to the sign combinations in VV 12139 were known to him; UR is, moreover, a different sign, which in its ED I-II form – UET 2, sign no. 284 – assumes precisely the expected function in personal names. The interpretation ŠUBUR = 'human' seems further excluded by the probable age qualifications in the text noted above.

³⁹⁴ See Archaic Bookkeeping, p. 93.

³⁹⁵ The qualification in the list of ŠUBUR with toponyms, for example, ADAB (ii B and see VV 20497 iii 1, ATU 3, p. 101, l. 18; the sign combination is also found in the administrative texts MSVO 4, 54, obv. i

name-generating exercises – a phenomenon well documented from later periods but also known, for example, in the archaic list of domestic animals³⁹⁸ – would make such a complex list imaginable, if not plausible. Thus the list here would presume a categorization of primarily domesticated animals, their products, probably including meat cuts and means of cooking or preserving/salting, and workers involved in the breeding, herding and slaughtering of pigs.

Only one presently known proto-cuneiform account records the keeping of herds of (wild?) pigs (archaic sign , conventionally read ŠAH₂ [=ŠUBURgunū]³⁹⁹). The Uruk III period

Lu₂ A, the signs ŠAH₂ = LAK 40 and 1N₅₇+ŠAH₂ = LAK 39, Sumerian šubur, for which see ATU 3, 70, and E. Arcari, *La lista di professioni 'Early Dynastic U.A.' [...]* (Naples 1982) 13 and 31, and below, n. 399. I have demonstrated in FS Boehmer (Mainz 1995), p. 125ⁿ, that this presumed correspondence to ŠUBUR was in fact erroneous, and again proposed a conventional reading ŠAH of the archaic sign.

- 4) ŠUBUR = 'pig' is clearly attested in MSVO 4, 72 obv. i 5 (1N₁ ŠAKIR₉ [-DUG₃+N₁]) ŠUBUR, following entries with notations of quantities of fish and fish containers; note the probable precursor of the sign UZU [ŠUBUR+X] in the preceding entry of the same text, also found in W 21418,3 [unpubl.] obv. iii 3 after entries for dairy fat and fish, and probably in 55 obv. i 5 and ii 5 (1N₅₇+ŠUBUR), possibly in ATU 5, pl. 46, W 9206,c and pl. 97, W 9656,cs (these are the texts identified by Steinkeller p. 213 cs ATU 1, nos. 85 and 184, respectively, erroneously identifying ATU-55 [=1N₅₇+ŠUBUR] with ŠAH₂). The entries SUHUR and ŠUBUR concluding the two accounts W 12015 and 20572,2 [unpubl.], moreover, reflect a practice known from pre-Sargonic Girsu (J. Marzahn, VS 25, 42 obv. ii 2: 2 šah₂ 9¹³gi as last entry following several recording fish and turtles, all delivered by a named fisheries foreman). Note also the inclusion in W 13946,a (ATU 2, pl. 47) obv. ii 4 of ŠUBUR with a metal object AN TAG₂₁, possibly a slaughtering axe (cp. the Old Akkadian text TMH 5, 147, 2: šen šah₂ tag^{urud}).
- 5) The identification of age designations in the list is *not* 'merely a supposition' (and correct 'horizontal 1, 2, 3' to 'horizontal 1, 2'). It is tiring to repeat the consistency with which these designations are used in archaic sources, including the text W 23948 cited by Steinkeller p. 212 as evidence of archaic pigherding (the account [see below, fig. 64] does not list two herds of ŠAH₂ and 1N₅₇+ŠAH₂, as Steinkeller seems to imply; note additionally that the combination 1N₅₇+ŠAH₂ in the account is fully parallel to 1N₅₇+ŠUBUR in MSVO 4, 55, etc., cited above, and constituting the second entry of the 'Piglist'), and the logical development later age designations of domestic animals represent relative to these early qualifications.

Nevertheless, it would be foolish not to entertain suggestions of alternative interpretations to the reputed 'Piglist' if they show some merit. However, the old argument of personal designations (p. 213) makes no sense now than when it was first considered and rejected by Falkenstein – particularly in light of the new evidence not available to the German scholar concerning the archaic designations of laborers, which makes superfluous a discussion of 'dogs/servants'.

³⁹⁸ See above, section 5.

³⁹⁹ Pictography and later use of the sign make sufficiently clear its referent pig. The sign is also found inscribed in the sign DUG₆ (C) representing a container of lard in the archaic lexical list 'Vessels' (above, fig. 29, l. 48); see ATU 3, 123-134, in particular the lines 21-61. ŠAH₂ is in fact the pictographic precursor of the sign with Sumerian reading šah₂ or sa_h₂ – the sign inscribed in the vessel DUG₆ was in the corresponding line of both of the Early Dynastic text witnesses (SF 64 iii 12 and OIP 99, no. 9 iii 3) replaced by ŠAH₂ = LAK 40 (S¹). Compare the entries ŠAH₂ a₂/g_u₄/amar/am in the ED cattle list (SF 81, OIP 99, 25-26, MEE 3, nos. 12-17, and the syllabic version MEE 3, no. 62 [edited most recently by J. Krecher, *OrAnt* 22, 1983, 179-189]) corresponding to ŠAH₂ AB₂ etc. in lines 20 and 46 of the archaic version (ATU 3, pp. 90-91; meaning unclear, usually read dun), the entry ŠAH₂ ku₂ in the ED fish list (SF 9-11, MEE 3, nos. 27-38) corresponding to ŠAH₂ KU₂ in l. 15 of the archaic version (ATU 3, p. 94; 'pig fish'), and the entry LA₂:SU ŠAH₂ in the ED grain list (SF 15-16, MEE 3, nos. 48+49, and see the Old Akkadian version MDP 27, 196) corresponding to l. D5 of the archaic version (ATU 3, p. 144; probably 'pork on a hook').

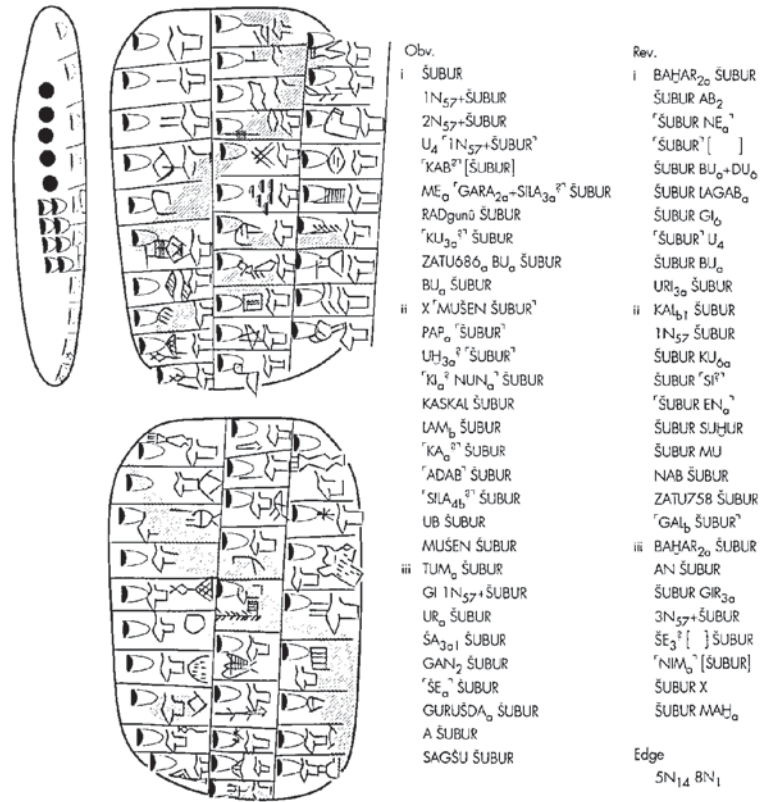


Figure 63: The presumable pig list W 12139

Note the first three entries of the obverse with the progression ŠUBUR, 1N₅₇+ŠUBUR and 2N₅₇+ŠUBUR ('pig', 'pig (in its first (year))', 'pig (in its second (year))'). The left edge of the tablet contains a numerical notation recording the total number of entries in the list (58).

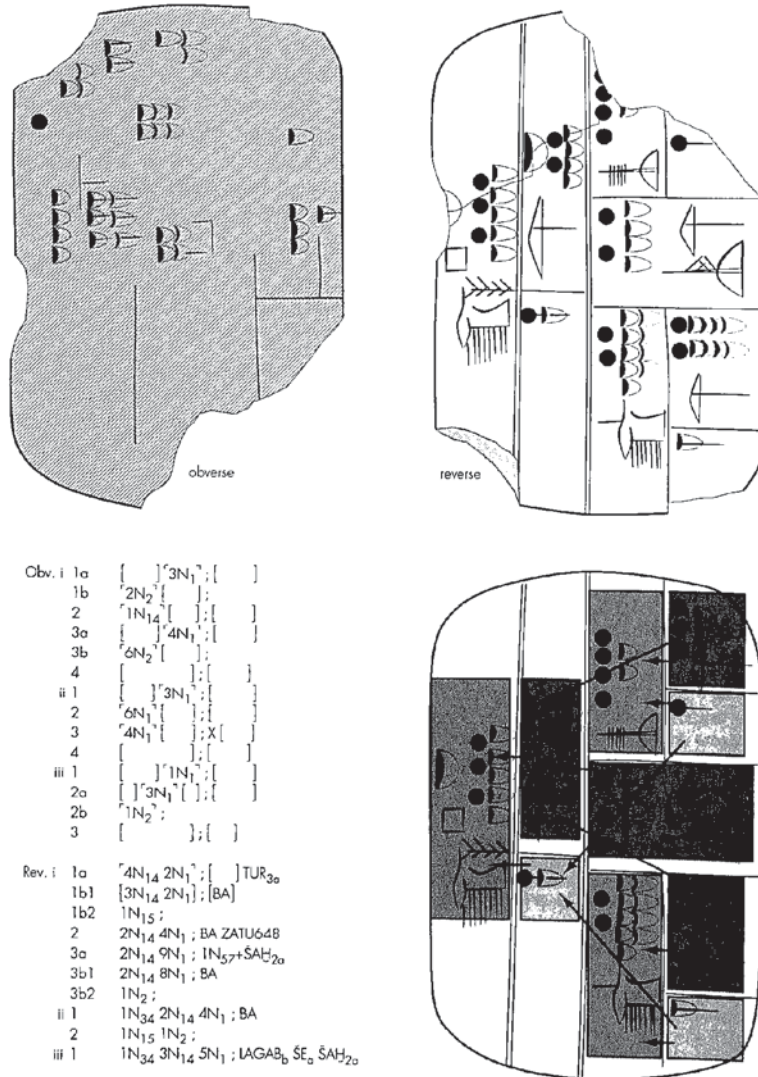


Figure 64: Pig-herding account
 The copy and transliteration of the archaic Uruk text W 23948 follow A. Cavigneaux, *BaM* 22 [1991] 57 (small differences between the drawing here and that of Cavigneaux result from my collation made in Baghdad in April 1986). The lower drawing contains a secure reconstruction of the totals on the reverse of the tablet.

account (figure 64) does, however, offer a good general outline of pigherding in the archaic period. The text apparently records the distribution of animals from a large herd of 95 pigs into two groups of adults assigned temple units in Uruk and a third comprised of juvenile animals. Despite the fact that the obverse of the text is almost entirely destroyed, its preserved traces of deeply impressed numerical signs confirm the assumption that this side of the tablet contained specific information about numbers of animals subsumed in totals on the tablet reverse. It is thus possible to recognize three columns on the obverse which likely correspond to the three main entries of the first column on the reverse face.⁴⁰⁰

The reverse of the partially destroyed account can be completely reconstructed. The first of three columns (counting from the right) consists of three entries, of which the first and third are further divided into two sub-cases to the right and one case to the left that contained a subtotal of animals listed in the sub-cases. Individual entries of numbers of pigs were qualified with the sign conventionally read BA (←), 'distributed' / 'inspected'⁴⁰¹ or through the addition to their corresponding numerical notation of horizontal strokes (system S'), apparently designating slaughtered animals.⁴⁰² The two qualifications BA and the numerical system S' are employed to form the second subtotals in the second column of the reverse of the account, comprising 84 BA animals and 11 counted using system S'; the addition of these two entries results in the final total of animals, qualified in the last (left) column of the reverse as "altogether (LAGAB₆/nigi n₂) 95 grain(-fed, ŠE₆) pigs". The animals are also qualified in the text according to their age; young pigs in their first year denoted 1N₅₇+ŠAH_{2a} (←) were not assigned one of the two households recorded in the first two cases of the reverse.⁴⁰⁴

⁴⁰⁰ The closest parallel to this text known to me was published by M.W. Green, *JNES* 39, 33, no. 39 = W 17729.gi (photo: UVB 11 [1940] pl. 38b), an account of a herd of 77 sheep.

⁴⁰¹ The sign, in subsequent periods used to denote the distribution of rations to dependent workers and animals, seems best translated in archaic sources with 'inspected' ('and found to be available', pictogram 'eye'), roughly corresponding to later Sumerian gub or ga₂, or possibly gurum₂ (GI+GAR). See P. Steinkeller, 'On the Reading and Meaning of igi-kár and gurum(GI.GAR)', *ASJ* 4 [1982] 149-151.

⁴⁰² First discussed by M.W. Green, *JNES* 39 (1980) 8, and interpreted as a qualification of sacrificial animals. A.A. Vajman, *VDI* 1981/4, 81-82 (see the German translation in *BaM* 21 [1990] 116-117), subsequently proposed a translation 'slaughtered', which seems to make better sense in context, connecting the sign semantically and graphically to later BAD.

⁴⁰³ The horizontal stroke before the sign ŠAH_{2a} is fully parallel to the sign combination U₄+1N₅₇ BAR used in the herding accounts discussed above, fig. 49, to qualify animals born in the accounting year of the text, whereby the first sign is known to represent 'one' or the 'first' year (cp. R.K. Englund, *JESHO* 31 [1988] 156-162). Old Sumerian accounts record the following corresponding qualifications of pigs: šah₂ u₂ SAL/nita ša₃.HI for piglets/shoots, šah₂ u₂ SAL/nita mu. 2-3 for pigs in their 2nd and 3rd years (in all likelihood including gilts, sows and barrows), and šah₂ šig₁ for breeding hogs, possibly boars ('reed thicker' pigs; cp. A. Deimel, *Or* 20 [1926] 57-59; R.K. Englund, *JESHO* 31, 141-147).

⁴⁰⁴ The institutions were signaled by the signs TUR_{3a} (←) and ZATU648 (←), comprised of a simplified form of the sign DU_{2a}, a pictogram of a reed hut, and a sign representing a cultic standard or emblem attached to a pole which stood at the front of and was possibly a structural part of the hut. These are two of the pictograms which represented presumable temple households in Uruk (see fig. 31 above).

6.3.3. Labor organization

The type of accounting format we have seen employed in recording household herds, including sheep and goats, cattle and pigs, during the archaic period toward the end of the 4th millennium B.C., and the administrative structures which must be assumed to underlie this format, in particular the goal of maximizing control and regulating production of the animals, was not restricted to domesticated beasts. Proto-cuneiform documents seem also to reward us with intriguing, albeit obscure information about the organization and exploitation of men and women, whose labor and low maintenance created the economic surpluses requisite for a growing urban elite; for the same archaic administrative interest in recording, as an example, the age of herded animals may be demonstrated in the organization of dependent labor. Individually named laborers are commonly found in archaic accounts, in which persons involved are totaled and specified by the signs SAL (\triangleright) and KUR₀ (\uparrow). Both signs are probably pictographic representations of human genitalia, the first sign designating the female and the second the male laborer. The compound sign called GEME₂ ($\triangleright\uparrow$) in the sign list ATU 2 represented both male and female laborers in the same way as the sign combination $\text{AB}_2 + \text{GU}_4$ ("cow+bull", see above) denoted "cattle" in dairy accounts. The text W 23999, 1 depicted in figure 65 contains an account of eight humans designated in the summation SAL+KUR₀ ($\triangleright\uparrow$).⁴⁰⁵ SAL and KUR₀ are here, just as in accounts recording herds of small and large cattle and, in the case of W 23948, pigs, booked separately according to sex and age: a group of five females consists of four women and one girl, a group of three males of one man and 2 boys.⁴⁰⁶ The only difference between the method of accounting for herded animals and for this group of humans, possibly slaves, lies in the fact that following entries of numbers of each sex and age category individual cases record the names of the persons involved.⁴⁰⁷ These accounts thus give a strong impression not of being an early census, but rather of being an account of a "herded" family of name-cognizant humans.

⁴⁰⁵ This compositum was first recognized by A.A. Vajman, "Die Bezeichnung von Sklaven und Sklavinnen in der protosumerischen Schrift," BaM 20 (1989) 121-133 [German translation of his Russian article in VDI 1974/2, 138-148; see also id., VDI 1981/4, 81-87 – BaM 21 (1990) 116-123], to represent male and female humans; the still seen reading gem₂ of the compositum in archaic texts is to be rejected. See now the treatment of the signs in proto-cuneiform and proto-Elamite texts in P. Damerow and R.K. Englund, Tepe Yahya, 24 and 53-57.

⁴⁰⁶ Based on this account, it has been possible to identify a number of other archaic texts of like format and parallel contents, including the second account in fig. 65 (and cp. the Jemdet Nasr accounts MSVO 1, 212-214 [see also Archaic Bookkeeping, 72-75]). Note the clear correspondence in the bookkeeping of the children qualified ŠA₃₀ TUR in W 23999, 1 (cf. the entry obv. ii 3a: 2N₁ ; 1N₅₇+U₄ TUR in W 20274, 2 as a possible further correspondence; the qualification in later periods was ša₃ .[H] [for children and juvenile animals!]) and the animals qualified 1N₅₇+U₄ and 1N₅₇+ŠAH₂₀ for large and small cattle and pigs, respectively. This is not to say that the designation SA₃₀ TUR will have qualified infants in their first year, but rather probably children which were "non-exploitable", i.e., too young to be set to some task. H. Waetzoldt estimated in "Die Situation der Frauen und Kinder anhand ihrer Einkommensverhältnisse zur Zeit der III. Dynastie von Ur," Aof 15 (1988) 40, that children will have been employed during the Ur III period beginning at the age of 5 or 6.

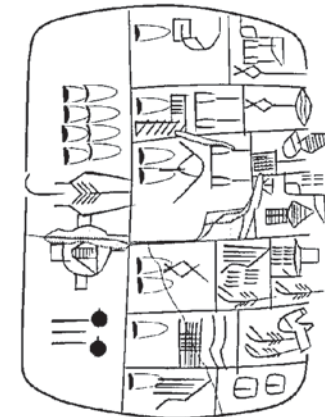
⁴⁰⁷ These together with further sign combinations in comparable texts should, as incontrovertible designations of individual persons, play a role in any attempt at language decipherment of the archaic texts (see above, section 4). It must be kept in mind, however, that, as is known from historic periods, dependent laborers and slaves often bore foreign names.



W 23999, 1

- obv. i 1a "5N₁" ; SAL
- 1b1a 4N₁ ; SAL
- 1b1b1 "NAB" DI "BU₀+DU₀"
- 1b1b2 "ZL₀" AN
- 1b1b3 ANŠE₀ 7N₅₇ DUR₂ DU
- 1b1b4 "LAL₃₀" GAR IG₀
- 1b2a 1N₁ ; ŠA₃₀1 TUR
- 1b2b TU₀
- 2a "3N₁" ; KUR₀
- *2b1a 1N₁ ; KUR₀
- 2b1b NA₀ NIR₀
- 2b2a 2N₁ ; ŠA₃₀1 "TUR"
- 2b2b1 "G₀ KIŠK₀ URI₃₀"
- 2b2b2 []

- obv. ii 1 8N₁ ; SAL+KUR₀ EN₀ EZEN₀ AN
- [H] URI₃₀ ZATU774



W 20274, 2

- obv. i 1a 1N₁ ; AL
- 1b MUŠEN TUR BU₀
- 2a 1N₁ ; EN₀ TUR
- 2b BU₀ ŠA₃₀1
- 3a 2N₁ ; 1N₅₇+U₄ TUR
- 3b1 GAL₀ LU₂
- 3b2 X MUŠEN 6N₅₇ ? KAŠ₀
- 4a 2N₁ ; BULUG₃
- 4b1 ŠU ZL₀
- 4b2 ZL₀ ŠUBUR PAP₀
- 5a 1N₁ ; U₂₀ A
- 5b GI+GI PIRIG₀1
- 6a 1N₁ ; ŠU
- 6b DUR₂ DUR₂

- obv. ii 1 8N₁ ; BAR ŠAM₂ "EZEN₀+SU₀"
- 3N₅₇+NUNUZ₀1

Figure 65: Accounts of herded humans?
Copies and transliterations of the human "herd" accounts W 23999, 1 (after A. Cavigneaux, BaM 22, 74; collated) and W 20274, 2. The texts record a group of eight probable slaves, divided into smaller groups according to sex and age in the first, and possibly in the second text, and named. The reverses are uninscribed.

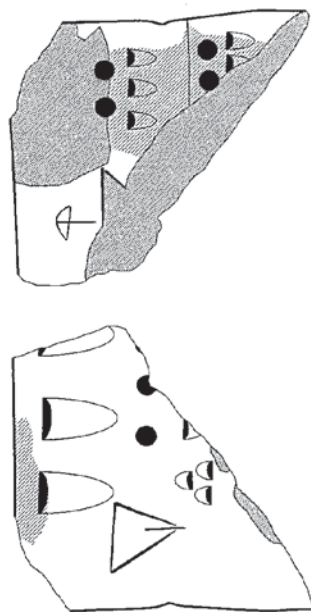


Figure 66: W 9827

The text contains an apparent account of a number of groups of male and female laborers, listed individually on the obverse ([] +23 in the first column, 22+ [] in the second) and totaled on the reverse (preserved is a notation representing in the sexagesimal system $211 + []$ female and male laborers, in proto-cuneiform SAL+KUR_o).

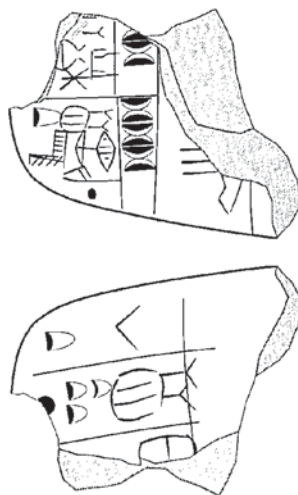


Figure 67: W 20274,93

According to later rationing systems, grain was distributed to laborers on a regular basis, wool or finished garments irregularly, usually once a year. A similar system seems documented in the above account, which records the apparent distribution to individuals of one TUG₂+BAD+BAD (a type of textile) and 360 products counted in the bisexagesimal system and thus presumably discrete grain rations.

It has not been possible to more closely quantify the numbers of persons controlled in this fashion by the archaic administrations of Mesopotamia. Such persons, who might conventionally be called 'slaves'⁴⁰⁸ until further text finds offer us a better basis for understanding

⁴⁰⁸ See the discussions of V.V. Struve, "Some New Data on the Organization of labour and on Social Structure in Sumer during the Reign of the IIIrd Dynasty of Ur," in: I.M. Diakonoff (ed.), *Ancient Mesopotamia* [...] (Moscow 1969) 127-172 (English translation of an article from 1949), G.A. Melikisvili, "Esclavage, féodalisme et mode de production asiatique dans l'Orient ancien," in: *Sur le "Mode de production asiatique"* (Centre d'Études et de Recherches marxistes, Paris 1974) 257-277, I.M. Diakonoff, "Main Features of the Economy in the Monarchies of Ancient Western Asia," in: *The Ancient Empires and The Economy* (Section VIII), *Troisième Conférence Internationale d'Histoire Économique*, Munich 1965, (Paris, The Hague 1969) 13-32, id., "Slaves, Helots and Serfs in Early Antiquity," *ActAntH* 22 (1974) 45-78, and

their exact status, are, however, booked into larger accounts. Such texts as W 9827 (figure 66), presumably of Uruk IV date, represent a consolidation of at least several smaller accounts, each of which was recorded in one case of the text's obverse face. The groups of 20+ individuals in those entries were added on the reverse of the tablet in a total of 211+ SAL+KUR_o.

Several archaic texts from Jemdet Nasr more precisely qualified laborers designated SAL and KUR_o with the signs SAG+MA (𒍪) and ERIM (𒂗).⁴⁰⁹ The latter sign was a pictographic representation of a yoke and presumably denoted fettered captives of war, consistent with reliefs from later periods depicting yoked enemies being led into captivity.⁴¹⁰ The sign combination SAG+MA did not survive past the archaic period. Nevertheless, we can, with some confidence, interpret its constituents to signify a human (the head SAG, known also as a constituent part, together with GAR, of the sign GU₇, 'ration for a human') and a pictogram for a cord used to hang fruit to dry (MA), employed in the archaic texts to denote certain categories of fruit. Consequently, the sign combination SAG+MA probably originally signified captives being led away with a rope tied round their necks. Both signs ERIM and SAG+MA qualified, following this interpretation, persons subjected to forced labor, and these were generally qualified SAL and KUR_o.

Further data regarding the administration of dependent laborers can be culled from accounts of their victualing.⁴¹¹ Since no less than in later periods these laborers will have been given only enough to guarantee for their productivity, we can assume that in line with Ur III practice they received approximately a liter of grain daily, and in yearly allotments a new garment, or the amount of wool necessary to make one. One account might reflect such a system of distribution in the archaic period. The obverse face of the text W 20274,93 (figure 67) consists of entries divided into two notations. The first represents '1' of the garments designated TUG₂+BAD+BAD followed by sign combinations representing apparent persons or officials,⁴¹² the second is only numerical and represents 3 120 = 360. We can assume that this otherwise unqualified notation stands for grain rations since these are the particular field of application of the bisexagesimal system, and given the fact that the administrative timekeeping system of

I. J. Gelb, "From Freedom to Slavery," in: D.O. Edzard, (ed.), *Gesellschaftsklassen im Alten Zweistromland und in den angrenzenden Gebieten*, CRRAL 18 (München 1972) 81-92, id., "Prisoners of War in Early Mesopotamia," *JNES* 32 (1973) 70-98, id., "Definition and Discussion of Slavery and Serfdom," *UF* 11 (1979) 283-297 (with detailed bibliography pp. 295-297), id., "Terms for Slaves in Ancient Mesopotamia," *FS Diakonoff* (Warminster 1982) 81-98; for later periods cf. R. Westbrook, "Slave and Master in Ancient Near Eastern Law," *Chicago-Kent Law Review* 70 (1995) 1631-1676; M.A. Dandamaev, *Slavery in Babylonia. From Nabopolassar to Alexander the Great (626-331 B.C.)* (DeKalb, IL, 1984), in particular pp. 30-35 (history of research).

⁴⁰⁹ See the texts MSVO 1, 212-214 and 217.

⁴¹⁰ The sign came to represent 'military troop' and later 'soldier/laborer' (Sumerian reading *erir₂*) only after its immediate pictographic meaning was lost.

⁴¹¹ The question of the third millennium system of rationing has played an important role in judging the nature of those receiving rations. The seminal work of I. J. Gelb, "The Ancient Mesopotamian Ration System," *JNES* 24 (1965) 230-243, remains a primary source for a general survey of rations.

⁴¹² The second case contains the combination EN_o BA KI_o ZATU647, also found in the geography list ATU 3, 160 no. 1, obv. iii 9 (meaning unclear).

the archaic period operates with a 360-day year it may be posited that the counted rations represent one 'man-year'.⁴¹³ Unfortunately, no other accounts exhibit this garment/grain product relationship.⁴¹⁴

Numerous accounts, as well as the archaeological record, do support an assumption that in the redistributive archaic administration grain was rationed to household dependents at a rate consonant with later tradition. A. Deimel first recognized in 1933 the pictographic referent of the sign GAR (Sumerian 'ninda' and Akkadian correspondence *akalu*) as a dining bowl;⁴¹⁵ since H.J. Nissen's discussion of the beveled-rim bowl, a so-called diagnostic ware dating from the Middle Uruk, but at its most common during the Late Uruk period and found in great masses in archaic levels of Uruk, which he interpreted to be a rationing bowl represented by GAR, no consensus has been reached in the field as to the ultimate function of these devices. Suggestions have ranged from the reasonable bread-baking mold, to the less plausible vessels for yogurt or salt.⁴¹⁶ Certainly the written sources give clear testimony to the correctness of Nissen's original interpretation. Counted cereal products in grain accounts are generally totaled and qualified with the ideographic sign GAR.⁴¹⁷ These products can contain the equivalent of grain represented by the sign N_1 , down to a measure represented by N_{30c} ⁴¹⁸ in the archaic grain capacity system. The ideogram does have a specific metrological equivalent in archaic accounts, however; with some variations, it corresponds to the numerical sign N_{30a} equal to $1/30$ of the sign N_1 in the capacity system.⁴¹⁹

⁴¹³ Note that the same relation applies to the preceding, damaged entry. The only other reasonable interpretation of this 1:360 ratio is that the grain product notation represents a value equivalent of the garment, but the reverse summations suggest that the textile products SU_2 and $TUG_{2a}+BAD+BAD$, and the small cattle UDU_a were held in the account as discrete objects and not consolidated into a common value equivalent such as grain.

⁴¹⁴ Two unpubl. accounts, W 21016,4 and 21019,4 share common notations of $3N_{51} = '360'$ (rations). Their fragmentary state, however, makes a judgment of the purpose of these quantities impossible.

⁴¹⁵ ŠL 2, 597.

⁴¹⁶ Indeed, the discussion of the function of these bowls continues unabated. Beyond R.K. Englund, 'Administrative Timekeeping in Ancient Mesopotamia, JESHO 31 (1988) 121-185, in particular pp. 162-164 with the treatment of the text MSVO 4, 27 (fig. 68 here), according to which the role of GAR as a rationing unit representing one day of grain in the archaic system of administrative timekeeping was firmly established, see the most recent discussions in A.R. Millard, 'The Bevelled-Rim Bowls: Their Purpose and Significance,' Iraq 50 (1988) 49-57, and G. Buccellati, 'Salt at the Dawn of History: The Case of the Bevelled-rim Bowls,' in: P. Matthiae et al. (eds.), *Resurrecting the Past [...]* (Leiden 1990) 17-40.

⁴¹⁷ The product GAR seems to stand in contrast to GUG_{2a} (denoting baked breads?); see MSVO 1, 109 obv. iii 1a, 111 rev. ii 1a, and compare the summation rev. i 1 of grain products baked in ATU 5, pl. 38, W 9123,ae (DU_{8c}, SIG₂₀₃, ZATU726₂ and GAR) with the similar qualification of a total in the text W 9169,c.

⁴¹⁸ See above, fig. 41.

⁴¹⁹ See P. Damerow and R.K. Englund, ATU 2, 153-154⁶⁰, and add MSVO 1, 140, obv. i 1a, with an explicit N_{30a} qualifying a GAR reconstructed according to the parallel text MSVO 1, 138, and Archaic Bookkeeping, p. 42, fig. 38, obv. ii 5a (ca. $1N_{20a}$ per unit), and R.K. Englund, JESHO 31, 162-164. For a comprehensive list of further qualifications of the products GAR with metrological and ideographic signs, see the appendix to my article 'Grain Accounting Practices in Archaic Mesopotamia,' in: J. Høyrup and P. Damerow (eds.), *Changing Views on Ancient Near Eastern Mathematics* (Berlin, forthcoming).

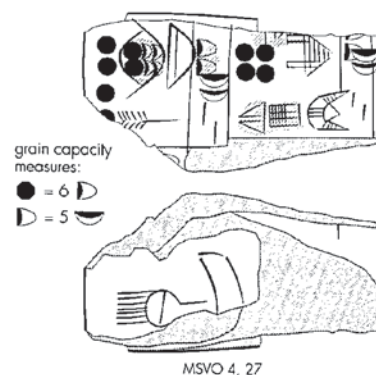


Figure 68: Daily bread
Our best evidence suggests that the beveled-rim bowl was an instrument of the archaic rationing system, equivalent to a daily ration of about 0.8 l. The grain notation in the first case of the text MSVO 4, 27, represents a measure equal to $24 \times 30 \times N_{30a}$, that is, 24 30-day months at one-thirtieth N_1 per day. This one-thirtieth of the basic measure N_1 , represented by the sign N_{30a} , is known to correspond to the sign GAR inscribed immediately after the timekeeping notation and this pictogram represents the beveled-rim bowl. The notation $2N_1 2N_{30}$ (= $2.4 N_1$) in the sub-case of the first entry represents exactly one-tenth of the amount recorded in the notation $4N_{14}$ (= $24 N_1$).

The fragment of an account pictured in figure 68 offers the clearest textual evidence for the meaning of the sign GAR. MSVO 4, 27,⁴²⁰ contains a notation recording a grain distribution, qualified as GAR, over a period of 24 months (represented by the sign combination $U_4 \times 2N_{14} 4N_1$). The resulting measure of grain (represented by $4N_{14}$) divided by (24 months \times 30 days per month =) 720 days gives us a measure of $1/30 \times N_1$ (remembering that $4N_{14} = 24N_1$), or exactly $1N_{30a}$ of grain per day. This is precisely the amount we would expect to correspond to GAR and, as was discussed above, section 6.2, implies a close relationship between the archaic system of administrative timekeeping and the grain capacity system, namely, that 'GAR grain' equals one day, and that ' $1N_1$ GAR grain' equals one month. The absolute size of the beveled-rim bowl shows a variance of between about 0.5 and 1 liter,⁴²¹ and so is fully consistent with the amounts of grain distributed daily to dependent workers in later third millennium administrative centers.

6.3.4. Grain and grain products

The major activity of laborers at all times in Mesopotamian history consisted of the tending of fields. Third millennium accounts recorded the plowing and sowing of individually surveyed fields, the necessary irrigation and tending of the crops, and the labor-intensive harvest and storage of the grain. Legendary yields of 50:1 and better were documented, and even the norm of 30:1 according to which cereal harvests were predicted and rents and interest calculated in the Ur III period would have appeared fabulous to medieval farmers in Europe.⁴²²

⁴²⁰ Edited in JESHO 31, 162-164.; see above, n. 266.

⁴²¹ See still ATU 2, 153-154⁶⁰, and the literature cited above, n. 385.

⁴²² See K. Butz, 'Landwirtschaft,' in RIA 6 (1980-83) 470-486, K. Butz and P. Schröder, 'Zu Getreideerträgen in Mesopotamien und dem Mittelmeergebiet,' BaM 16 (1985) 165-209, and M.A. Powell, 'Salt, Seed, and Yields in Sumerian Agriculture. A Critique of the Theory of Progressive Salinization,' ZA 75 (1985) 7-38. B. Hruska has published an excellent survey of current knowledge of Mesopotamian agricultural practices in the preprint series of the Max Planck Institute for the History of Science, Berlin, entitled *Sumerian Agriculture: New Findings* (no. 26, Berlin 1995).

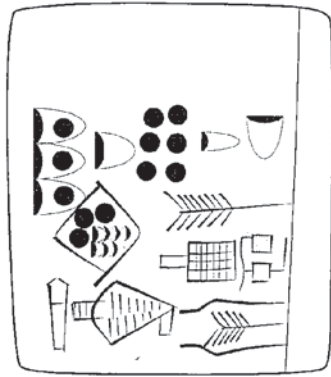


Figure 69: MSVO 3, 29
The single entry probably represents a consolidation of an account contained on another tablet, including notations of a large amount of grain (ca. 135,000 liters), an accounting period of 37 months, and the responsible office 'KU ŠIM'.

It is thus not unexpected that the majority of archaic accounts are concerned with cereals. However, texts currently available to us seem to document with very few exceptions exclusively the storage and distribution of grain. Such accounts can be recognized above all through the inclusion, usually in the key position of colophons, of the sign ŠE_0 (𒀭), a pictogram of a barley spike), of a numerical notation using the grain capacity system, or of an ideogram which denotes a grain product, often collectively qualified with the sign GAR (𒄠), a pictogram of a beveled-rim bowl probably used to hold a daily ration of grain) or DUG₀ (𒄠), a pictogram of a clay jar with spout) representing dry grain products and beer, respectively. For example, the account MSVO 3, 29 (figure 69),⁴²³ contains a large grain capacity system notation⁴²⁴ corresponding, if our interpretation of the absolute size of the measures represented by the individual members of the grain capacity system are correct, to approximately 135,000 liters of grain. The notation is qualified with the object designation ŠE_0 and the largest month notation known from the archaic text corpus, namely, a notation representing 37 months.⁴²⁵ Even though we are not in a position to interpret the final meaning of the ideographic notation accompanying these signs,⁴²⁶ the size of the grain measure recorded in this text remains an important indication of the size and probable complexity of household economies active in the Late Uruk period.

A pair of Uruk III period grain accounts, both possibly from Uqair, record in eight cases amounts of grain again qualified with the sign ŠE_0 and with sign combinations representing

⁴²³ The text identification refers to the archaic tablets of the Erlenmeyer collection (see above, n. 49), to be edited forthcoming by P. Damerow and myself in the volume MSVO 3.

⁴²⁴ Recognizable in the final sign N_{300} (𒄠); the repetition of the sign N_{14} six times would also exclude both the sexagesimal and bisexagesimal systems from consideration).

⁴²⁵ That is, three years plus one month. Whether this in any way reflects an archaic intercalation in a three year cycle, as was common in later administrations, is a matter of speculation.

⁴²⁶ They might reflect an exchange transaction account consolidating the grain used in the brewing office of the official 'KU ŠIM' (see Archaic Bookkeeping, pp. 36-37) during this period of 37 months. To put the amount in perspective: 135,000 liters of grain would be sufficient rations to feed a crew of 150 workmen for a period of three years.

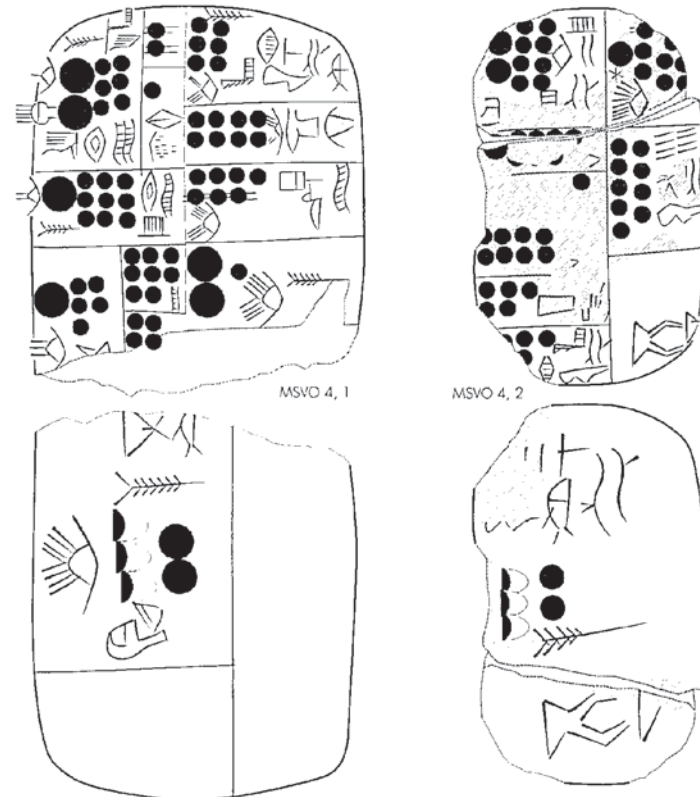


Figure 70: Eight-year grain accounts MSVO 4, 1-2

the first through the eighth year of an unclear administrative period (figure 70).⁴²⁷ Although the individual grain measures are further qualified according to the apparent field connected with the grain, the purpose of this connection is unclear, since the grain would appear to have neither served as seed nor have been the harvest of the named fields.⁴²⁸

⁴²⁷ $1-8\text{N}_{57}+U_4$, whereby in the second text $8\text{N}_{57}+U_4$ is replaced by the simplified 8N_{57} inscribed with two rows of four strokes each. See above, section 6.2. This type of account with ordinally reckoned years is comparable to the time notations and summations in the artificial 10-year Ur III account TCL 2, 5499, for which see Archaic Bookkeeping, pp. 97-102.

⁴²⁸ The apparent artificial calculations of grain ration distributions (signaled by notations representing round numbers and by the sign GU_2 [SAG+GAR] in no. 1, rev. i 1) and the fact that both totals are equal to a large measure equivalent to 660 of the basic grain measure units N_1 (representing a measure of approximately 25 liters and so altogether ca. 16,500 liters or 10 tons of grain) at least suggest that the texts might represent production or cost norms.

Grain distribution

Aside from such accounts of larger amounts of grain measured in the capacity system, numerous archaic accounts record the distribution of grain in the form of dry grain products and beer. The Uruk III period text presented in figure 71 is a good example of these types of accounts. The first case of the text's obverse contains two sub-cases. In the first, a bisexagesimal notation representing 598 discrete units is qualified by the sign GAR, so denoting grain rations. In the second, a sexagesimal⁴²⁹ notation representing 59 units is qualified by the sign DUG_o, denoting jars of beer.⁴³⁰ The function of the text seems indicated on its reverse face. The sign BA (𒀭) inscribed alone in the final column to the right must represent a global qualification of the grain products and beer recorded on the obverse; the often close relationship of this sign with notations including the sign GAR seems to suggest that it had a meaning similar to the later tradition of 'distribute'.

This qualification 'distribution' was particularly common in the archaic texts and was used to represent the transfer of goods to lower- and to higher-level state dependents. A BA transaction concerning high-level officials is recorded in the texts MSVO 3, 64 and 58 (figure 72). The obverse of the former tablet has 4 entries, each recording a specific amount of grain in the capacity system, and each including the title of an official. The first, second and fourth entries include professional designations which are found both in the lexical list Lu₂ A and in many administrative accounts. The sign combination EN_o SAL of the third entry is not found in the professions list; it is, however, very common in accounts, particularly in this form in accounts from Jemdet Nasr, where it probably describes the wife of the ruler, EN_o. The reverse side of the tablet contains the usual sum of the entries, qualified by the signs ŠE_o and BA (presumably "grain distribution"), and further sign combinations "KU ŠIM" and "NI SA", which stand for two persons or offices; these are probably co-signers for the transfer of the grain.

A similar account is MSVO 3, 58. Numerical notations representing relatively large measures of grain are booked into entries qualified with sign combinations designating persons, including here the same "KU ŠIM" and "NI SA" who in the first account signed the grain out. The receiving persons in this account, however, are not known from the professions list. A working hypothesis to explain both accounts would be that the named individuals were heads of rather large households who received grain distributions from communal storage facilities.⁴³¹

⁴²⁹ We know this notation, which in another context might be bisexagesimal, is from the sexagesimal system, since all archaic notations of vessels which cross the '120 barrier' continue with the '60' (𒀭), and not with the '120' (𒀭) signs characteristic of the bisexagesimal system.

⁴³⁰ Note the close approximation of a 10:1 relationship between dry grain products and jars of beer, which may themselves have had a capacity of ca. eight liters. If the beer was brewed at the rate of 1:1 (one measure of grain per measure of finished beer) – the brewing ratio of the common man in later periods – and if the sign GAR represented the standard measure equal to that represented by the sign N_{30a} (see above, section 6.3.3), these sizes would imply that the two notations of GAR and DUG_o were roughly value-equivalent.

⁴³¹ Both texts also offer straightforward evidence of calculations in the capacity system. In MSVO 3, 64, the addition consists of 2 units of the size 𒀭, + 2 units of the size 𒀭, + 22 units of the size 𒀭, + 1 unit of the size 𒀭. The total can be seen to be fully consistent with the replacement rules of the capacity system discussed above, section 6.1, of N₃₄ = 3N₄₅, and N₄₅ = 10N₁₄.

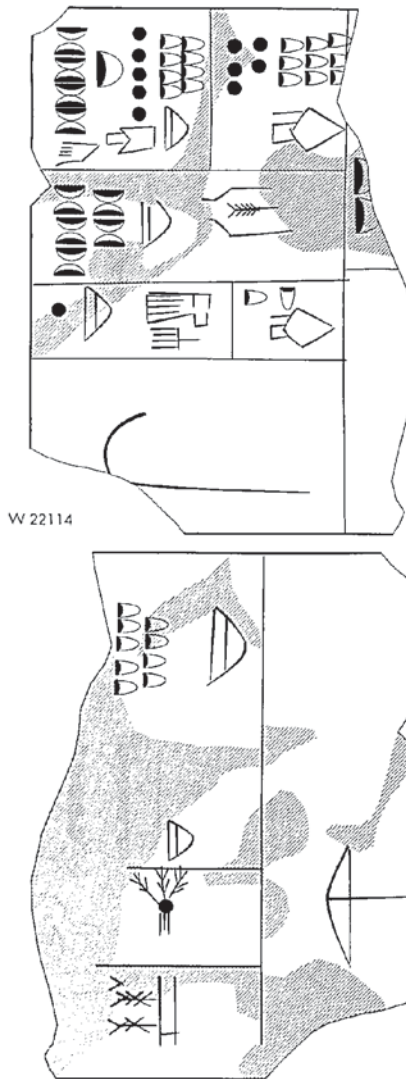
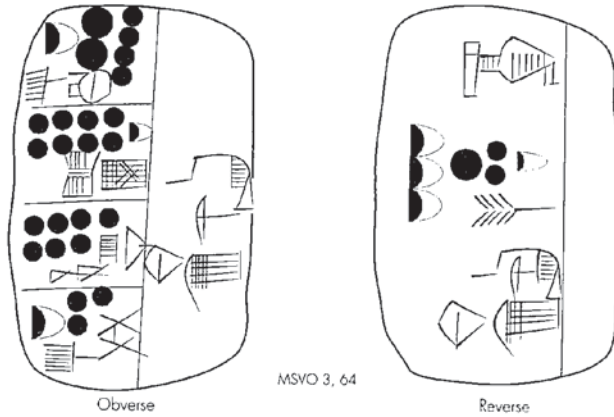


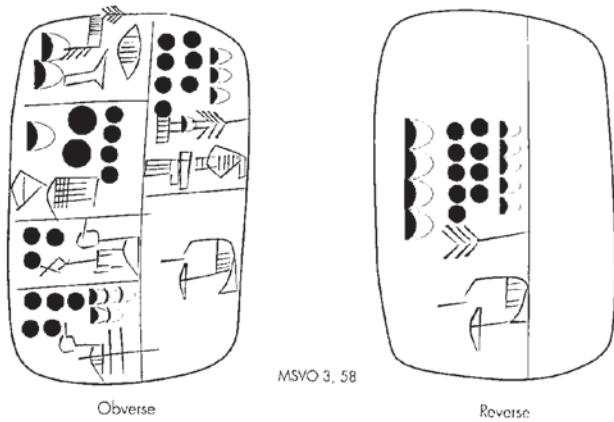
Figure 71: An account of 'bread and beer'



MSVO 3, 64

Obverse

Reverse

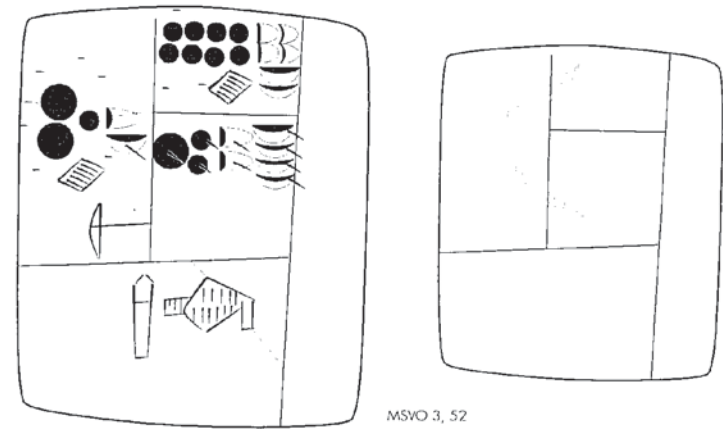


MSVO 3, 58

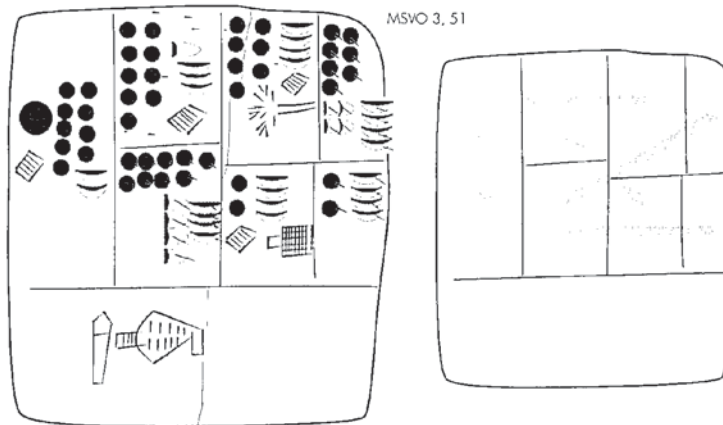
Obverse

Reverse

Figure 72: MSVO 3, 64 and 58
 These two consolidated accounts contain notations on their obverse faces representing grain distributions (sign BA [𒀭] on obverse and reverse) to high officials, and a summation on the reverse. The office "KU SIM" apparently co-signed the note with "NI SA" in the upper account; note that both offices were themselves beneficiaries of distributions recorded in the lower account.



MSVO 3, 52



MSVO 3, 51

Figure 73: MSVO 3, 52 and 51
 The two tablets, inscribed only on the obverse, represent presumably consolidated accounts of beer production drawn from separate tablets. In the first case, notations representing amounts of barley groats and malt were subsumed in a total qualified as "BA", "distribution"; the account is a functional duplicate of the left half of the second tablet, which included, additionally, entries recording distribution to two separate offices (?) ("NAGA" [𒀭] and "DUB" [𒀭]). The graphics to the right indicate the individual summands of the respective texts.

Another pair of accounts from the Erlenmeyer collection, MSVO 3, 52 and 51 (figure 73) offer more explicit information about the function of the official "KU ŠIM". Since these two and a series of further accounts identify "KU ŠIM" as an official responsible for the processing and distribution of large measures of cracked grain or groats on the one hand (represented by notations in the derived capacity system Š*), and of malted barley on the other (represented by notations in the derived capacity system Š̄), we have concluded that he is responsible for a brewery directly related to an archaic central administration.⁴³² Although only noted on the former, we can assume that both accounts dealt with distributions (sign BA) of the brewing ingredients – these being the expenditure journals of the office of "KU ŠIM". Like the accounts discussed above, these texts offer fine examples of the complexity of archaic grain accounts. The same sort of complexity, however to a somewhat higher degree and centered on the use of the global qualifier GI (𒄀) instead of BA, is found in the unprovenient accounts MSVO 4, 45 and 43 in figure 74. Both texts register on the obverse face, in two sections separated by a double dividing line, measures of grain qualified as either barley (by the sign ŠE_o and numerical notations in the basic capacity system) and/or emmer wheat (numerical notations in the derived system Š̄)⁴³³ together with an ideographic notation which must represent individuals who either received or delivered the measures of grain recorded in the same cases, dependent on our understanding of the sign GI. If this sign has a semantic function similar to that of later Sumerian gi/gi₄, that is, qualifying the movement of goods into a central administrative authority, the individuals would be delivering agents.

Grain calculations

Archaic accountants recorded the movement of grain measures from one office to the next, but also were responsible for overseeing the use of grain in the production process. We have seen that barley and emmer were above all ground and processed into dry grain products, probably a mixture of breads and simple rationing measures, and into barley beer. Ledgers recording the amounts of grain in various stages of processing needed to produce bread and beer belong to the most numerous of all archaic texts. The tablet depicted in figure 75⁴³⁴ is in fact not one of these accounts; it is, instead, one of but several archaic administrative exercises, as is obvious by the very large and round numbers represented in its individual cases, and by the fact that no persons and no designations of the purpose of the text are recorded.

The first column of MSVO 4, 66, records numbers of dry grain products counted with the bisexagesimal system, followed in each case with the amount of grain used in their production. In the first case, the production of 60 units of the product 𒄀 (= 1/5 𒄀) required 60 x 1/5 𒄀 = 12 𒄀 (and since 6 𒄀 = 1 ● in the grain capacity system) = 2 ●. The same kind of calculations are made in the following cases with ever larger numbers of ever smaller grain products,⁴³⁵ ending not with a member of the capacity numerical system, but with its ideographic equivalent, the sign GAR+6N₅₇, which as we have seen was the pictographic representation of the beveled-rim rationing bowl supplemented with a varying number of strokes and which had its correspondence in the capacity system with the sign N_{30o} (𒄀) representing 1/30 of the basic unit N₁ (𒄀). The second column of the obverse face of this text records in like fashion jars of beer, using the sexagesimal system, and in an accompanying sub-case the amount of barley groats used in their brewing.⁴³⁶ These clear calculations thus demonstrate the close relationship between numerical systems employed in archaic accounts to qualify discrete objects and the capacity system used to qualify measures of grain:

obv. i	1	1N ₃₄ ; 1N _{39o}	2N ₂₀
	2	1N ₅₁ ; 1N ₂₄	2N ₂₀
	3	1N ₅₁ ; 1N ₂₆	1N ₂₀ 2N ₅
	4	2N ₅₁ 1N ₃₄ ; 1N ₂₈	2N ₂₀ 3N ₅
	5	5N ₅₁ ; 1N _{29o}	4N ₂₀
	6	5N ₅₄ ; GAR+6N ₅₇	1N ₃₇ 3N ₂₀ 2N ₅
ii	1	2N ₃₄ ; DUG _o +U ₂₀	5N ₂₀ 1N ₅ 1N _{42o}
	2	3N ₃₄ ; DUG+AS _o	6N ₂₀
	3	5N ₃₄ ; KAŠ _o	3N ₂₀ 2N ₅
rev. i	1	1N ₅₄ ; BA GAR	1N ₄₇ 1N ₂₀ 5N ₅
	2	5N ₅₄ ; GAR+5N ₅₇	1N ₃₇ 3N ₂₀ 2N ₅
	3	1N ₄₈ ; DUG _o KAŠ _o	1N ₄₇ 4N ₂₀ 3N ₅ 1N _{42o}
ii	1	1N ₃₇ 2N ₄₇ 9N ₂₀ 4N ₅ 1N _{42o}	
	2	8N ₁₈ 4N ₃ 1N ₄₀	

The grain calculations:⁴³⁷

obv. i	1	60 x 1/5 𒄀	(𒄀) = 12x 𒄀 = 2x ●
	2	120 x 1/10 𒄀	(𒄀) = 12x 𒄀 = 2x ●

⁴³² The latter of the two texts is only on its surface more complex. The left upper half of the account can be seen to parallel the entire account of the former text. To the right, more detailed information was included concerning presumable condiments (NAGA_o and DUB_o) added to the brews.

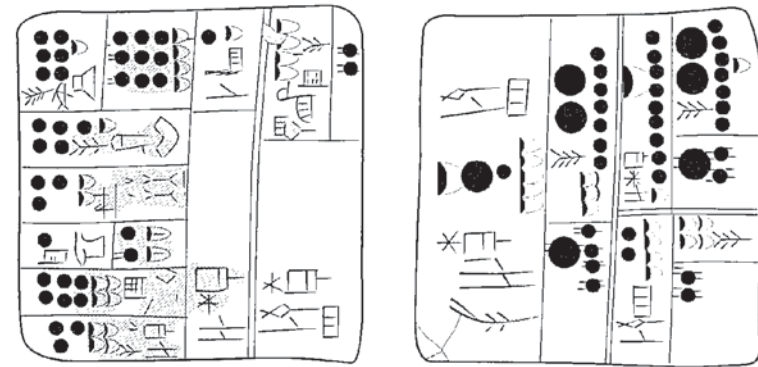
⁴³³ Barley (six-rowed, *Hordeum hexastichum*) and emmer wheat (*Triticum dicoccum*) are in fact the two major cereals which have been paleobotanically identified in archaic levels of Uruk; see W. Nagel, RIA 3 (1957-71) 316, and J.M. Renfrew, BSA 1 (1984) 32-44. The derived capacity system was created by simply adding two short strokes to either side of signs from the basic system, occasionally simplified to two long strokes drawn through the whole sign. See A.A. Vojman, "Über die protosumerische Schrift," ActAntH 22 (1974) 21-22.

⁴³⁴ MSVO 4, 66; see above, section 6.2, and the first successful treatment of the text in J. Friberg, ERBM II, 33-43, in copy in id., "Mathematik," RIA 7/7-8 (1990) 539. According to the dealer who sold it to the Iraqi department of antiquities in 1933, the tablet came from Larsa.

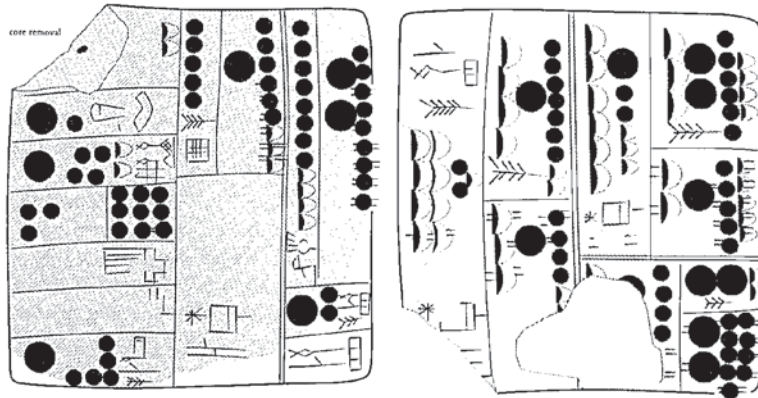
⁴³⁵ Each of the products is in fact well represented as such in the archaic text corpus, in all cases employing the bisexagesimal counting system.

⁴³⁶ As with the dry grain products, the type of beer recorded in the first entry required more grain for its production, the following two types progressively less, due probably to the fact that higher beer qualities required more barley in the brewing process than did the beer of the "common man". The sign DUG_o is according to this text the denoter of a beer vessel of a particular size, KAŠ_o the denoter of the liquid itself. The differentiation between DUG_o and DUG_o (𒄀 and 𒄀) was in the archaic sources very strict. The latter sign lacking the representation of a spout referred without exception to vessels containing different kinds of fats, for the most part animal fats such as ghee, lard and the like.

⁴³⁷ The results are shown in the basic capacity system. All calculated grain "costs" are in fact in the derived system Š* (see above, fig. 41).



MSVO 4, 45

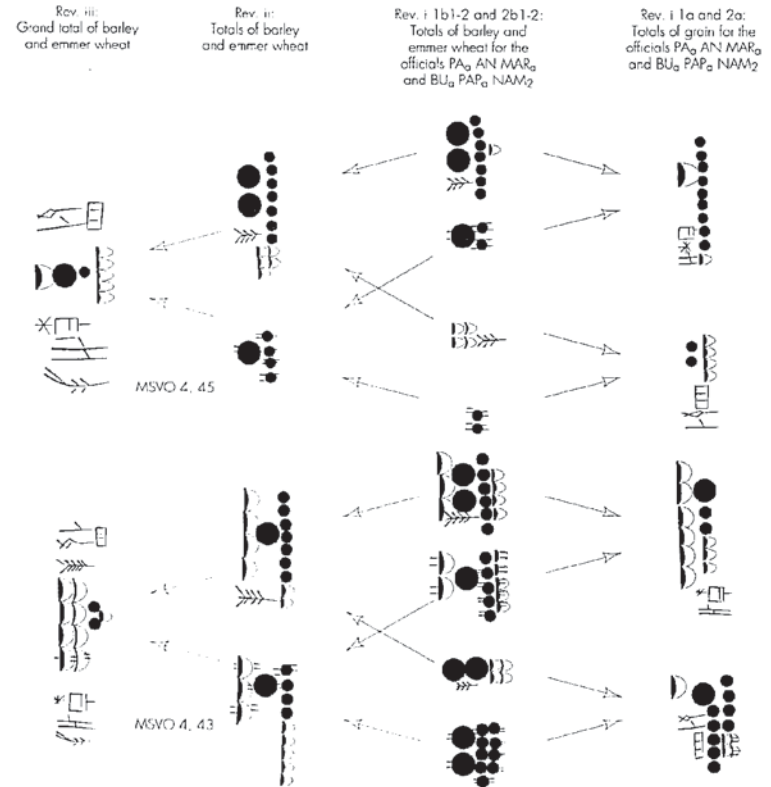


MSVO 4, 43

Figure 74: A comparison of the additions in the two grain accounts MSVO 4, 45 and 43.

3	120 x 1/15	(S ⁴)	= 8x	-	1x ●	2x
4	300 x 1/20	(S ⁴)	= 15x	-	2x ●	3x
5	600 x 1/25	(S ⁴)	= 24x	-	4x ●	
rev. i 1 1200					1x ●	1x ● 5x

The first column of the reverse of MSVO 4, 66, contains the totals of the dry grain products and of the beer vessels, in each case with a notation of the total amount of grain used in their production, added together for a grand total of barley groats in the second column to



the left. A final notation below this grand total represents, as we know from complete accounts of archaic brewing offices, the amount of malt added to the beer during its processing.⁴³⁸ The quantity of malt added varies according to the sort of beer (figures 76-77); in the case of MSVO 4, 66, the malt was added to all three sorts at an average rate of 3 measures of malt to 5 of barley groats.

⁴³⁸ The oblique stroke added to the signs of the system S⁴ is presumably the pictographic representation of the sprout from the individual kernels, just as the dotted impressions of the system S⁴ are suggestive of cracked or rough-ground barley groats.

The account recorded on the tablet MSVO 3, 11 (figure 76), offers more exact calculations. The entries on the obverse of the text consist of varying numbers of numerical notations qualified by the signs ŠEN₆, ŠEN₆tenū and DUG₆ (E₆, $\overline{\text{E}}_6$ and $\overline{\text{E}}_6$) designating types of beer, and followed by an ideographic notation representing a temple household or a high official. The reverse of the tablet carries the sum of the jars for each beer type together with the amount of barley and malt needed for their production.⁴³⁹

The same sequence of entries representing a delivery to one office, recorded in the middle column of the obverse of MSVO 3, 11, is found in another account, MSVO 3, 6 (figure 76). It may be that the latter text merely records a different delivery of the same measures of beer; however, we suspect that the oblique stroke added to the sign GI in the large account⁴⁴⁰ acted as an accounting check-off that the entry had been successfully carried over.

A veritable manual of grain calculations was inscribed on one tablet from the Erlenmeyer collection (figure 77). Eleven different cereal products and five kinds of beer were compiled in a form which, given subscripts indicating the purpose of the account and for whom it was drawn up, would have been ascribed to a normal accounting office. Lacking these ideographic qualifications, the text is, like MSVO 4, 66 (figure 75), to be considered a school exercise. As in MSVO 4, 66, five different numerical systems were used in the account: the bisexagesimal system for the cereal products, the sexagesimal system for the beer containers, and three different systems for the measures of cereals.⁴⁴¹

The grain calculations in MSVO 3, 2:

obv. i	1	10 ¹ x 1/2	($\overline{\text{E}}_2$)	= 5x	= 1x	
	2	10 x 1/3	($\overline{\text{E}}_3$)	= 3 1/3x		
	3	20 x 1/4	($\overline{\text{E}}_4$)	= 5x	= 1x	
	4	30 x 1/5	($\overline{\text{E}}_5$)	= 6x	= 1x	1x
	5	20 x 1/5	($\overline{\text{E}}_5$)	= 4x		
	6	60 x 1/6	($\overline{\text{E}}_6$)	= 10x	= 2x	
obv. ii	2	30 x 1/6	($\overline{\text{E}}_6$)	= 5x		
		30 x 1/10	($\overline{\text{E}}_{10}$)	= 3x	= 1x	3x ⁴⁴²

⁴³⁹ Beers qualified ŠEN₆ were brewed with the addition of malt at the rate of 1:1 for both types GAL₆ and TUR. The beer qualified simply DUG₆ was supplemented with malt at the rate of 2:3.
⁴⁴⁰ Note the same check mark added to the sign U₄ at the bottom of the first column, and to GI in the fourth case of the third column of the text.
⁴⁴¹ The basic system was used for the specification of the quantities of the cereal ingredients contained in the products; the other two are those derived systems used to qualify barley groats and malt.
⁴⁴² Different amounts of rough-ground barley were required in the production of the respective units ŠAGunū (x) and DUG₆gunū (y). In the first case (obv. ii 2), 30x and 30y required the equivalent of 8N₃₀ grain, or on average 2/15 N₃₀ per unit; in the second (obv. iii 2), 120 of the former and 60 of the latter products required the equivalent of 26N₃₀. Since the replacement of x and y with the factor 2/15 would in the second case result in (180 x 2/15 =) 24 instead of the recorded 26 N₃₀, the solution which fits both equations 30x + 30y = 8N₃₀ and 120x + 60y = 26N₃₀ will require x = y. This solution, which also harmonizes with what we know from other attestations of the products concerned, requires that x = 1/6 and y = 1/10 N₃₀ (solving for y: 120x = 32N₃₀ - 120y and 120x = 26N₃₀ - 60y, or 60y = 6N₃₀, or y = 1/10 N₃₀, with, directly, x = 1/6 N₃₀).

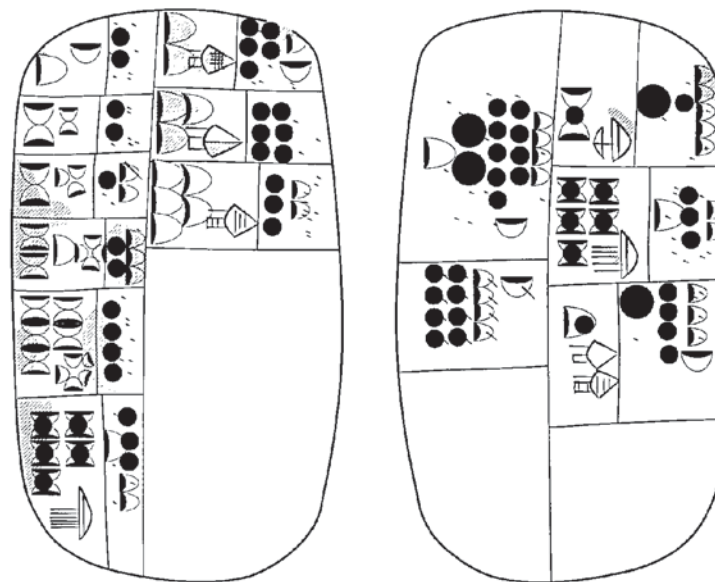
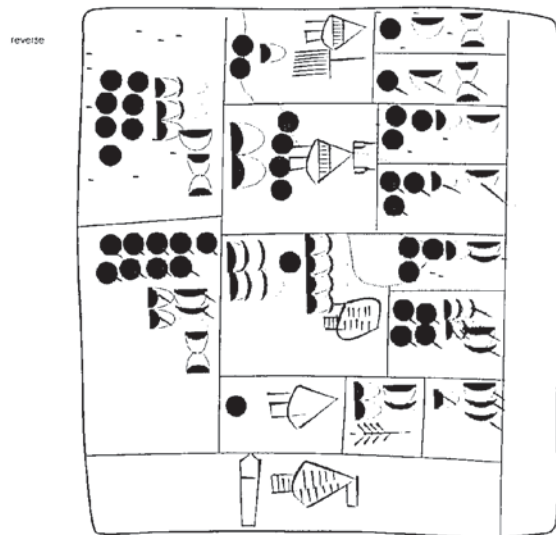
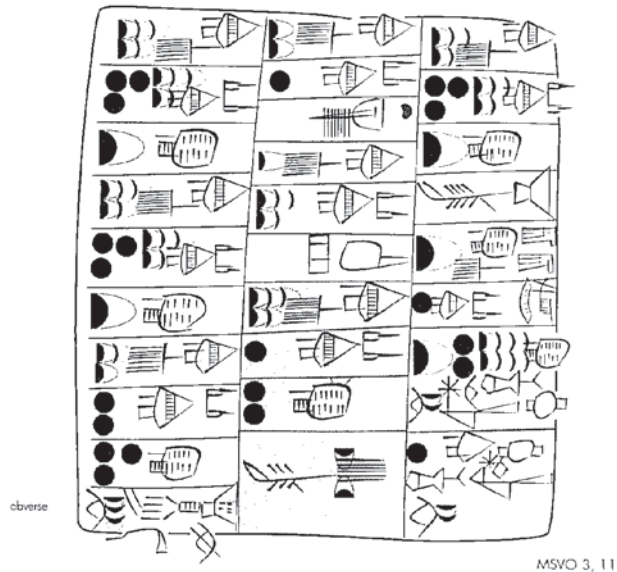


Figure 75: MSVO 4, 66
 The text pictured above represents one of only several administrative exercise tablets from the archaic corpus. First published and partially understood by A. Falkenstein, MSVO 4, 66, was a key text in Jöran Friberg's correct identification of the structure of the archaic metrological system used to count grain measures, in particular the relationship of 1:6 between the two signs N₁₄ and N₁ earlier believed to be 1:10.

	5	1800 x 1/3	($\overline{\text{E}}_3$)	= 360x	= 1x	2x ⁴⁴³
obv. iii	2	120 x 1/6	($\overline{\text{E}}_6$)	= 20x	= 5x	1x ⁴⁴⁴
		60 x 1/10	($\overline{\text{E}}_{10}$)	= 6x		

Knowledge of the calculations of archaic grain processing evident in the artificial texts discussed above substantially eases the task of understanding the meaning of large numbers of real grain accounts, and even aids in reconstructing all or part of damaged texts. The preserved text and a nearly complete reconstruction of a grain account from Jemdet Nasr⁴⁴⁵ offered in figure 78 are good examples of this process.⁴⁴⁶

⁴⁴³ Note the deviation from the norm of GAR = 1/30 N₁.
⁴⁴⁴ See above, n. 442.
⁴⁴⁵ Cereal grains found inside pots at Jemdet Nasr were discussed by H. Field, "Ancient Wheat and Barley from Kish, Mesopotamia," *American Anthropologist* 34 (1932) 303-309.
⁴⁴⁶ See the detailed treatment of this text in my "Grain Accounting Practices in Archaic Mesopotamia," in: J. Höyryp and P. Damerow (eds.), *Changing Views on Ancient Near Eastern Mathematics* (Berlin, forthcoming).



entries concerning the same
beer distribution to the same
office called

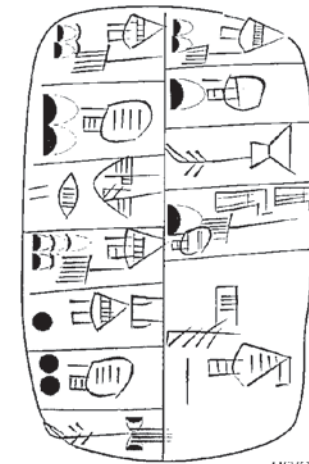



Figure 76: MSVO 3, 11 and 6

The large account on page 194 represents the consolidation of at least five texts, one of which is depicted above (note particularly the oblique stroke etched at the base of the sign G1 |  | in the former text, missing in the latter, it presumably indicated that the respective entry had been checked for accuracy). The counted measures of beer (jugs, probably of various sizes and/or representing beer sorts of different strengths) recorded on the obverse of MSVO 3, 11, were in the reverse of the account totaled and qualified with the amount of the grain products: barley, greats, and malt required for their brewing. The entire account was signed by the responsible office: KU SIM.

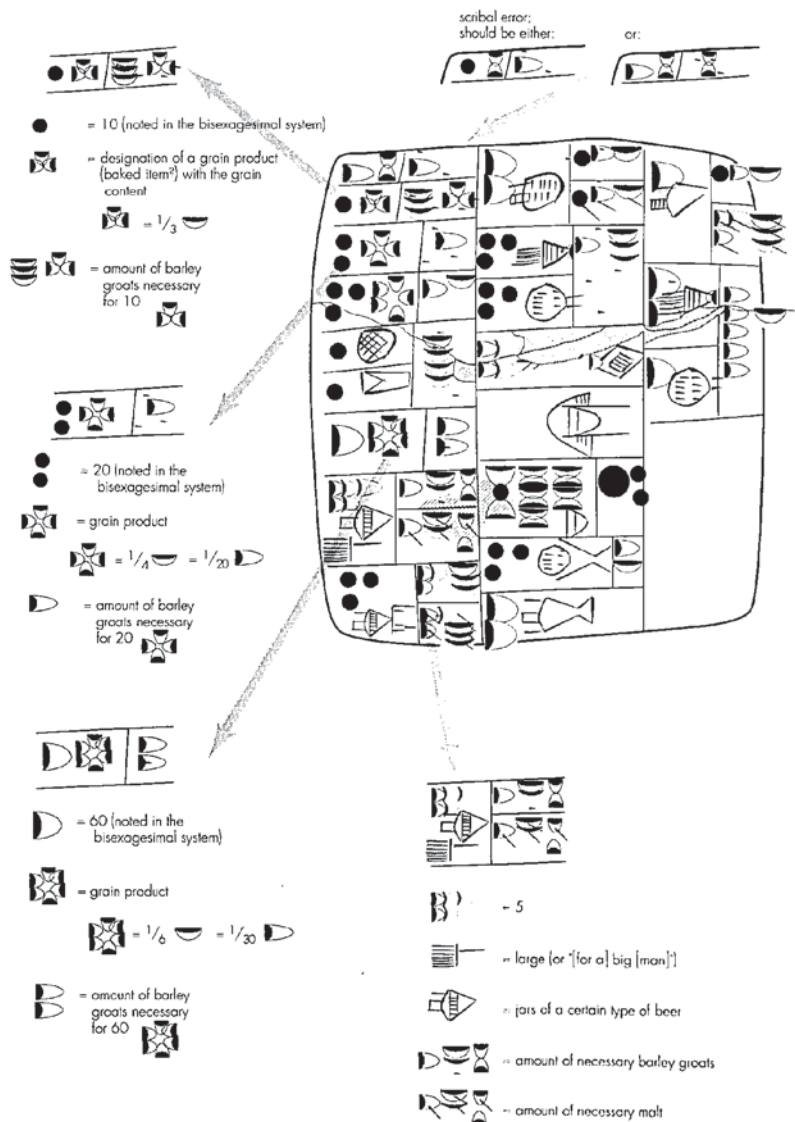


Figure 77: MSVO 3, 2
The text seems to have served as a school exercise in administrative bookkeeping.

The obverse face of the tablet contains three discrete sections. The first presents a number of grain products together with the amount of grain necessary for their production, clearly parallel to the format seen in figures 75 and 77 above. These objects are quantified using the bisexagesimal system for dry grain products and the sexagesimal for jugs of beer, and the measures of grain needed are, as seen before, qualified with notations from the derived capacity systems designating groats and, in the case of beer, malt.⁴⁴⁷ A double dividing line below the last grain notation in obv. ii 3 separates this section from a second section with entries recording non-cereal objects. These include animals and animal products (dried fish [SUHUR, see above, section 6.3.1], sheep and goats [UDU_o, see above, section 6.3.2], containers of animal fats, textile goods) and dried fruits⁴⁴⁸. With the exception of the still poorly understood notation N₅₂ from the derived bisexagesimal system B* in the case ii 6⁴⁴⁹, all notations derive from the sexagesimal system. The final, ideographic section describes the function of the text. This notation seems to include a toponym NI_o+RU (possibly the archaic designation of Jemdet Nasr⁴⁵⁰), a time notation 2N₅₇ SU_o GIBIL⁴⁵¹ and a qualification of all the recorded products, GU₇, which may be translated "rations".⁴⁵²

⁴⁴⁷ The total of the amount of barley groats used in its brewing, recorded on the reverse of the tablet, allows us to confidently reconstruct the first of the two beer notations as 20 beer jugs (DUG_o KAS₃), requiring (2N₁ N₃₀ N₂₄ [rev. ii 2b1] - 3N₃₀ N₂₄ [obv. ii 2b] =) N₁ 3N₃₀, or 8 of the units N₃₀. This means that each jug of KAS_o required 2/5 N₃₀ or perhaps just 1 1/2 - 2 liters of barley groats. The second beer qualified with the sign combination E_{2a} DUB_o required 1/3 N₃₀ of grain for each of 10 jugs. The same 1/3 N₃₀ is also attested as the grain quantity necessary for the production of a jug of beer in the text MSVO 4, 66 (fig. 75), with obv. ii 3: 5N₃₄ KAS_o / 3N₂₀ 2N₅, i.e., 300 + ((3 6 + 2) 5 =) 100N₃₀ = 3 jugs per N₃₀. There seems to have been no fast rule concerning the inclusion of malt measures with entries of individual types of beer. See fig. 79 below.

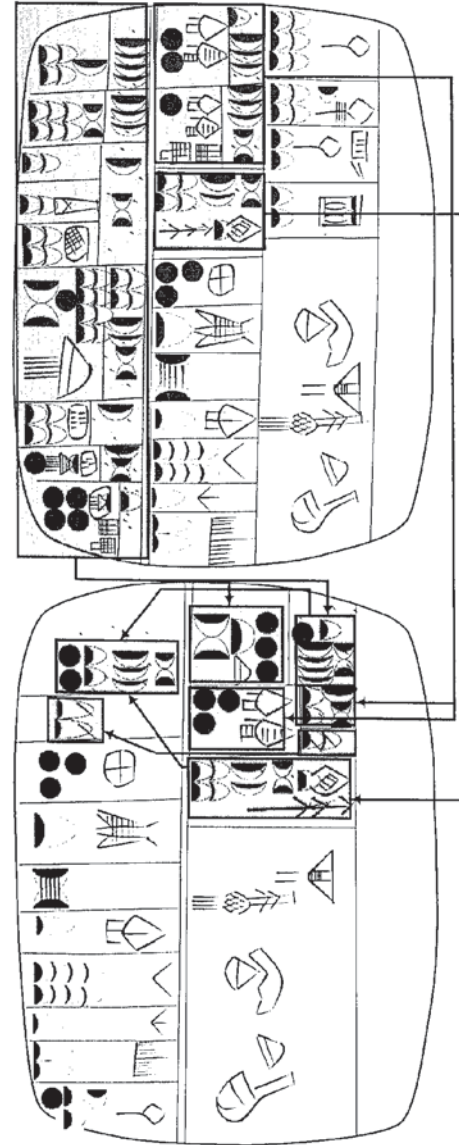
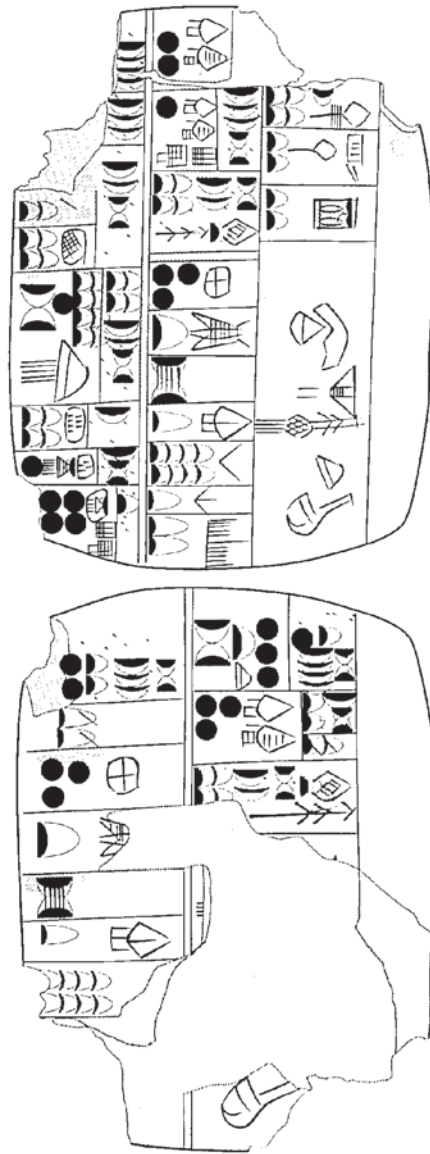
⁴⁴⁸ The entries obv. iii 1-4 include object designations which form a particular set of goods best documented in a large group of Jemdet Nasr tablets sealed with the so-called City Seal (R.J. Matthews, MSVO 2, 34-38, and see above, fig. 27). Based primarily on the pictography and later use of the sign MA together with length measurements (see above, n. 116), it is plausibly equated with a string used to tie up and dry fruit, and in a transferred sense with the fruit itself.

⁴⁴⁹ Notations in this system might represent a type of fish product.

⁴⁵⁰ Note that 1) the sign combination is attested only in the Jemdet Nasr text corpus, yet in very large numbers (in fully 59 of 244 texts), 2) a characteristic entry sequence in the large city seal text group, PN / NI_o+RU / 3N₅₇ MUŠ₃₀ / UNUG_o (perhaps 'from PN of Jemdet Nasr, for the male(?); 3N₅₇ = KUR) Inanna in Uruk'), exhibits the pattern PN / GN₁ / DN / GN₂ known from other texts, and 3) the combination NI_o+RU is most often attested with AB₃₁, which may be the "strange building" of Jemdet Nasr (see above, section 2) as well as with SANGA_o, "bookkeeper". It cannot be excluded, however, that NI_o+RU itself refers to a SANGA_o official at Jemdet Nasr.

⁴⁵¹ In a position otherwise occupied by signs denoting years, nN₅₇+U₄. The double stroke 2N₅₇ seems to lend numerical meaning to the entire combination, although it has been impossible to discover the numerical structure of the apparent system in the same fashion as was possible to delineate the archaic administrative time notations for year, month and day (above, section 6.2). We have in this system the numerical notations 1N₅₇, 2N₅₇, 3N₅₇, 4N₅₇, in MSVO 1, 94, 6N₁ and 1N₁₄ 2N₁, and in MSVO 1, 90, the complex notation 3N₅₇+U₄ SU_o 6N₁ GIBIL (cp. my remarks in J. Hájny and P. Damerow (eds.), *Changing Views on Ancient Near Eastern Mathematics* [Berlin, forthcoming]).

⁴⁵² See above, n. 380



i		ii		iii
1a	1b	1a	1b	1
2a	2b	2a	2b	2
3a1				3
3a2	3b	3		4
3a3				
		4		
4a	4b	5		5
		6		
5a	5b	7		
6a	6b	8		
		9		
7a	7b	10		

Obverse

i		ii	
1		1a	1b
2		2a	2b1 2b2
3		3	
4			
5		4	
6			
7			
8			
9			
10a	10b		

Reverse

Case identifications in the text transliteration

Figure 78: MSVO 1, 93
 The account seen here can be reconstructed with a high measure of certainty due to its relatively good state of preservation and to the straightforward numerical notations of its entries. Only the entry rev. i 10 (N₁₄ 2N₁ N₆; MA) is not justified by parallel accounts.

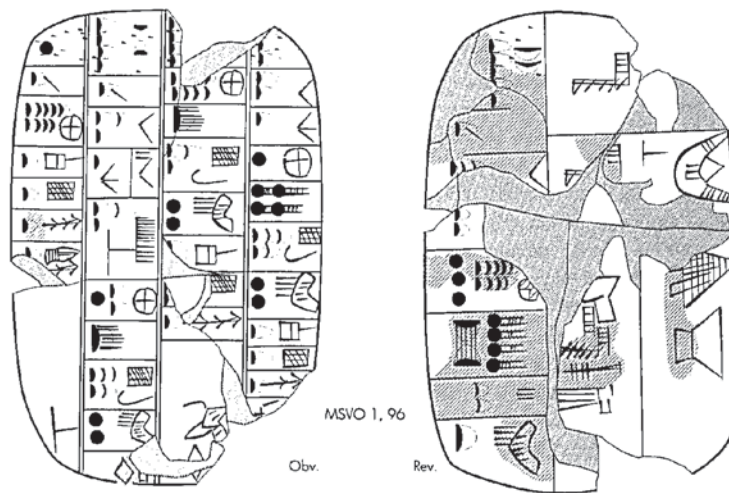
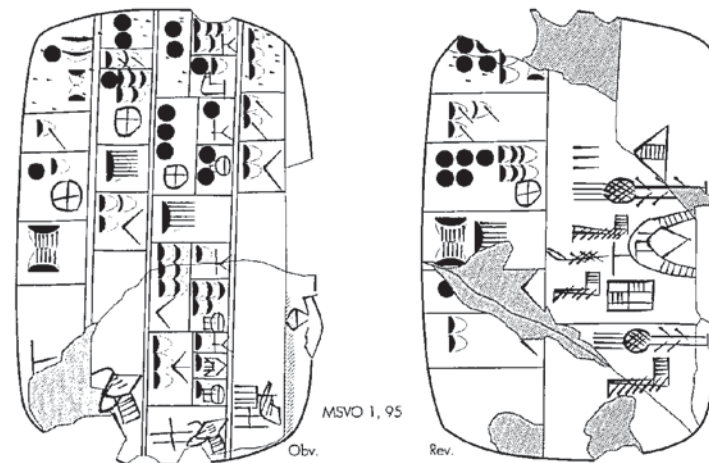
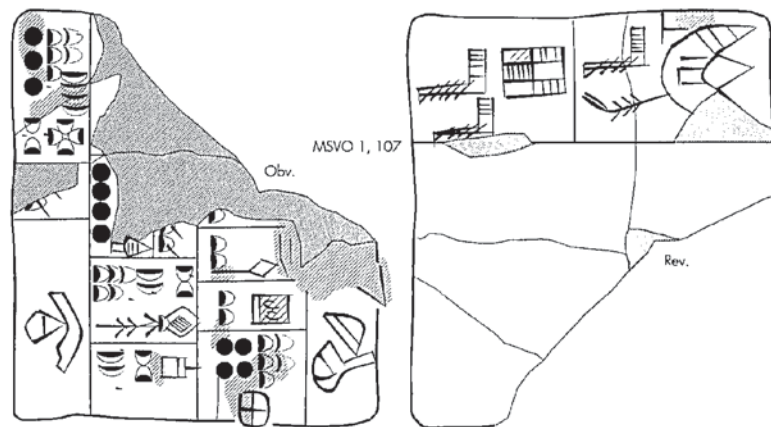
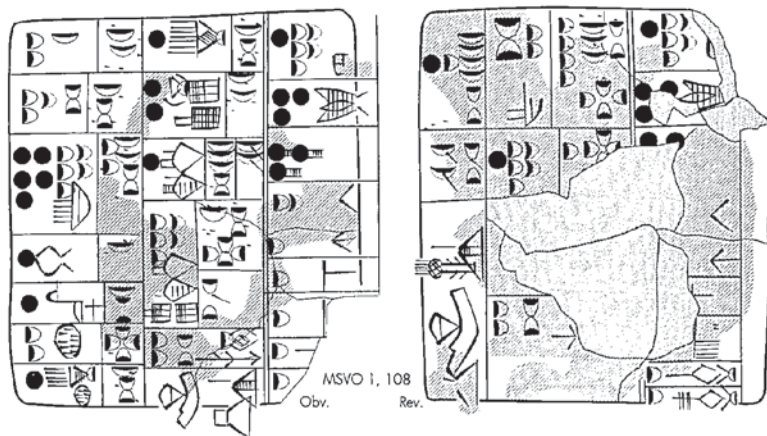


Figure 79: Complex grain accounts from Jemdet Nasr
The two texts MSVO 1, 107 and 108, contain accounts from the same level of bookkeeping as MSVO 1, 93, discussed above. The two accounts on page 201 represent a level of consolidation of such texts as MSVO 1, 93 and 107-108; each column of those accounts consisted of a series of entries drawn from the summations of individual accounts now lost. The goods recorded were presumably delivered to central authorities by the individuals named in the respective columns.

The grain calculations in MSVO 1, 93:

obv. i	1	[4]	1	☐	= 4	☐	
	2	6	1/2	☐	= 3	☐	
	3	8	1/2	☐/☐	= 1 1/2	☐	
	4	138	1/6	☐	= 23	☐	≈ 4 ☐ 2 1/2 ☐
	5	4	1/4	☐	= 1	☐	
	6	10	1/6	☐	≈ 1 1/2	☐	
	7	40	1/8	☐	= 5	☐	= 1 ☐

MSVO 1, 93, is one of a number of examples of rationing texts from Jemdet Nasr which exhibit parallel formats and contents. The best currently known parallel text, MSVO 1, 108 (figure 79, page 200 top), records in its first section numbers of dry grain products together with the barley groats necessary for their production, followed by a second recording quantities of beer together with both measures of groats and malt. The third column of the obverse contains a section of non-grain products in the same sequence as that recorded in MSVO 1, 93. The reverse face of MSVO 1, 108, also closely parallels that of no. 93 in both summations and subscript.

The text MSVO 1, 107 (figure 79, page 200 bottom) represents a shortened form of the two accounts MSVO 1, 93 and 108, merely recording the totals of a separate ledger.⁴⁵³ The text includes all the elements of full accounts, i.e., notations representing barley groats (and malt) used in the production of dry and liquid grain rations (first column), notations representing a total both of numbers of dry grain rations (GAR) and of jars of beer together with their respective grain (and malt) equivalents (second column) and notations representing non-grain products, including both small cattle and dried fruits.

The two Jemdet Nasr accounts MSVO 1, 95-96 (figure 79, page 201), represent the highest level of grain accounting known to us from that site. Each column of the obverse of these texts contains a consolidated account of the type discussed above, cleansed of all details. The first entries in each column represent relatively large measures of milled grain (and malt) used in the production of dry grain products and beer⁴⁵⁴ – neither of which is mentioned at this level of accounting – and are followed by entries concerned with the same types of non-grain goods, including sheep and goats, fishery products (?; system B*) and with products from the textile manufactories.⁴⁵⁵ The apparent delivering agents (? of the goods listed are high officials of the central administration of Jemdet Nasr.⁴⁵⁶

These accounts offer a wealth of information concerning the processing of grain and the constitution of beer, bread and other cereal products – as is obvious from a perusal of

⁴⁵³ Few examples of individual receipts or journals which were copied into larger accounts (see above, fig. 76) have been identified, although the accounts can scarcely be explained otherwise.

⁴⁵⁴ We can assume that only those columns which include a notation representing a measure of malt (in MSVO 1, 95, cols. i, ii and iv; in 96, cols. i and ii) derived from accounts including beer processing.

⁴⁵⁵ Including, however, a number of undeciphered ideograms, among them in MSVO 1, 96 obv. i 4: MÄR, i 5: KID_b, i 6: MU and ii 9: KU₂gunü.

⁴⁵⁶ See below, with figs. 83 and 87.

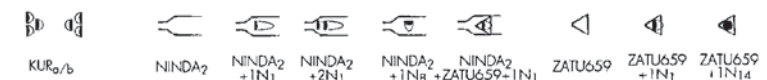
DRY CEREAL PRODUCTS AND RATIONS: GENERAL DESIGNATIONS



DRY CEREAL PRODUCTS AND RATIONS: NUMERICAL SIGNS IN IDEOGRAPHIC USE



DRY CEREAL PRODUCTS AND RATIONS: COMBINATIONS OF NUMERICAL SIGNS AND IDEOGRAMS



DRY CEREAL PRODUCTS AND RATIONS: IDEOGRAMS



LIQUID PRODUCTS CONTAINING CEREALS: BEERS




SEMI-LIQUID PRODUCTS CONTAINING CEREALS: DAIRY FATS (?)



Figure 80: Designations of cereal products and rations in the archaic texts

figure 80 – which fed the archaic communities of Mesopotamia. More importantly, the accounts formed part of a complex system of victualing both at the high, and of course at the lower level of organization. Some, as J. Friberg has suggested, might also reflect a specific aspect of the temple household organization known from the later third millennium in which provisions, known as $sa_2.du_{11}$ rations, for deities or revered elites were registered. These included, in a striking parallel, bread and beer, sheep, fish, dairy products and fruits, often in this order.

6.3.5. Fields

Of course the grain registered in the majority of archaic accounts represented the yield of difficult work in the fields (proto-cuneiform sign GAN_2 , ) surrounding documented settlements. Few texts combine notations both from the grain capacity and from the area measures systems,⁴⁵⁸ thus probably implying that seed or harvest grain from fields was being recorded. One of the best known examples of this combination is found in the Uruk III period account W 19726,a in figure 81. The 'obverse' face of this tablet⁴⁵⁹ preserves one numerical notation representing, in later Sumerian tradition, $40 bu r_3$, or about 640 acres.⁴⁶⁰ To the left of this notation are two damaged signs, one of which is certainly the pictogram GAN_2 . The 'reverse' contains a grain notation, indeed one which represents far and away the largest capacity measure in the archaic text corpus, corresponding to ca. 550 tons of emmer.⁴⁶¹

⁴⁵⁷ The sign presumably represents irrigated fields defined on a long axis by two parallel canals, with feeder canals running between them; compare the hypothetical plots calculated in the text MSVO 1, 2, presented in fig. 83. An unusually involved numerical sign system was used in the archaic period to qualify the size of fields, for which see the table in fig. 41 above. In no instance has it been possible to isolate an occurrence of an area measurement which could be interpreted to be a qualification of a city lot. We might expect such a notation to consist of a small fraction of an iku, represented in archaic texts with the sign N_1 . However, the only likely candidate for such a division is the sign N_8 (—) found in several texts from Jemdet Nasr and probably representing $1/10 N_1$ (see here fig. 83 and my remarks in N.A.B.U. 1995:38); these all refer to divisions of a field. The ideogram SAR_9 as precursor of the later sign sar , representing 1 ninda² or $1/100$ iku, seems in all notations of surface measures to qualify, if anything, the type of produce grown on fields concerned, and in no case can discretely counted SAR_9 be confidently interpreted to represent surface measures and thus measures of gardens or vacant or developed lots, as was the case in later periods.

⁴⁵⁸ See above, fig. 41, for factor diagrams representing these systems.

⁴⁵⁹ As is the case with many such text fragments, it is difficult to recognize a difference between obverse and reverse. Assuming that W 19726,a represents a harvest account led necessarily to the recording first of field measures and including on the reverse the grain measures representing the harvest.

⁴⁶⁰ The sexagesimal and the field measurement systems were the two most conservative numerical systems in third millennium Mesopotamia, and were presumably linked by a system of lengths which, though not evident, is certainly implicit in the archaic texts, in particular in the calculation of field areas. In order to establish the size of a field surface, two different standards were employed, the linear measure based on a metrological unit approximately equivalent to 6 meters (later Sumerian 'ninda'), and the surface measure 'garden' (plot; Sumerian 'sar'), the equivalent of one square ninda. Although units of length were sexagesimally based, field measurements followed an irregular system probably derived from traditional methods of sowing and harvest.

⁴⁶¹ The notation in fact represents an amount five times as large as the next largest measure, that recorded in W 17729,au (unpubl.). Note that assuming our interpretation of this text is correct (see ATU 2, 140), the

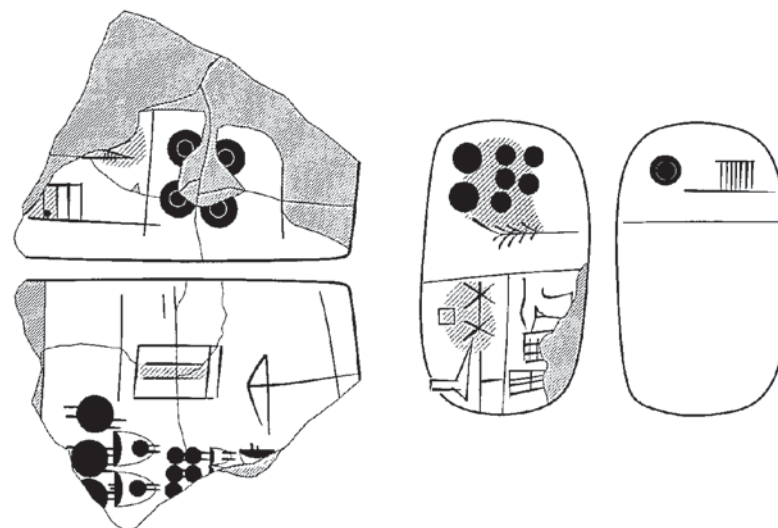


Figure 81: W 19726,a
According to yields known from later texts, the harvest from the field surface recorded in the preserved notation on the obverse of this account ($4 bu r_3$, ca. 640 acres) would be about 220 tons of grain. The preserved part of the notation on the reverse corresponds to an amount of about 550 tons of emmer.

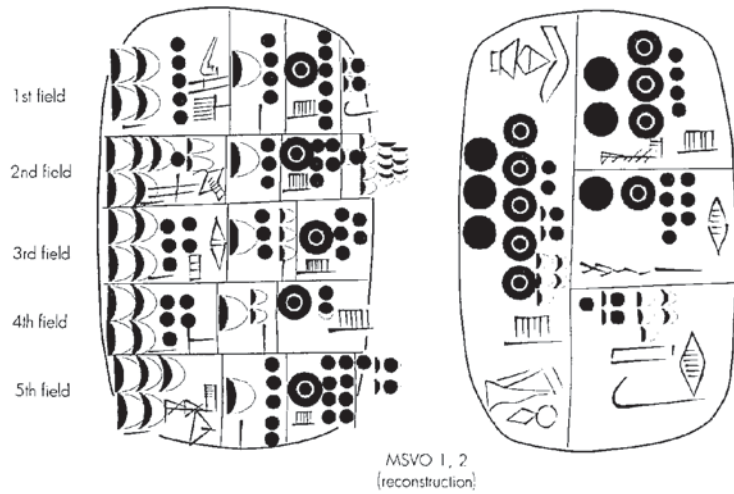
Figure 82: MSVO 1, 10
This is the only archaic text which implies a standard relation between field and grain measures of $15N_1$, or, according to our calculations, ca. 360 l per bur. This would be in rough accordance with seed and feed rates per bur known from later 3rd millennium texts.

Based on the Ur III normed yield of 30 gur (9000 liters) per $bu r_3$, this amount of grain would correspond to somewhat more than twice as much as would be expected from the field recorded on the obverse of the account, suggesting that that notation was one of two or more which registered grain fields surrounding Uruk.

A second, complete account, presumably but not certainly from Jemdet Nasr (figure 82), seems to bear evidence of an archaic norm for sowing grain. There, the grain notation on one face of the tablet stands in a relation to an area measure on its reverse face of $15N_1$ grain per N_{14} ($bu r_3$).⁴⁶² Using our hypothetical absolute values of $GAR = N_{300} \sim 4/5$ liter,

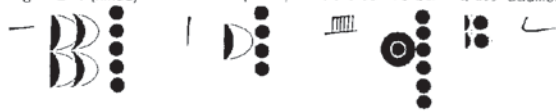
sign N_{46} would have served in the derived capacity system S' to represent both a measure 10 as large as that represented by N_{10} , and a measure 1800 as large (see above, fig. 41). Not only would the connection with field measures on the obverse of the account speak for this interpretation, but the use of N_{46} to represent a multiple of N_{45} would find a good analogy in the use of N_{48} to represent a multiple of N_{34} in the basic grain system, both based on the sequence $N_{45} > N_{48} > N_{34}$ in the sexagesimal system (the sexagesimal system served to record larger grain measures in later grain capacity systems as well). It may be noted that this large measure of emmer wheat would provide over a million rations of the size distributed in the archaic period to dependent laborers (ca. $4/5$ liter); that would correspond to yearly rations for 3000 workers.

⁴⁶² The area of 1 'bur' ($\bullet = 10 bu r_3$) on the reverse corresponding to an amount of 25 \bullet of grain on the obverse. Relative to the area, this would equal 25 \bullet ('GAR units') per iku.



Calculation of the first field:

length 290 (ninda) x width 100 (ninda) = field area 16 bur + 2 ese 'additional' (that is together 300 instead of 290 iku; calculation error?)



length measures:

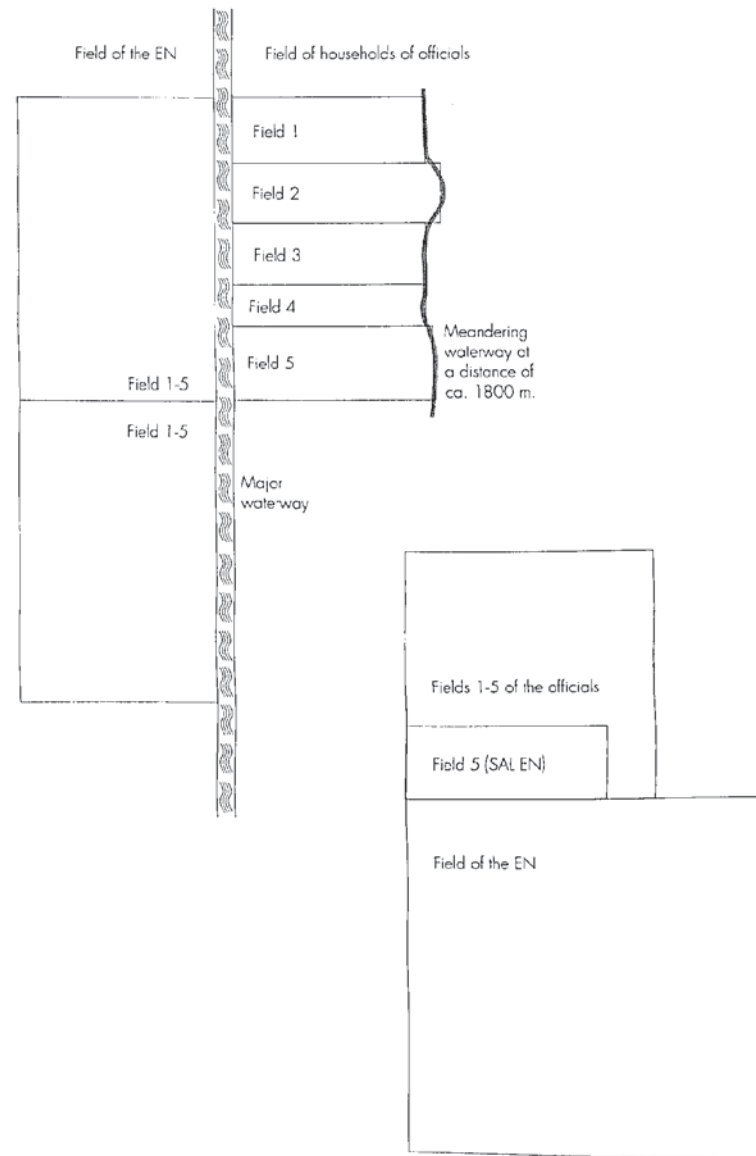
- ☞ = 1 ninda (ca. 6 m)
- = 10 ninda
- ☞ (with a horizontal line) = 60 ninda

surface measures:

- ☞ (with a horizontal line) = 1/10 iku (e)
- ☞ = 1 iku ca. 0.9 acre
- ☞ (with a horizontal line) = 1 ese = 6 iku ca. 5.2 acres
- = 1 bur = 3 ese ca. 15.6 acres
- ☞ (with a horizontal line) = 1 bur'u = 10 bur ca. 156 acres
- (with a horizontal line) = 1 šar = 6 bur'u ca. 936 acres

Figure 83: MSVO 1, 2 (reconstructed)

This account is of a group of texts recording the division of fields among high officials in Jemdet Nasr, including the ruler 'EN'. Lengths and widths of individual fields are recorded together with calculated surface measures on the obverse. The hypothetical plots depicted on page 207 are an attempt to understand how the calculated fields might have been situated along a waterway. Note that the amount of agricultural land held by the ruler 'EN' and his presumable wife 'SAL EN' was approximately 3/4 of the fields recorded in these accounts.



15N₁ would represent 360 liters of grain, an amount which would be fully in line with the amount of grain expended in sowing a plot of 1 bur₃ in the Ur III period, reckoning either with 360 sila₃ seed + 180 sila₃ fodder for the draft oxen for a total of 540, or with 240 + 120 for a total of 360 sila₃.⁴⁶³

How field areas were calculated in the archaic period is clear, at least on the surface, based on a series of texts from Jemdet Nasr.⁴⁶⁴

The best-preserved of these tablets, MSVO 1,2 (figure 83),⁴⁶⁵ contains entries relating to length measurements and the areas of five fields (one in each of the five horizontal columns, or lines, on the obverse of the tablet). The first two sub-cases of each line record the linear measurements of a field assigned a high official in Jemdet Nasr, named in the first sub-case.⁴⁶⁶ Qualified by the horizontal stroke N₅₇, the first numerical notation, a sexagesimal notation qualifying units of linear measurement equal to later 'ninda', represents the length of the fields and so corresponds to later Sumerian us₂, 'side'. The second sexagesimal notation is qualified by the vertical stroke N₅₈, representing the width of the fields and so corresponding to later Sumerian sag, 'head'.⁴⁶⁷ The exact method according to which the ancient surveyors derived the fields' area from these two linear measures is not known; for us the multiplication is straightforward, 290 (ninda) × 100 (ninda) = 29,000 (sar) = 290 (iku), and finally 16 bur₃ 2 iku. In this and other field texts, a large section of the calculated field was entered in the third sub-case and qualified as GAN₂, that is, irrigated and arable land, and often a small remainder appended in a fourth sub-case and qualified with the sign BAR. This small parcel is presumably border land, possibly wooded to protect the fields against wind erosion or simply planted with producing date palms or some other trees or shrubs.⁴⁶⁸

All GAN₂ measures are added to a total of arable land denoted KI₀ BU₁, probably the same as land called ki gid(a)₂, 'measured land', in later third millennium texts. The notation representing this total is entered in the second case of the first column on the reverse of the

⁴⁶³ This would then tend to support those absolute values, with the warning that the grain is not qualified as seed grain and that such 'nice numbers' can derive from artificial calculations.

⁴⁶⁴ MSVO 1, 2-6.

⁴⁶⁵ The text was first understood and edited by F.-M. Allotte de la Fuÿe, RA 27 (1930) 65-71, and has since been the object of regular interest. See A.A. Vajman, *Peredneaziatskij sbornik* 1966, 13-15 (German translation in *BaM* 21 (1990) 101-103); P. Steinkeller, *Jahrbuch für Wirtschaftsgeschichte* 1987, 13; *Archaic Bookkeeping*, 55-57; and most recently, J. Friberg, *AFO* (forthcoming).

⁴⁶⁶ The persons designated GAL₁ SAB₂, PA₀ GIR₂gunū₄, NAM₂ DI, ME₂, and EN₂ SAL were presumably officials ranking immediately below the city ruler in status. Of these five officials, two – NAM₂ DI and GAL₁ SAB₂ – are attested in lines 3 and 25 respectively of the list Lu₂ A, and at least three are well attested as persons of high status who delivered grain products, animals and other goods to central authorities in Jemdet Nasr, as was recorded in accounts such as MSVO 1, 95-96, in fig. 79 above.

⁴⁶⁷ These were almost certainly averages of opposing sides, since the resulting area measures are in three of the five cases split into apparently arable fields and 'GIS KI₀ BAR', 'wooded border', that is, areas outside the measured and exploited surface. This irregularity of the fields was generally the case in field calculations in third millennium Mesopotamia and is clearly attested already in the Uruk IV period; see for one example below, fig. 85.

⁴⁶⁸ The small parcels added together on the reverse of the tablet were qualified GIS₁ KI₀ BAR (see preceding n.). The collated copy of the first BAR area of MSVO 1, 2, shows 2 eše₃ (■) instead of the expected 2 iku (□).

tablet above the total of BAR land. The first case of this column contains exactly twice the total of the 'measured land' of the five officials calculated on the obverse, and is qualified GAN₂ EN₀, 'arable land of/for the EN'.

The EN is in all likelihood the chief administrator of the large building excavated in the 1920s in Jemdet Nasr (see above, section 2) and represented by the sign AB₀. Indeed, the sign combination AB₀ NI₀+RU which qualifies the grand total of land divided among the EN and his high officials – apparently including his own wife (EN₂ SAL, who was assigned the largest plot of those recorded on the account's obverse⁴⁶⁹) – can be reasonably interpreted to mean 'household of NIRU', whereby NIRU might represent Jemdet Nasr itself.⁴⁷⁰ Based on the hypothetical yield of 30:1 and a seeding rate of 15N₁ per bur₃ (see above, figure 82), the parcels of the high officials registered in this account would, on average, support a working household of ca. 500⁴⁷¹ dependents, and thus that of the EN a household of 2500. Of course, the variables in such calculations, for example, the likelihood that livestock, trade and elite luxuries will have commanded a large portion of such harvests, warn us to be cautious.

Only one fragment from Uruk offers evidence of the same type of field accounts in the much larger urban center of the Late Uruk period (figure 84). Nonetheless, other texts prove the existence of comparably large agricultural households, and the greater antiquity of field surveying there. The oldest evidence known of the calculation of field areas is found in a group of texts from the Uruk IV period, of which VV 19408,76 (figure 85), unearthed by P. Damerow in the Uruk collection of the German Archaeological Institute in Heidelberg, is certainly the most important. The fragmented Uruk IV period tablet contains only numerical signs and the ideograms we have seen above denoting the length and width of measured fields. Both obverse and reverse contain notations representing imaginary fields whose opposing sides averaged 1200 and 900 ninda in length, respectively. The multiplication of these average lengths results in the highly regular and unrealistically large field of 10 sar₂, or 600 bur₃ (the largest otherwise attested field notation is of a little more than 334 bur₃; see below, figure 87). Since, moreover, no further ideograms qualify the purpose of this account, it is certain that the text represents another school exercise,⁴⁷² the oldest accounting exercise known to us, containing "difficult" exercises on surface calculation.

Another field account from Uruk (figure 86) bears some resemblance to the texts MSVO 1, 2-6 discussed above. Parcels ranging from 45 down to just 8 bur₃ are registered in the middle and right columns of this text, together with ideographic notations which probably represent officials whom the parcels were assigned. These parcels are totaled in the first case of the left column – of the reconstructed total of 150 bur₃, 141 are at least partially

⁴⁶⁹ Note that taken together the plots of the EN and his wife accounted for approximately 3/4 of all arable land registered in MSVO 1, 2.

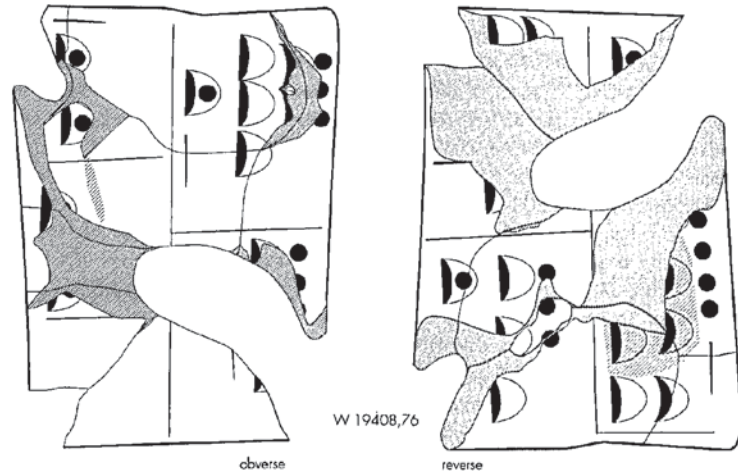
⁴⁷⁰ See above, n. 450. I can offer no explanation for the final sign combination at the bottom of this left column.

⁴⁷¹ As a very rough basis for estimation: 15 (bur₃) × 15N₁ (seed/bur₃) × 30 (:1 yield) × 30(GAR/N₁) ÷ 360(days per year) = 562.5.

⁴⁷² See above, section 5 to 'learning bookkeeping', and figs. 75 and 77.



Figure 84: W 15772,k
The account represents the only recovered text from Uruk which parallels in format the field calculation texts MSVO 1, 2-6, known from Jemdet Nasr. Accordingly, the first two entries of the upper line would represent the length and width, respectively, the last entry the area of a field (thus perhaps $100' \times 82$ (ninda) = 82 iku (4 bur [1 eše 4 iku]).



obverse: $\frac{1,200 + 1,200}{2} \times \frac{930 + 870}{2} = 1,200 \times 900$ (ninda) = 10,800 iku = 10 šār

reverse: $\frac{990 + 1,410}{2} \times \frac{1,280 + 520}{2} = 1,200 \times 900$ (ninda) = 10,800 iku = 10 šār

Figure 85: W 19408,76
The text depicted above represents the earliest known accounting school text. The unrealistic practice exercises on both faces of the tablet, based on slight variations of a multiplication of 1200 x 900 ninda, result in an implicit field area of approximately 39 km², or about 11,500 acres. P. Damerow was the first to recognize the importance of this text.

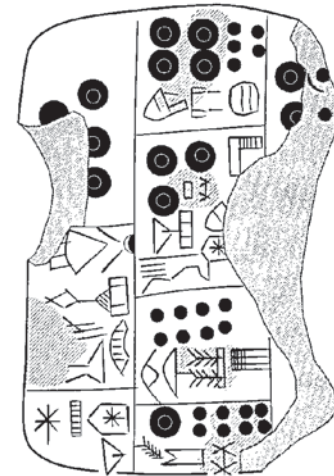


Figure 86: W 20551,1
The 150 bur, or ca. 2340 acres recorded in this account (its reverse face is unscrubed) represent one of the larger such parcels found in the archaic texts from Uruk. Assuming the text documents agricultural land in production, the fields would produce enough barley to sustain a household of ca. 5000 individuals. The poorly preserved texts W 17729, a+ and ,be (both unpublished) contained notations representing substantially larger fields.

preserved in the individually registered parcels – and qualified in two following cases with ideographic notations. The sign combination SIIA₃+DUG₀ in the second case has been cited as evidence that this text belongs to a group of stone documents registering the sale of agricultural land in the archaic period.⁴⁷³

The largest account of fields from Jemdet Nasr, depicted in figure 87, exhibits a unique format, but also records the activities of acquaintances met in other texts from that settlement. MSVO 1, 1, records on its reverse face a total of over 334 bur₃ of land qualified as LAGAB₀ GAN₂ BU₀ KI₀ NI₀+RU AB₀ APIN₀, 'total of measured arable land, (from) the plowing office of the household of NIRU'. This land is comprised of three types of parcels: those qualified as ŠE₀+ŠE₀ BA, as GURUŠ₀ SAL, and as GAN₂ KI₀ A, and in each of the first five cases of the obverse face the parcels so qualified are assigned to the same five officials, including the wife of the EN, as were fields in the account MSVO 1, 2 (figure 83). Unfortunately, all three field qualifications are peculiar to this text, but the other field accounts from Jemdet Nasr, and known farmland utilization practice from later periods, can help to make an informed judgment about the meaning of these notations. In the first place, the accounts MSVO 1, 2-6, register fields ranging from an average of 6 (MSVO 1, 3-4) to an average of 35 (MSVO 1, 5) bur₃ per official. This would accord rather well with the average of ca. 22 bur₃ per official of ŠE₀+ŠE₀ fields in MSVO 1, 1, and suggest that these parcels were really 'distributed as grain-growing plots' (ŠE₀+ŠE₀ BA). We might further imagine that groups of workmen were assigned to each plot and at the same time themselves given subsistence

⁴⁷³ I. J. Gelb, P. Steinkeller and R.M. Whiting, OIP 104 (1991) 28.

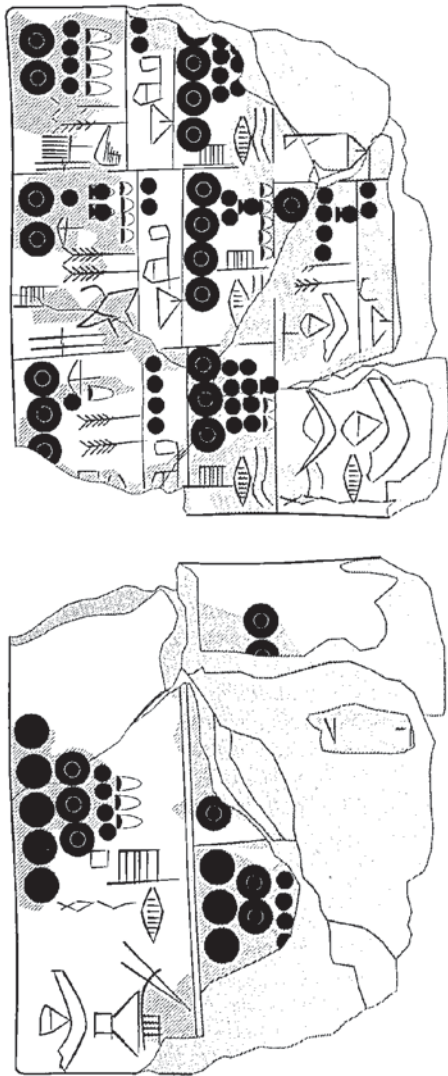


Figure 87: MSVO 1, 1
The total area of $5 \frac{1}{2}+$ šar recorded on the reverse represents agricultural fields of more than 5200 acres.

fields, ranging from 2 bur₃ (obv. i 1-2, ii 2) to 4 (obv. i 3) per team. Fields of this size could be expected to support a crew of, roughly estimated, between 20 and 100 persons, male and female (GURUS₃ SAL), presumably enough to manage the daily tending of the fields in grain. Finally, there is good evidence that farmers understood the need of rotating fallow and producing fields in later third millennium agriculture; this may be the meaning of the qualification GAN₂ KI₆ A, which literally translated according to later sign meanings would result in 'arable land, wetland'.⁴⁷⁴

7. CONCLUSIONS

Of the four best documented early indigenous writing systems, namely Babylonian cuneiform, Egyptian hieroglyphics, pictographic Chinese and Meso-American, cuneiform assumes a dominant role in any discussion of the development of script. From the period of its explosive development toward the end of the 4th millennium B.C., cuneiform texts document a continuous record of transmission through more than three millennia.

A number of historical developments have been posited as causal, or at least in the aggregate extant, in periods immediately preceding the inception of writing. The first seems to be the development of an early state form, so far removed from tribal associations as to support a hierarchical division of labor and the amassing of those surpluses which can result in less dependence on farming for primary livelihood. The administration of the goods and services circulating in this system required involved methods of bookkeeping, including calculation aids and, ultimately, writing. Yet that this development is not a necessary precondition of writing can be demonstrated not only by reference to those cultures which have flourished without the aid of writing, but also with the uneven use of bookkeeping during the archaic period in mind. Whereas the level of communal activity and thus the best indicator of state strength in Uruk during the periods Uruk V-IVa was intensive, monumental building apparently came to an abrupt halt in the succeeding Uruk III / Jemdet Nasr period, precisely when administrative documentation became its most impressive, both in numbers of documents and in the quantities of goods and services recorded in the accounts. Assuming that we do have a roughly representative group of accounts from both periods, the size of economic activity reflected in Uruk III texts, in particular insofar as it concerns agricultural production, must have been on the order of ten times or more as large as that of the earlier period.

Indeed, nearly everything of substance which can be culled from the archaic texts, from canonicity and breadth of lexical compendia, to methods of timekeeping and complexity and fields of application of numerical sign systems, derives ultimately from the Uruk III period; whether these elements of writing were also in use during the Uruk IV period a hundred years earlier but not visible to us is a matter of speculation. At the same time, we can see that the very rapid development of all the basic tools inherent in proto-cuneiform concluded in the

⁴⁷⁴ One might speculate that the sign A reflects water being drawn off the fields, that is, lands being drained to leach out salts.

Uruk IV period, and a text such as the artificial field calculation found in figure 85 above makes us wonder at the already playful use of the script, and makes us ask ourselves how much we are missing in the texts available to us, and in those that are not.

Available evidence can be interpreted in different ways, as certainly the debate between D. Schmandt-Besserat and her critics has shown. Based on what has been presented in this paper, the development of proto-cuneiform can be sketched in the following manner:

1. *Period of early tokens*

Prior to ca. 3400 B.C., simply formed geometric clay counters were used in an *ad hoc* fashion to record simple deliveries of goods, primarily grain and animal products of local economies. Distinct transactions represented by an assemblage of counters were presumably contained in bags of leather or some other perishable material. These counters qualifying discrete objects (animals, humans, jars, etc.) probably represented traditional forms of tallying with one-to-one correspondence between counted object and counter; larger counters qualifying measures stood for larger containers and so only apparently represented a metrological structure.

2. *Period of clay envelopes*

Ca. 3400-3300 B.C., geometric clay counters with some further ideographic differentiations, representing the derived numerical signs of the archaic period, were enclosed in clay envelopes, and these envelopes were covered with impressions from cylinder seals. Each clay envelope and its contents represented a discrete transaction concerning primarily grain and animal products of local economies. The outer surfaces of some envelopes were impressed with counters in a one-to-one correspondence to the enclosed pieces. There is insufficient evidence to determine whether with statistically relevant probability numerical systems with bundling steps had formed.

3. *Period of early numerical tablets*

Ca. 3300-3250 B.C., flat and rounded clay tablets, sealed and unsealed, were impressed with counters or with styli cut and shaped to imitate counters, thus representing numerical notations. In some cases it is evident that a standardized numero-metrological structure with set bundling steps was not employed. The end of this phase saw the last direct contact between the north (Syria and northern Mesopotamia) and southern Babylonia.

4. *Period of late numerical tablets*

Ca. 3250-3200 B.C., flat and rectangular-shaped, sealed clay tablets were impressed with styli to record numerical notations. A standardized numero-metrological structure with set bundling steps was employed. Numerical sign sequence and seals of officials attached to specific administrative units such as herding or grain storage signaled the type of numerical system used and thus the object(s) of the transaction.

5. *Period of numero-ideographic tablets*

Ca. 3200 B.C., flat and rectangular-shaped, sealed clay tablets were impressed with styli to record numerical notations and one or at most two ideograms. All ideograms represented the objects of the transaction, including sheep and goats and products derived from them (textiles, dairy oils). Numerical sign sequence and seals of officials signaled the type of other numerical (metrological) systems used and thus the object(s) of

such transactions, including fields and grain. This phase saw the last direct contact between Persia and southern Babylonia.

6. *Period of early proto-cuneiform*

Ca. 3200-3100 B.C. (Uruk IVa), flat and rectangular-shaped, as a rule unsealed clay tablets were impressed with styli to record numerical notations and a full array of pictograms. Pictograms represented the objects of the transaction, and pictograms in ideographic use the persons and offices, and the type of transaction involved. A ca. 900 picto-ideogram repertory and a developed means of reckoning employing five basic numerical sign systems were developed in the first years of this period; there was a coterminous development of lexical lists, of which only the professions list was canonized. Multivalency is likely but not demonstrable with available texts and knowledge of third millennium Babylonian languages. The early phase of this ideographic writing system is only attested at southern Babylonian Uruk.

7. *Period of developed proto-cuneiform*

Ca. 3100-3000 B.C. (Uruk III), this period is characterized by the refinement and abstraction of early proto-cuneiform, with the addition of an involved system of timekeeping and a systematization both of complex accounts and of more than a dozen lexical lists dealing with all facets of archaic administration and including the first use of writing to record literature. Multivalency is likely but not demonstrable. Developed proto-cuneiform, serving the accounting needs of a complex administration including offices of the fisheries, of herded animals and animal products, of field management, grain production and processing, and of labor, is attested throughout Babylonia and is coterminous with a native system of writing in Persia called proto-Elamite.

8. *Period of late proto-cuneiform*

Ca. 2800-2700 B.C. (Early Dynastic I), this period is characterized by the earliest apparently multivalent use of proto-cuneiform to write Sumerian words in personal names. The archaic numerical systems were used, but in simplified forms, and the lexical lists were copied and transmitted, but no new lists were added. Tablets were as a rule clumsily formed and inscribed.

8. LIST OF FIGURES

- Fig. 1: Map of Western Asia
 Fig. 2: Third millennium chronology
 Fig. 3: The 'large building' of Jemdet Nasr
 Fig. 4: Tablet loci at Uqair
 Fig. 5: Plan of Uruk
 Fig. 6: Plan of the central district Eanna
 Fig. 7: The so-called Red Temple
 Fig. 8: The White Temple
 Fig. 9: Common archaic seal motifs
 Fig. 10: Archaic seals with scenes of wild pigs
 Fig. 11: Examples of tokens from Uruk
 Fig. 12: Clay envelope with contents, from Susa
 Fig. 13: Numerical tablets
 Fig. 14: The gypsum tablet W 10133,a
 Fig. 15: Three numerical tablets
 Fig. 16: Examples of numero-ideographic tablets
 Fig. 17: Tablet formats found in the archaic texts
 Fig. 18: Archaic "legs"
 Fig. 19: Tablets with varying degrees of complexity
 Fig. 20: Complex summations
 Fig. 21: Tablet rotation in complex archaic texts
 Fig. 22: Paleographic differences
 Fig. 23: Archaic scribal exercises
 Fig. 24: Major lexical lists of the third millennium
 Fig. 25: W 21126
 Fig. 26: Composite copy of the lexical list "Cities"
 Fig. 27: The archaic "City Seal"
 Fig. 28: The "Wood list" W 20327,2
 Fig. 29: Composite copy of the lexical list "Vessels"
 Fig. 30: Composite copy of the lexical list "Tribute"
 Fig. 31: Signs representing archaic temple households
 Fig. 32: Composite copy of the lexical list Lu₂ A
 Fig. 33: The first lines of the list Lu₂ A
 Fig. 34: Paleographic development of selected signs
 Fig. 35: Administrative occurrences of lexical entries
 Fig. 36: Archaic accounting exercises
 Fig. 37: Dairy oil and barley accounts
 Fig. 38: Archaic replacement rules
 Fig. 39: Determining numerical sign sequences
 Fig. 40: W 20568
 Fig. 41: Numerical systems used in archaic texts
 Fig. 42: Vaiman's limekeeping system
 Fig. 43: Key texts for understanding archaic limekeeping
 Fig. 44: W 21671
 Fig. 45: Bone recovery in excavations
 Fig. 46: Dried fish
 Fig. 47: Administrative documentation of archaic fisheries
 Fig. 48: Plan of the lobzur fish trap
 Fig. 49: Uruk III accounts of herds
 Fig. 50: Accounts of large sheep herds
 Fig. 51: Archaic signs for large and small cattle and for pigs
 Fig. 52: Simple receipts for cattle

- Fig. 53: Examples of complex accounts of cattle
 Fig. 54: Containers of dairy products
 Fig. 55: Accounts of dairy products
 Fig. 56: Metrological relationship between SILA₃₀ and DUG_b
 Fig. 57: Accounts concerning dairy fat stored in the jar DUG_c
 Fig. 58: Account concerning dairy fat stored in the jar DUG_c
 Fig. 59: W 20274,39
 Fig. 60: Probable archaic designations of liquid and semi-liquid products
 Fig. 61: Metrological systems employed in dairy notations
 Fig. 62: Ancient boar hunts
 Fig. 63: The presumable piglist W 12139
 Fig. 64: Pig-herding account
 Fig. 65: Accounts of herded humans?
 Fig. 66: W 9827
 Fig. 67: W 20274,93
 Fig. 68: Daily bread
 Fig. 69: MSVO 3, 29
 Fig. 70: Eight-year grain accounts MSVO 4, 1-2
 Fig. 71: An account of "bread and beer"
 Fig. 72: MSVO 3, 64 and 58
 Fig. 73: MSVO 3, 52 and 51
 Fig. 74: A comparison of the additions in the two grain accounts MSVO 4, 45 and 43
 Fig. 75: MSVO 4, 66
 Fig. 76: MSVO 3, 11 and 6
 Fig. 77: MSVO 3, 2
 Fig. 78: MSVO 1, 93
 Fig. 79: Complex grain accounts from Jemdet Nasr
 Fig. 80: Designations of cereal products and rations in the archaic texts
 Fig. 81: W 19726,a
 Fig. 82: MSVO 1, 10
 Fig. 83: MSVO 1, 2
 Fig. 84: W 15772,k
 Fig. 85: W 19408,76
 Fig. 86: W 20551,1
 Fig. 87: MSVO 1, 1

9. BIBLIOGRAPHY

- ADAMS, R.McC.
 Heartland of Cities: Surveys of Ancient Settlement and Land Use on the Central Floodplain of the Euphrates, Chicago 1981.
- ADAMS, R.McC., NISSEN, H.J.
 The Uruk Countryside: The Natural Setting of Urban Societies, Chicago 1972.
- ALGAZE, G.
 The Uruk Expansion: Cross-cultural Exchange in Early Mesopotamian Civilization, *Current Anthropology* 30, 1989, 571-608.
 The Uruk World System: The Dynamics of Expansion of Early Mesopotamian Civilization, Chicago 1993.
- ALLOTTE DE LA FUÏE, F.-M.
 Documents présargoniques, Paris 1908-20.
 Mesures agraires et calcul des superficies dans les textes pictographiques de Djemdet-Nasr, RA 27, 1930, 65-71.

- AMJET, P.
Il y a 5000 ans les Elamites inventaient l'écriture, *Archeologia* 12, September-October 1966, 16-23.
Glyptique susienne, des origines à l'époque des Perses achéménides: cachets, sceaux-cylindres et empreintes antiques découverts à Suse de 1913 à 1967, MDP 43, Paris 1972.
- ARCARI, E.
La lista di professioni "Early Dynastic LU A": Esempio di metodo di analisi dei rapporti tra le scuole scribali del III millennio a.C., Supplemento n. 32 agli ANNALI - vol.42 (1982), fasc. 3, Naples 1982.
Sillabario di Ebla e ED LU A: Rapporti intercorrenti tra le due liste, *OrAnt* 22, 1983, 167-178.
- ARCHI, A.
La "Lista di nomi e professioni" ad Ebla, *SEb* 4, 1981, 177-204.
The "Names and Professions List": more fragments from Ebla, *RA* 78, 1984, 171-174.
Position of the Tablets of Ebla, *OrNs* 57, 1988, 67-69 + pls. 1-3.
- BAKER, H., MATTHEWS, R.J., POSTGATE, J. N.
Lost Heritage: Antiquities Stolen from Iraq's Regional Museums, fascicle 2, London 1993.
- BARTZ, F.
Die grossen Fischereiräume der Welt. Versuch einer regionalen Darstellung der Fischereiwirtschaft der Erde II, Wiesbaden 1965.
- BAUER, J.
Review of Selz, G.J., *Altsumerische Verwaltungstexte aus Lagas, 1: Die altsumerischen Wirtschaftsurlunden der Eremitage zu Leningrad*, *FAOS* 15/1, Wiesbaden 1989, *AIO* 36/37, 1989-90, 76-91.
- BEHRENS, H., LODING, D., ROTH, M.T. (EDS.)
DUMU-E₂-DUB-BA-A: Studies in Honor of Åke W. Sjöberg, *OPNSKF* 11, Philadelphia 1989.
- BENITO, C.A.
"Enki and Ninma" and "Enki and the World Order", UPenn dissertation, Philadelphia, 1969, University Microfilms International, Ann Arbor 1977.
- BIGGS, R.D.
The Abū Šalābikh Tablets. A Preliminary Survey, *JCS* 20, 1966, 73-88.
Semitic Names in the Fara Period, *OrNs* 36, 1967, 55-66.
Inscriptions from Tell Abū Šalābikh, *OIP* 99, Chicago, London 1974.
- BLACK, J.A.
The Alleged "Extra" Phonemes of Sumerian, *RA* 84, 1990, 107-118.
- BIEGVAD, H.
Fishes of the Iranian Gulf, Copenhagen 1944.
- BLUNT, A.
A pilgrimage to Nejd. The cradle of the Arab race [...], vol. I, London 1881.
- BODENHEIMER, F.S.
Animal and Man in Bible Lands, Collection de Travaux de l'Académie Internationale d'Histoire des Sciences, N° 10, Leiden 1960.
- BOESSNECK, J.
Tierknochenfunde aus Išān Bahriyāt (Isin), in: Hrouda, B., *Isin-Išān Bahriyāt I. Die Ergebnisse der Ausgrabungen 1973-1974*, Munich 1977, 111-133.
Tierknochenfunde aus Nippur, in: Gibson, McG. et al., *Excavations at Nippur: Twelfth Season*, *OIC* 23, Chicago 1978, 153-187.
- BOESSNECK, J., KOKABI, M.
Tierknochenfunde II. Serie, in: Hrouda, B., *Isin-Išān Bahriyāt II. Die Ergebnisse der Ausgrabungen 1975-1978*, Munich 1981, 131-155.
- BOESSNECK, J., DRIESCH A. VON DEN, STEGER, U.
Tierknochenfunde der Ausgrabungen des Deutschen Archäologischen Instituts Baghdad in Uruk-Warka, *Iraq*, *BaM* 15, 1984, 149-189.

- BOISSON, C.P.
Contraintes typologiques sur le système phonologique du Sumérien, *Bulletin de la Société de Linguistique de Paris* 84, 1989, 201-233.
- BRAIDWOOD, R.J., HOWE, B.
Prehistoric investigations in Iraqi Kurdistan, *SAOC* 31, Chicago 1960.
- BRANDES, M.A.
Siegelabrollungen aus den archaischen Bauschichten in Uruk-Warka, *FAOS* 3, Wiesbaden 1979.
- BOTTERO, J.
Konservierung von Lebensmitteln, *RIA* 6, 1980-83, 191-197.
- BREKIE, H.E.
Konventionsbasierte Kriterien der Buchstabenstruktur am Beispiel der Entwicklung der kanaanäisch-phönizischen zur altgriechischen Schrift, *Kodikas/Code Ars Semeiotica* 10, 1987, 229-246.
Some Thoughts on a Historico-Genetic Theory of the Lettershapes of our Alphabet, in: Watt, W.C. (ed.), *Writing Systems and Cognition. Perspectives from Psychology, Physiology, Linguistics, and Semiotics, Neuropsychology and Cognition* 6, Dordrecht, Boston, London 1994, 129-139.
- BRICE, W.C.
The Writing System of the Proto-Elamite Account Tablets of Susa, *Bulletin of the John Rylands Library* 45, 1962-63, 15-39.
- BROWN, S.C.
Review of Schmandt-Besserat, D., *Before Writing*, Austin 1992, *CSMS Bulletin* 31, May 1996, 35-43.
- BUCCELLIATI, G.
Salt at the Dawn of History: The Case of the Bevelled-rim Bowls, in: Matthiae, P. et al. (eds.), *Resurrecting the Past. A Joint Tribute to Adnan Bounni*, Uitgaven van het Nederlands Historisch-Archaeologisch Instituut te Istanbul 67, Leiden 1990, 17-40.
- BURROWS, E.
UET 2. Archaic Texts, London 1935.
- BUTZ, K.
On Salt Again ...: Lexikalische Randbemerkungen, *JESHO* 27, 272-316.
Zur Terminologie der Viehwirtschaft in den Texten aus Ebla, in: Cagni, L. (ed.), *La lingua di Ebla*, Naples 1981, 321-353.
Landwirtschaft, *RIA* 6, 1980-83, 470-486.
- BUTZ, K., SCHRODER, P.
Zu Getreideerträgen in Mesopotamien und dem Mittelmeergebiet, *BaM* 16, 1985, 165-209.
- CAVIGNEAUX, A.
Lexikalische Listen, *RIA* 6, 1980-83, 609-641.
L'écriture et la réflexion linguistique en Mésopotamie, in: Aurox, S., Mardoga, P. (eds.), *Histoire des idées linguistiques. Vol. I: la naissance des métalangages en Orient et en Occident*, Liège-Brussels 1989, 99-118.
Die Texte der 33. Kampagne, *BaM* 22, 1991, 33-123.
Die Texte der 34. Kampagne, *BaM* 22, 1991, 124-163.
- CHARVÁT, P.
Fig. or, on Ethnicity in Archaeology, *ArOr* 62, 1994, 1-6.
- CHRISTIE, A.
An Autobiography, London 1977.
- CHRISTIAN, V.
Altertumskunde des Zweistromlandes von der Vorzeit bis zum Ende der Achämenidenherrschaft, Textband, Tafelband, Leipzig 1940.
- CIVIL, M.
The Home of the Fish. A New Sumerian Literary Composition, *Iraq* 23, 1961, 154-175.
From Enki's Headaches to Phonology, *JNES* 32, 1973, 57-61.

- The Sumerian Writing System: Some Problems, *OrNs* 42, 1973, 21-34.
Studies on Early Dynastic Lexicography. I, *OrAnt* 21, 1982, 1-26.
- CIVIL, M., BIGGS, R.D.
Notes sur des textes sumériens archaïques, *RA* 60, 1966, 1-16.
- CLUTTON-BROCK, J., BURLEIGH, R.
The Animal Remains from Abu Salabikh: Preliminary Report, *Iraq* 40, 1978, 89-100.
- COLLON, D.
First Impressions: Cylinder Seals in the Ancient Near East, London 1987.
- COLLON, D., READE, J.
Archaic Nineveh, *BaM* 14, 1983, 33-41.
- CRAWFORD, H.E.W.
Mesopotamia's invisible exports in the third millennium B.C., *World Archaeology* 5/2, 1973, 232-241.
- CROS, G.
Nouvelles feuilles de Tello, publiées avec le concours de: Léon Heuzey, *Foos* Thureau-Dangin, Paris 1910.
- CUTTING, C.
Fish Saving: A History of Fish Processing from Ancient to Modern Times, London 1955.
- DAMEROW, P.
Review of Schmandt-Besserat, D., *Before Writing*, Austin 1992, *Rechtshistorisches Journal* 12, 1993, 9-35.
Abstraction and Representation: Essays on the Cultural Evolution of Thinking, Dordrecht, Boston, London 1996.
- DAMEROW, P., ENGLUND, R.K.
Die Zahlzeichensysteme der Archaischen Texte aus Uruk, in: Green, M.W., Nissen, H.J., *Zeichenliste der archaischen Texte aus Uruk*, ATU 2, Berlin 1987, 117-166
The Proto-Elamite Texts from Tepe Yahya, *American School of Prehistoric Research Bulletin* 39, Cambridge, MA, 1989.
Bemerkungen zu den vorangehenden Aufsätzen von A. A. Vajman unter Berücksichtigung der 1987 erschienenen Zeichenliste ATU 2, *BaM* 20, 1989, 133-138.
The Proto-Cuneiform Texts from the Erlenmeyer Collection, *MSVO* 3, Berlin, forthcoming.
- DAMEROW, P., ENGLUND, R.K., NISSEN, H.J.
Die Entstehung der Schrift, *Spektrum der Wissenschaft*, Februar 2/1988, 74-85.
Die ersten Zahlendarstellungen und die Entwicklung des Zahlbegriffs, *Spektrum der Wissenschaft*, März 3/1988, 46-55.
- DAMEROW, P., MEINZER, H.-P.
Computertomographische Untersuchung ungeöffneter archaischer Tonkugeln aus Uruk W 20987,9, W 20987,11 und W 20987,12, *BaM* 26, 1995, 7-33 + pls. 1-4.
- DANDAMAIEV, M.A.
Slavery in Babylonia. From Nabopolassar to Alexander the Great (626-331 B.C.), DeKalb, IL, 1984.
- DANIELS, P.T., BRIGHT, W. (EDS.)
The World's Writing Systems, New York, Oxford 1996.
- DEIMEL, A.
Die Inschriften von Fara I: Liste der archaischen Keilschriftzeichen, *WVDOG* 40, Leipzig 1922.
Die Inschriften von Fara II: Schullexte aus Fara, *WVDOG* 43, Leipzig 1923.
Die Inschriften von Fara III: Wirtschaftstexte aus Fara, *WVDOG* 45, Leipzig 1924.
Die Viehzucht der Sumerer zur Zeit Urukaginas, *Or* 20, 1926, 1-61.
- DEUTZSCH, F.
Handel und Wandel in Altbabylonien, Stuttgart 1910.

- DELOUGAZ, P.
The temple oval at Khafajah, *OIP* 53, Chicago 1940.
Pottery from the Diyala Region, *OIP* 63, Chicago 1952.
- DELOUGAZ, P., KANTOR, H.J. (ED. BY A. ALIZADEH)
Chogha Mish, *OIP* 101, Chicago 1996.
- DIKONOFF, I.M.
Études sur les facteurs sociaux dans l'histoire de la civilisation mésopotamienne (no materiale sumera), *VDI* 84/2, 1963, 167-179.
Main Features of the Economy in the Monarchies of Ancient Western Asia, in: *The Ancient Empires and The Economy* (Section VIII), *Troisième Conférence Internationale d'Histoire Économique*, Munich 1965, Paris, the Hague 1969, 13-32.
Slaves, Helots and Serfs in Early Antiquity, *ActAnth* 22, 1974, 45-78.
Some Reflections on Numerals in Sumerian: Towards a History of Mathematical Speculation, *JAOs* 103, 1983, 83-93.
- DIK, J. VAN
Ein spätaltbabylonischer Katalog einer Sammlung sumerischer Briefe, *OrNs* 58, 1989, 441-452.
- DITTMANN, R.
Seals, Sealings and Tablets. Thoughts on the Changing Pattern of Administrative Control from the Late-Uruk to the Proto-Elamite Period at Susa, in: Finkbeiner, U., Röllig, W. (eds.), *Gamdat Nasr*, Wiesbaden 1986, 332-366.
Betrachtungen zur Frühzeit des Südwest-Iran: Regionale Entwicklungen vom 6. bis zum frühen 3. vorchristlichen Jahrtausend, *BBVO* 4, Berlin 1986.
- DREYER, G.
Umm el-Gaab I: Das prädynastische Königsgrab U-j und seine frühen Schriftzeugnisse, *Habilitationschrift*, AV 86, forthcoming.
- DRIEL, G. VAN
Tablets from Jebel Aruda, *FS Kraus*, Leiden 1982, 12-25.
- DRIESCH, A. VON DEN
Fischknochen aus Abu Salabikh/Iraq, *Iraq* 48, 1986, 31-38.
- DRIHON, F., LAVAL-JEANTET, P. M., LAHMI, A.
Étude en laboratoire de seize bulles mésopotamiennes appartenant au Département des Antiquités Orientales, in: *Préhistoire de la Mésopotamie. La Mésopotamie préhistorique et l'exploration récente du djebel Hamrin*, Paris 17-18-19 décembre 1984, Paris 1987, 335-344.
- DUMONT, J.
La pêche dans le Fayoum hellénistique [...], *Chronique d'Égypte* 52, 1977, 125-142.
- DYSON, R.H.
The relative and absolute chronology of Hissar II and the Proto-Elamite horizon of Northern Iran, in: Aurenche, O., Evin, J., Hours, F. (eds.), *Chronologies du Proche Orient - Chronologies in the Near East. Relative Chronologies and Absolute Chronology 16,000-4,000 B.P.*, C.N.R.S. International Symposium, Lyon (France) 24-28 November 1986, *BAR International Series* 379 [i-ii], Oxford 1987, 647-680.
- EDZARD, D.O.
Sumerer und Semiten in der frühen Geschichte Mesopotamiens, *Genava* n.s. 8, 1960, 241-258.
Die Keilschrift, in: Hausmann, U. (ed.), *Allgemeine Grundlagen der Archäologie: Begriffe und Methode, Geschichte, Problem der Form, Schriftzeugnisse*, Munich 1969, 214-221.
Keilschrift, *RIA* 5, 1976-80, 544-568.
Review of Green, M.W., Nissen, H.J., *Zeichenliste der archaischen Texte aus Uruk*, ATU 2, Berlin 1987, *ZA* 83, 1993, 136-141.
- EICHMANN, R.
Uruk: Die Stratigraphie; Grabungen 1912-1977 in den Bereichen 'Eanna' und 'Anu-Ziqqurat', *AUWE* 3, Mainz 1989.
Uruk: Die Architektur I, Von den Anfängen bis zur frühdynastischen Zeit, *AUWE* 14, Mainz, forthcoming.

- ELLISON, R.
Diet in Mesopotamia: The Evidence of the Barley Ration Texts (c. 3000-1400 B.C.), *Iraq* 43, 1981, 35-45.
Some Thoughts on the Diet of Mesopotamia from c. 3000 - 600 B.C., *Iraq* 45, 1983, 146-150.
- ENGLUND, R.K.
Administrative Timekeeping in Ancient Mesopotamia, *JESHO* 31, 1988, 121-185.
Organisation und Verwaltung der Ur III-Fischerei, *BBVO* 10, Berlin 1990.
Archaic Dairy Metrology, *Iraq* 53, 1991, 101-104.
Review of Schmandt-Besserat, D., *Before Writing*, Austin 1992, *Science* 260, 11 June 1993, 1670-1671.
Review of Lafont, B., Yildiz, F., *Tablettes cunéiformes de Tello au Musée d'Istanbul [...]*, Leiden 1989, *AFO* 40-41, 1993-1994, 98-103.
Archaic administrative texts from Uruk: the early campaigns, *ATU* 5, Berlin 1994.
Late Uruk Period Cattle and Dairy Products: Evidence from Proto-Cuneiform Sources, *BSA* 8, 1995, 33-48.
Late Uruk Pigs and Other Herded Animals, *FS Boehmer*, Mainz 1995, 121-133.
Regulating Dairy Productivity in the Ur III Period, *OrNs* 64, 1995, 377-429.
Question Mark Retrieval, *N.A.B.U.* 1995:38.
Proto-Cuneiform Texts from Diverse Collections, *MSVO* 4, Berlin 1996.
Grain Accounting Practices in Archaic Mesopotamia, in: Høyrup, J., Damerow, P. (eds.), *Changing Views on Ancient Near Eastern Mathematics*, Berlin, forthcoming.
- ENGLUND, R.K., GREGOIRE, J.-P.
The Proto-Cuneiform Texts from Jemdet Nasr. I: Copies, transliterations and glossary, *MSVO* 1, Berlin 1991.
- ENGLUND, R.K., NISSEN, H.J.
Die lexikalischen Listen der archaischen Texte aus Uruk, *ATU* 3, Berlin 1993.
- EVANS, J.G.
The exploitation of molluscs, in: Ucko, P.J., Dimbleby, G.W. (eds.), *The domestication and exploitation of plants and animals*, London 1969, 479-484.
- FALES, F.M., KRISPIJN, TH.J.H.
An Early Ur III Copy of the Abū Sālabikh 'Names and Professions' List, *JEOL* 26, 1979-80, 39-46.
- FALKENSTEIN, A.
Die Haupttypen der sumerischen Beschwörung literarisch untersucht, *Leipziger Semitische Studien*, Neue Folge 1, Leipzig 1931.
Literarische Keilschrifttexte aus Uruk, Berlin 1931.
Archaische Texte aus Uruk, *ATU* 1, Berlin, Leipzig 1936.
Archaische Texte des Iraq-Museums in Bagdad, *OLZ* 40, 1937, 401-410.
- FEX, J. (ED.)
Herodot Historien, vol. II, Munich 1963.
- FIELD, H.
Ancient Wheat and Barley from Kish, Mesopotamia, *American Anthropologist* 34, 1932, 303-309.
The Track of Man; *Adventures of an Anthropologist*, Garden City, NY, 1953.
- FINKBEINER, U., RÖLLIG, W. (EDS.)
Gamdat Nasr: Period or Regional Style? Papers given at a symposium held in Tübingen November 1983, *Beihefte zum Tübinger Atlas des Vorderen Orients*, Reihe B 62 (Geisteswissenschaften), Wiesbaden 1986.
- FINKEL, I.L.
Inscriptions from Tell Brak 1984, *Iraq* 47, 1985, 187-201 + pls. 32-36.

- FLANNERY, K.V.
Early Pig Domestication in the Fertile Crescent: A Retrospective Look, *FS Braidwood*, *SAOC* 36, Chicago 1983, 163-188.
- FORBES, R.J.
Studies in Ancient Technology III, Leiden 1955.
- FRASER, J.
Travels in Koordistan, Mesopotamia, etc., Including an Account of Parts of Those Countries Hitherto Unvisited by Europeans, London 1840.
- FRAYNE, D.R.
The Early Dynastic List of Geographical Names, *AOS* 74, New Haven 1992.
- FRIBERG, J.
The Early Roots of Babylonian Mathematics, vols. III, Göteborg 1978-79.
Numbers and Measures in the Earliest Written Records, *Scientific American* 250/2, February 1984, 110-118.
Mathematik, *RIA* 7, 1987-90, 531-585.
Review of Schmandt-Besserat, D., *Before Writing*, Austin 1992, *OLZ* 89, 1994, 477-502.
- GELB, I. J.
A Study of Writing, Chicago 1963.
The Ancient Mesopotamian Ration System, *JNES* 24, 1965, 230-243.
Growth of a Herd of Cattle in Ten Years, *JCS* 21, 1967, 64-69.
From Freedom to Slavery, in: Edzard, D.O. (ed.), *Gesellschaftsklassen im Alten Zweistromland und in den angrenzenden Gebieten*, *CRRAI* 18, München 1972, 81-92.
Prisoners of War in Early Mesopotamia, *JNES* 32, 1973, 70-98.
Methods of Decipherment, *JRAS* 1975, 95-104.
Definition and Discussion of Slavery and Serfdom, *UF* 11, 1979, 283-297.
Terms for Slaves in Ancient Mesopotamia, *FS Diakonoff*, Warminster 1982, 81-98.
Sumerian and Akkadian Words for 'String of Fruit', *FS Kraus*, Leiden 1982, 67-82.
- GELB, I. J., STEINKELLER, P., WHITING, R.M.
Earliest Land Tenure Systems in the Near East: Ancient Kudurrus, *Text*, *OIP* 104, Chicago 1991.
- GIBSON, MCG., BIGGS R.D. (EDS.)
Seals and Sealing in the Ancient Near East, *BiMes* 6, Malibu 1977.
- GOLDSTEIN, L., KINTIGH, K.,
Forum. Ethics and the Reburial Controversy, *American Antiquity* 55, 1990, 585-591.
- GORDON, C.H.
The Ancient Near East, New York 1965.
- GRAEVE, M.-C. DE
The Ships of the Ancient Near East (c. 2000-500 B.C.), *OIA* 7, Leuven 1981.
- GREEN, M.W.
A Note on an Archaic Period Geographical List from Warka, *JNES* 36, 1977, 293-294.
Animal Husbandry at Uruk in the Archaic Period, *JNES* 39, 1980, 1-35.
The Construction and Implementation of the Cuneiform Writing System, *Visible Language* 15, 1981, 345-372.
Miscellaneous Early Texts from Uruk, *ZA* 72, 1982, 163-177.
Early Sumerian Tax Collectors, *JCS* 36, 1984, 93-95.
Uruk and Uqair, *ASJ* 8, 1986, 77-83.
- GREEN, M.W., NISSEN, H.J.
Zeichenliste der archaischen Texte aus Uruk, *ATU* 2, Berlin 1987.

- GREGOIRE, J.-P.
Inscriptions et archives administratives cunéiformes (1^{re} partie), MVN 10, Rome 1981.
- HACKMAN, G.G.
Sumerian and Akkadian Administrative Texts from Predynastic Times to the End of the Akkad Dynasty, BIN 8, New Haven 1958. Bearbeitung: Selz, G.J., Altsumerische Verwaltungstexte aus Lagaš, 2: Altsumerische Wirtschaftsurlunden aus amerikanischen Sammlungen, FAOS 15/2, Stuttgart 1993, 509-642.
- AL-HADITHI, A.
Optimal Utilization of the Water Resources of the Euphrates River of Iraq, UArizona dissertation, University Microfilms, Ann Arbor 1979.
- HALL, H.R.
La sculpture babylonienne et assyrienne au British Museum, Ars Asiatica 11, Paris-Brussels 1928.
- HALLO, W.W.
A Sumerian Amphictyony, JCS 14, 1960, 88-114.
- HARRISON, D.L.
The Mammals of Arabia, London 1964-72.
- HATT, R.T.
The Mammals of Iraq, University of Michigan. Museum of Zoology. Miscellaneous Publications no. 106, Ann Arbor 1959.
- HEIMPEL, W.
Sumerische und akkadische Personennamen in Sumer und Akkad, AIO 25, 1974-77, 171-174.
- HEINRICH, E.
Schiff und Lehm. Ein Beitrag zur Baugeschichte der Sumerer, Studien zur Bauforschung 6, Berlin 1934.
Kleinfunde aus den archaischen Tempelschichten in Uruk, ADFU 1, Leipzig 1936.
Die Stellung der Uruktempel in der Baugeschichte, ZA 49, 1950, 20-44.
Bauwerke in der altsumerischen Bildkunst, Wiesbaden 1957.
Die Tempel und Heiligtümer im alten Mesopotamien. Typologie, Morphologie und Geschichte, Berlin 1982.
- HEINRICH, E., FALKENSTEIN, A.
Sechster vorläufiger Bericht über die von der Deutschen Forschungsgemeinschaft in Uruk-Warka unternommenen Ausgrabungen (UVB 6), APAW 1935/2, Berlin 1935.
- HOCH, E.
Reflections on Prehistoric Life at Umm an-Nar (Trucial Oman) Based on Faunal Remains from the Third Millennium BC, in: Taddei, M. (ed.), South Asian Archaeology 1977, vol. 1, Naples 1979, 589-638.
- HOLE, F., FLANNERY, K.V., NEELY, J.A. (EDS.)
Prehistory and Human Ecology of the Deh Luran Plain. An Early Village Sequence from Khuzistan, Iran, Memoirs of the Museum of Anthropology, University of Michigan, no. 1, Ann Arbor 1969.
- HØYRUP, J.
Sumerian: The descendant of a proto-historical creole? An alternative approach to the 'Sumerian Problem', Annali dell'Istituto Orientale di Napoli: Annali del Seminario di studi del mondo classico, Sezione linguistica 14, 1992, 21-72.
- HØYRUP, J., DAMEROW, P. (EDS.)
Changing Views on Ancient Near Eastern Mathematics, Berlin, forthcoming.
- HRUSKA, B.
Sumerian Agriculture: New Findings, Preprint Series of the Max Planck Institute for the History of Science no. 26, Berlin 1995.
- JACOBSEN, TH.
Early Political Development in Mesopotamia, ZA 52, 1957, 91-140.
On the Textile Industry at Ur under Ibbi-Sin, Studia Orientalia Ioanni Pedersen [...] dicata, Copenhagen 1953, 172-187.

- The lil₂ of ^dEn-lil₂, FS Sjöberg, OPSNKF 11, Philadelphia 1989, 267-276.
- JASIM, S.A., OATES, J.
Early tokens and tablets in Mesopotamia: new information from Tell Abada and Tell Brak, World Archaeology 17, 1986, 348-362.
- JESTIN, R.
Tablettes sumériennes de Šuruppak conservées au Musée de Stamboul. Mémoires de l'Institut français d'archéologie de Stamboul III, Paris 1937.
- JORDAN, J.
Aus den Berichten aus Warka. Oktober 1912 bis März 1913, MDOG 51, April 1913, 47-76.
Aus den Berichten aus Warka. März bis Mai 1913, MDOG 53, April 1914, 9-17.
Uruk-Warka nach den Ausgrabungen durch die Deutsche Orient-Gesellschaft, WDOG 51, Leipzig 1928.
Erster vorläufiger Bericht über die von der Notgemeinschaft der Deutschen Wissenschaft in Uruk-Warka unternommenen Ausgrabungen (UVB 1), APAW 1929/7, Berlin 1930.
Zweiter vorläufiger Bericht über die von der Notgemeinschaft der Deutschen Wissenschaft in Uruk unternommenen Ausgrabungen (UVB 2), APAW 1930/4, Berlin 1931.
Dritter vorläufiger Bericht über die von der Notgemeinschaft der Deutschen Wissenschaft in Uruk unternommenen Ausgrabungen (UVB 3), APAW 1932/2, Berlin 1932.
- KHALAF, K.T.
Reptiles of Iraq, with some Notes on the Amphibians, Baghdad 1959.
The Marine and Freshwater Fishes of Iraq, Baghdad 1961.
- KHOLHAAS, W.
Hilfer-Abenteuer in Irak, Freiburg 1989.
- KOSE, A.
Walter Andraes Besuch in Uruk-Warka vom 18.12.1902, FS Boehmer, Mainz 1995, 299-306.
- KRAUS, F.R.
Staatliche Viehhaltung im altbabylonischen Lande Iarsa, Amsterdam 1966.
Sumerer und Akkader, ein Problem der altsopotamischen Geschichte, Amsterdam 1970.
- KREBERNIK, M.
Die Beschwörungen aus Fara und Ebla. Untersuchungen zur ältesten keilschriftlichen Beschwörungsliteratur, TSO 2, Hildesheim, Zürich, New York, 1984.
Review of Green, M.W., Nissen, H.J., Zeichenliste der archaischen Texte aus Uruk, ATU 2, Berlin 1987, OLZ 89, 1994, 380-385.
- KREBERNIK, M., NISSEN, H.J.
Die sumerisch-akkadische Keilschrift, in: Günther, H., Ludwig, O. (eds.), Schrift und Schriftlichkeit, Berlin 1994, 274-288.
- KRECHER, J.
Eine unorthographische sumerische Wortliste aus Ebla, OrAnt 22, 1983, 179-189.
- KRISPIJN, TH.J.H.
Die Identifikation zweier lexikalischen Texte aus Ebla: MEE III Nr. 62 und 63, JEOL 27, 1981-82, 47-59.
- KUCKENBURG, M.
Die Entstehung von Sprache und Schrift. Ein kulturgeschichtlicher Überblick, Cologne 1989.
- LABAT, R.
Manuel d'épigraphie akkadienne (Signes, Syllabaire, Ideogrammes). Nouvelles édition, revue et corrigée par Florence Malbran-Labat, Paris 1988.
- LAFONT, B., YILDIZ, F.
Tablettes cunéiformes de Tello au Musée d'Istanbul, Datant de l'époque de la III^e Dynastie d'Ur. I (ITT II/1, 617-1038), Uitgaven van het Nederlands Historisch-Archaeologisch Instituut te Istanbul 65, Leiden 1989.

- Tablettes cunéiformes de Tello au Musée d'Istanbul, Datant de l'époque de la III^e Dynastie d'Ur. II (ITT II/1, 2544-2819, 3158-4342, 4708-4713), Uitgaven van het Nederlands Historisch-Archaeologisch Instituut te Istanbul 77, Leiden 1996.
- LANDSBERGER, B.
Die Fauna des alten Mesopotamien nach der 14. Tafel der Serie H₁AR-RA = HUBULLU, ASAVV 42/6, Leipzig 1934.
Three Essays on the Sumerians (1943-1945). Introduction and Translation by M. deJ. Ellis, SANE 1/2, Los Angeles 1974.
- LANGDON, S.
Excavations at Kish I. The Herbert Weld (for the University of Oxford) and Field Museum of Natural History (Chicago) Expedition to Mesopotamia, vol I, 1923-1924, Paris 1924.
Ausgrabungen in Babylonien seit 1918, Der Alte Orient 26, Leipzig 1927, 3-75.
The Herbert Weld Collection in the Ashmolean Museum: Pictographic Inscriptions from Jemdet Nasr, OECT 7, Oxford 1928.
A New Factor in the Problem of Sumerian Origins, JRAS 1931, 593-596.
New Texts from Jemdet Nasr, JRAS 1931, 837-844.
- LE BRUN, A.
Recherches stratigraphiques à l'Acropole de Suse, 1969-1971, CahDAFI 1, 1971, 163-216.
- LE BRUN, A., VALLAT, F.
L'origine de l'écriture à Suse, CahDAFI 8, 1978, 11-59.
- LENZEN, H.J.
Die Entwicklung der Zikurrat von ihren Anfängen bis zur Zeit der III. Dynastie von Ur, ADFU 4, Leipzig 1941.
Die Tempel der Schicht Archaisch IV in Uruk, ZA 49, 1950, 1-20.
Mesopotamische Tempelanlagen von der Frühzeit bis zum zweiten Jahrtausend, ZA 51, 1955, 1-36.
Die Architektur der Schicht Uruk Arch. III (Jemdet Nasr) in Eanna, FS Salonen, SiOr 46, Helsinki 1975, 169-191.
- LIEBERMAN, S.J.
Of Clay Pebbles, Hollow Clay Balls, and Writing: A Sumerian View, AJA 84, 1980, 339-358.
- LIMET, H.
L'Anthroponymie sumérienne dans les documents de la 3^e dynastie d'Ur, Bibliothèque de la Faculté de Philosophie et Lettres de l'Université de Liège - Fascicule 180, Paris 1968.
- LLOYD, S., SAFAR, F.
Eridu: A Preliminary Communication on the First Season's Excavations: January-March 1947, Sumer 3, 1947, 84-111.
Eridu: A Preliminary Communications [sic] on the Second Season's Excavations: 1947-1948, Sumer 4, 1948, 115-125.
Tell Uqair. Excavations by the Iraq Government Directorate of Antiquities in 1940 and 1941, JNES 2, 1943, 131-158 + pls.
- LOFTUS, W.K.
Travels and Researches in Chaldea and Susiana; with an account of excavations at Warka, the "Erech" of Nimrod, and Shûsh, "Shushan the palace" of Esther, in 1849-52, London 1857.
- MACKAY, E.
Report on Excavations at Jemdet Nasr, Iraq, Field Museum of Natural History, Anthropology, Memoirs 1/3, Chicago 1931.
- MAIR, V.H.
Modern Chinese Writing, in: Daniels, P.T., Bright, W. (eds.), The World's Writing Systems, New York, Oxford 1996, 200-208.
- MARGUERON, J.
Recherches sur les palais mésopotamiens de l'âge du Bronze, Paris 1982.

- MARTIN, H.P.
Fara: A Reconstruction of the Ancient Mesopotamian City of Shuruppak, Birmingham 1988.
- MARZAHN, J.
Altsumerische Verwaltungstexte aus Girsu/Lagaš, VS 25, Berlin 1991.
- MATHEWS, R.J.
The World's First Pig Farmers, Pig Farming 33, March 1985, 51-55.
Excavations at Jemdet Nasr, 1988, Iraq 51, 1989, 225-248 + pls. 33-34.
Excavations at Jemdet Nasr, 1989, Iraq 52, 1990, 25-39.
Clay Sealings in Early Dynastic Mesopotamia: a Functional and Contextual Approach, Diss. University of Cambridge, 1989.
Jemdet Nasr: the Site and the Period, Biblical Archaeologist 55, 1992, 196-203.
Cities, Seals and Writing: Archaic Seal Impressions from Jemdet Nasr and Ur, MSVO 2, Berlin 1993.
- MEER, P.E. VAN DER
Dix-sept tablettes semi-pictographiques, RA 33, 1936, 185-190.
- MELIKŠVILI, G.A.
Esclavage, féodalisme et mode de production asiatique dans l'Orient ancien, in: Sur le "Mode de production asiatique", Centre d'Études et de Recherches marxistes, Paris 1974, 257-277.
- MERIGGI, P.
Altsumerische und proto-elamische Bilderschrift, ZDMG Spl. 1, 1969, 156-163.
La scrittura proto-elamica III, Rome 1971-74.
Der Stand der Erforschung des Proto-Elamischen, JRAS 1975, 105.
- MICHALOWSKI, P.
Review of Schmidt-Besserat, D., Before Writing, Austin 1992, American Anthropologist 95, 1993, 996-999.
Memory and Deed: The Historiography of the Political Expansion of the Akkad State, in: Liverani, M. (ed.), Akkad. The First World Empire. Structure, Ideology, Traditions, HANE/S 5, Padua 1993, 69-90.
Writing and Literacy in Early States: A Mesopotamianist Perspective, in: Keller-Cohen, D. (ed.), Literacy: Interdisciplinary Conversations, Cresskill, NJ, 1994, 49-70.
- MILIARD, A.R.
The Bevelled-Rim Bowls: Their Purpose and Significance, Iraq 50, 1988, 49-57.
- MOOREY, P. R. S.
Kish Excavations 1923-1933, Oxford, New York 1978.
- MUDAR, K.
Early Dynastic III Animal Utilization in Lagash: A Report on the Fauna of Tell Al-Hiba, JNES 41, 1982, 23-34.
- MYNORS, H.
An Examination of Mesopotamian Ceramics Using Petrographic and Neutron Activation Analysis, in: Aspinall, A., Warren, S. (eds.), Proceedings of the 22nd Symposium on Archaeometry, School of Physics and Archaeological Sciences, Bradford 1983, 377-387.
- NAGEL, W.
Getreide. C. In der Archäologie, RIA 3, 1957-71, 315-318.
Frühe Grossplastik und die Hochkulturkunst am Erythräischen Meer, Berliner Jahrbuch für Vor- und Frühgeschichte 6, 1966, 1-54 + pls. 1-14.
- NISSEN, H.J.
Remarks on the Uruk IVa and III Forerunners, in: Civil, M. (ed.), The Series lu = ša and Related Texts, MSL 12, Rome 1969, 4-8.
Grabung in den Quadraten K/L XII in Uruk-Warka, BaM 5, 1970, 101-191.
Aspects of the Development of Early Cylinder Seals, in: Gibson, McG., Biggs R.D. (eds.), Seals and Sealing in the Ancient Near East, BimMes 6, 1977, 15-23.

- Bemerkungen zur Listenliteratur Vorderasiens im 3. Jahrtausend (gesehen von den Archaischen Texten von Uruk), in: Cagni, L. (ed.), *La lingua di Ebla*, Naples 1981, 99-108.
- Grundzüge einer Geschichte der Frühzeit des Vorderen Orients, Grundzüge 52, Darmstadt 1983.
- Ortsnamen in den archaischen Texten aus Uruk, *OrNs* 54, 1985, 226-233.
- The Development of Writing and of Glyptic Art, in: Finkbeiner, U., Röellig, W. (eds.) *Ġamdat Našr*, Wiesbaden 1986, 316-331.
- The Context of the Emergence of Writing in Mesopotamia and Iran, in: Curtis, J. (ed.), *Early Mesopotamia and Iran: Contact and Conflict 3500-1600 B.C.*, London 1993, 54-71.
- Katalog der archaischen Texte aus Uruk, ATU 4, Berlin, forthcoming.
- NISSEN, H.J., DAMEROW, P., ENGIUND, R.K.
Frühe Schrift und Techniken der Wirtschaftsverwaltung im alten Vorderen Orient, Berlin 1991.
Archaic Bookkeeping: Early Writing and Techniques of Economic Administration in the Ancient Near East, Chicago 1993 (revised English edition of Frühe Schrift).
- NOEGEL, S.B.
An Asymmetrical Janus Parallelism in the Gilgamesh Flood Story, *ASJ* 16, 1994, 306-308.
- NOLDECKE, A. ET AL.
Vierter vorläufiger Bericht über die von der Notgemeinschaft der Deutschen Wissenschaft in Uruk unternommenen Ausgrabungen (UVB 4), *APAW* 1932/6, Berlin 1932.
Fünfter vorläufiger Bericht über die von der Notgemeinschaft der Deutschen Wissenschaft in Uruk unternommenen Ausgrabungen (UVB 5), *APAW* 1933/5, Berlin 1934.
Siebenter vorläufiger Bericht über die von der Deutschen Forschungsgemeinschaft in Uruk-Warka unternommenen Ausgrabungen (UVB 7), *APAW* 1935/4, Berlin 1936.
Achter vorläufiger Bericht über die von der Deutschen Forschungsgemeinschaft in Uruk-Warka unternommenen Ausgrabungen (UVB 8), *APAW* 1936/13, Berlin 1937.
Neunter vorläufiger Bericht über die von der Deutschen Forschungsgemeinschaft in Uruk-Warka unternommenen Ausgrabungen (UVB 9), *APAW* 1937/11, Berlin 1938.
Zehnter vorläufiger Bericht über die von der Deutschen Forschungsgemeinschaft in Uruk-Warka unternommenen Ausgrabungen (UVB 10), *APAW* 1939/2, Berlin 1939.
Elfter vorläufiger Bericht über die von der Deutschen Forschungsgemeinschaft in Uruk-Warka unternommenen Ausgrabungen (UVB 11), *APAW* 1940/3, Berlin 1940.
- NORTH, R.
Status of the Warka Excavation, *OrNs* 26, 1957, 185-256.
- OATES, D., OATES, J.
The Rise of Civilization, Oxford 1976.
- OATES, J. ET AL.
Seafaring merchants of Ur?, *Antiquity* 51, 1977, 221-234.
- OPPENHEIM, A.L.
On an Operational Device in Mesopotamian Bureaucracy, *JNES* 18, 1959, 121-128.
Ancient Mesopotamia: Portrait of a Dead Civilization, Chicago 1964. Rev. Ed., Compl. by Erica Reiner, Chicago, London 1977.
- ORTHMANN, W.
Der alte Orient, PKG 14, Frankfurt, Berlin, Vienna 1975.
- PARPOLA, S.
Transliteration of Sumerian: problems and prospects, *FS Salonen*, *SiOr* 46, Helsinki 1975, 239-257.
- PARROT, A.
Les Fouilles de Tello et de Senkereh-Larsa. Campagne 1932-1933 (Rapport préliminaire), *RA* 30, 1933, 169-182.
Tello. Vingt campagnes de fouilles (1877-1933), Paris 1948.
Les fouilles de Mari. Quatorzième campagne (Printemps 1964), *Syria* 42, 1965, 1-24.

- PAYNE, S.
Partial Recovery and Sample Bias: The Results of Some Sieving Experiments, in: Higgs, E.S. (ed.), *Papers in Economic Prehistory I*, Cambridge 1972, 49-64.
Partial Recovery and Sample Bias, in: Clason, A.T. (ed.), *Archaeozoological studies. Papers of the Archaeozoological Conference 1974*, held at the Biologisch-Archaeologisch Instituut of the State University of Groningen, Amsterdam, Oxford, New York 1975, 7-17.
- PETTINATO, G.
L'Atlante Geografico del Vicino Oriente Antico attestato ad Ebla e ad Abū Salābikh (I), *OrNs* 47, 1978, 50-73 + pls. 7-12.
Testi lessicali monolingui della Biblioteca L. 2769, *MEE* 3, Naples 1981.
Liste presargoniche di uccelli nella documentazione di Fara ed Ebla, *OrAnt* 17, 1978, 165-178 + pls. 14-16.
- POMPONIO, F.
The Fara Lists of Proper Names, *JAOS* 104, 1984, 553-558.
- PORADA, E.
Iranian Art and Archaeology: A Report of the Fifth International Congress, 1968, *Archaeology* 22, 1969, 54-65.
- POSTGATE, J. N.
Excavations at Abu Salabikh, 1975. Part I: The Excavations, *Iraq* 38, 1976, 133-161.
Early Dynastic Burial Customs at Abu Salabikh, *Sumer* 36, 1980, 65-82.
- POSTGATE, J. N., MOOREY, P. R. S.
Excavations at Abu Salabikh, 1975, *Iraq* 38, 1976, 133-169.
- POTTS, D.
On Salt and Salt Gathering in Ancient Mesopotamia, *JESHO* 27, 1984, 225-271.
- POWELL, M.A.
The Origin of the Sexagesimal System: The Interaction of Language and Writing, *Visible Language* 6, 1972, 5-18.
Sumerian Area Measures and the Alleged Decimal Substratum, *ZA* 62, 1972, 165-221.
Three Problems in the History of Cuneiform Writing: Origins, Direction of Script, Literacy, *Visible Language* 15, 1981, 419-440.
Salt, Seed, and Yields in Sumerian Agriculture. A Critique of the Theory of Progressive Salinization, *ZA* 75, 1985, 7-38.
- QUALIS, C.
Early shipping in Mesopotamia, UColumbia dissertation, New York, 1981.
- READE, J.
An early Warka tablet, *FS Strommenger*, Munich 1992, 177-179 + pl. 79.
- REDDING, R.W.
The Faunal Remains, in: Wright H.T. (ed.), *An Early Town on the Deh Luran Plain. Excavations at Tepe Farukhabad, Memoirs of the Museum of Anthropology, University of Michigan*, no. 13, Ann Arbor 1981, 233-261.
- REIMPELL, W.
Geschichte der babylonischen und assyrischen Kleidung, Berlin 1921.
- RENFREW, J. M.
Cereals cultivated in Ancient Iraq, *BSA* 1, 1984, 32-44.
- RIVOYRE, D. DE
Les vrais Arabes et leurs pays. Bagdad et les villes ignorées de l'Euphrate, Paris 1884.
- ROAF, M.
Excavations at Al Markh, Bahrain: a fish midden of the fourth millennium B.C., *Paléorient* 2, 1974, 499-501.

- ROBINSON, A.
The Story of Writing: Alphabets, Hieroglyphs and Pictographs, London 1995.
- ROHR, H.M.
Writing: its evolution and relation to speech, Bochum 1994.
- RÖMER, W.H.PH.
Einführung in die Sumerologie, Nijmegen 1982.
Die Sumerologie. Versuch einer Einführung in den Forschungsstand nebst einer Bibliographie in Auswahl, AOAT 238, Neukirchen-Vluyn 1994.
- SAFAR, F.
Eridu: A Preliminary Report on the Third Season's Excavations, 1948-49, Sumer 6, 1950, 27-38.
- SAFAR, F., MUSTAFA, M. A., LLOYD, S.
Eridu, Baghdad 1981.
- SALONEN, A.
Die Wasserfahrzeuge in Babylonien nach sumerisch-akkadischen Quellen (mit besonderer Berücksichtigung der 4. Tafel der Serie HAR-ra = *hubullu*). Eine lexikalische und kulturgeschichtliche Untersuchung, SiOr 8/4, Helsinki 1939.
Nautica Babyloniaca. Eine lexikalische und kulturgeschichtliche Untersuchung, SiOr 11/1, Helsinki 1942.
Die Fischerei im alten Mesopotamien nach sumerisch-akkadischen Quellen, AASF B166, Helsinki 1970.
- SAMPSON, G.
Writing Systems: A Linguistic Introduction, Palo Alto 1984.
- SCHÉL, V.
Textes élamites-sémitiques. Première série, MDP 2, Paris 1900.
Textes élamites-sémitiques. Troisième série, MDP 6, Paris 1905.
Documents et arguments 9. Tablettes pictographiques, RA 26, 1929, 15-17.
- SCHMANDT-BESSERAT, D.
The Use of Clay before Pottery in the Zagros, Expedition 16/2, 1974, 11-17.
An Archaic Recording System and the Origin of Writing, SMS 1/2, 1977, 31-70.
The Envelopes that Bear the First Writing, Technology and Culture 21, 1980, 357-385.
From Tokens to Tablets: A Re-evaluation of the So-called 'Numerical Tablets', Visible Language 15, 1981, 321-344.
Before Numerals, Visible Language 18, 1984, 48-60.
The Origins of Writing. An Archaeologist's Perspective, Written Communication 3, 1986, 31-45.
Tokens at Susa, OrAnt 25, 1986, 93-125 + pls. 4-10.
Before Writing, vols. I-II, Austin 1992.
- SCHRETTER, M.
Sumerische Phonologie: Zu Konsonantenverbindungen und Silbenstruktur, Acta Orientalia 54, 1993, 7-30.
- SELZ, G.J.
Review of Hayes, J.L., A Manual of Sumerian Grammar and Texts, Malibu 1990, OLZ 87, 1992, 136-148.
Maš-da-ri-a und Verwandtes. Ein Versuch über da-ri 'an der Seite führen': ein zusammengesetztes Verbum und einige nominale Ableitungen, ASJ 17, 1995, 251-274.
- SERJEANT, R.B.
Fisher-Folk and Fish-Traps in al-Bahrain, BSOAS 31, 1968, 486-514.
- SHENDGE, M.J.
The use of Seals and the invention of Writing, JESHO 26, 1983, 113-136.
- SIGRIST, M.
Messenger Texts from the British Museum, Potomac, MD 1990.
Sumerian Archival Texts I: Texts from the British Museum, Bethesda 1993.

- SMITH, J.
Historical Observations on the Conditions of the Fisheries Among Ancient Greeks and Romans, and on Their Mode of Salting and Pickling Fish, U.S. Commission on Fish and Fisheries, Report of the Commissioner for 1873-4 and 1874-5, Washington 1876.
- SOLLBERGER, E.
Sumerica, ZA 53, 1959, 1-8.
- STEINKELLER, P.
Alleged GUR.DA = ugula-gés-da and the Reading of the Sumerian Numeral 60, ZA 69, 1979, 176-187.
On the Reading and Location of the Toponyms URÚ.KI and A.HA.KI, JCS 32, 1980, 23-33.
On the Reading and Meaning of igi-kár and gúrum(IGI.GAR), ASJ 4, 1982, 149-151.
The Administrative and Economic Organization of the Ur III State: The Core and the Periphery, in: Gibson McG., Biggs, R.D. (eds.), The Organization of Power: Aspects of Bureaucracy in the Ancient Near East, SAOC 46, Chicago 1987, 19-41 = 21991, 15-33.
Grundeigentum in Babylonien von Uruk IV bis zur frühdynastischen Periode II, Jahrbuch für Wirtschaftsgeschichte 1987, 11-27.
Review of Green, M.W., Nissen, H.J., Zeichenliste der Archaischen Texte aus Uruk, ATU 2, Berlin 1987, BiOr 52, 1995, 689-713.
Review of Englund, R.K., Nissen, H.J., Die lexikalischen Listen der archaischen Texte aus Uruk, ATU 3, Berlin 1993, AIO 42/43, 1995-96, 211-214.
- STOL, M.
Milk, Butter, and Cheese, BSA 7, 1993, 99-113.
Milch[produkte]. A. In Mesopotamien, RIA 8/3-4, 1994, 189-201.
- STROMMENGER, E.
Mesopotamische Gewandtypen von der Frühsumerischen bis zur Larsa-Zeit, Acta Praehistorica et Archaeologica 2, 1971, 37-55.
Habuba Kabira. Eine Stadt vor 5000 Jahren, Mainz 1980.
Kleidung. B. Archäologisch, RIA 6, 1980-83, 31-38.
- STRUVE, V.V.
Some New Data on the Organization of Labour and on Social Structure in Sumer During the Reign of the IIIrd Dynasty of Ur, in: Diakonoff, I.M. (ed.), Ancient Mesopotamia. Socio-economic History. A Collection of Studies by Soviet Scholars, Moscow 1969, 127-172.
- SÜRENHAGEN, D.
Relative Chronology of the Uruk Period. New Evidence from Uruk-Warka and Northern Syria, Bulletin of The Canadian Society for Mesopotamian Studies 25, May 1993, 57-70.
- SZARZYŃSKA, K.
Some of the oldest cult symbols in archaic Uruk, JEOL 30, 1987-88, 3-21.
- THESIGER, W.
The Marsh Arabs, London 1964.
- THOMSEN, M.-L.
'The Home of the Fish': A New Interpretation, JCS 27, 1975, 197-200.
- F. THUREAU-DANGIN
Tablettes à signes picturaux, RA 24, 1927, 23-29.
- TILKE, M.
Studien zur Entwicklungsgeschichte des orientalischen Kostüms, Berlin 1923.
- TOSI, M.
Catalogue to the exhibition of the Museo Nazionale d'arte orientale, 14.5 - 19.7.1981.
Early maritime cultures of the Arabian Gulf and the Indian Ocean, in: Al Khalifa, S., Rice, M. (eds.), Bahrain through the ages: the Archaeology, London 1986, 94-107.

- TURNBULL, P.F., REED, C.A.
The Fauna from the Terminal Pleistocene of Palegawra Cave. A Zarzian Occupation Site in Northeastern Iraq, *Fieldiana Anthropology* 63/3, 1974, 81-146.
- VAJMAN, A.A.
Über die protosumerische Schrift, *ActAnth* 22, 1974, 15-27.
Eisen in Sumer, *AfO Beih* 19, 1982, 33-37.
Über die Beziehung der protoelamischen zur protosumerischen Schrift, *BaM* 20, 1989, 101-114.
Protosumerische Mass- und Zählsysteme, *BaM* 20, 1989, 114-120.
Die Bezeichnung von Sklaven und Sklavinnen in der protosumerischen Schrift, *BaM* 20, 1989, 121-133.
Zur Entzifferung der proto-sumerischen Schrift (vorläufige Mitteilung), *BaM* 21, 1990, 91-103.
Formale Besonderheiten der proto-sumerischen Texte, *BaM* 21, 1990, 103-113.
Die Zeichen É und ÛL in den proto-sumerischen Texten aus Djemdet-Nasr, *BaM* 21, 1990, 114-115.
Die Deutung einiger Zeichen in proto-sumerischen Sklaven- und Sklavinnenlisten, *BaM* 21, 1990, 116-123.
- VAILLAT, F.
Les documents épigraphiques de l'acropole (1969-1971), *CahDAFI* 1, 1971, 235-245.
Le matériel épigraphique des couches 18 à 14 de l'acropole, *Paleorient* 4, 1978, 193-195.
- VANSTIPHOUT, H.L.J.
An Essay on "The Home of the Fish", *OIA* 13, 1982, 311-319.
- VEENHOF, K.R.
SAG.IL.LA = *saggilû*, "Difference Assessed" on Measuring and Accounting in Some Old Babylonian Texts, *FS Birot*, Paris 1985, 285-306.
- VELDHUIS, N.
Review of Englund, R.K., Nissen, H.J., *Die lexikalischen Listen der archaischen Texte aus Uruk*, *ATU* 3, Berlin 1993, *BiOr* 52, 1995, 433-440.
- VITO, R.A. DI
Studies in Third Millennium Sumerian and Akkadian Personal Names. The Designation and Conception of the Personal God, *SifPohl SM* 16, Rome 1993.
- WAETZOLDT, H.
Untersuchungen zur neusumerischen Textilindustrie, Rome 1972.
Zu den Strandverschiebungen am Persischen Golf und den Bezeichnungen der Hörs, in: Schäfer, J., Simon, W. (eds.), *Strandverschiebungen in ihrer Bedeutung für Geowissenschaften und Archäologie*, *Ruperto Carola Sonderheft* 1981, Heidelberg, 159-184.
Zur Terminologie der Metalle in den Texten aus Ebla, in: Cagni, L. (ed.), *La lingua di Ebla*, Naples 1981, 363-378.
Kleidung. A. Philologisch, *RIA* 6, 1980-83, 18-31.
Die Situation der Frauen und Kinder anhand ihrer Einkommensverhältnisse zur Zeit der III. Dynastie von Ur, *AoF* 15, 1988, 30-44.
- WATELIN, L.CH., LANGDON, S.
Excavations at Kish, the Herbert Weld (for the University of Oxford) and Field Museum of Natural History (Chicago) Expedition to Mesopotamia, vol. IV 1925-1930, Paris 1934.
- WATERMAN, J.
The Production of Dried Fish, *FAO Fisheries Technical Paper* no. 160, Rome 1976.
- WATT, B., MERRILL, A.
Composition of Foods, *Agricultural Handbook* No. 8, Washington, D.C., 1975.
- WEISS, H., YOUNG, T.C.
The Merchants of Susa. Godin V and Plateau-lowland Relations in the Late Fourth Millennium B.C., *Iran* 13, 1975, 1-17.

- WESTBROOK, R.
Slave and Master in Ancient Near Eastern Law. Symposium on Ancient Law, Economics and Society I, *Chicago-Kent Law Review* 70, 1995, 1631-1676.
- WESTPHAL-HELLBUSCH, S., WESTPHAL, H.
Die Ma'dan. Kultur und Geschichte der Marschenbewohner im Süd-Iraq, *Forschungen zur Ethnologie und Sozialpsychologie* 4, Berlin 1962.
- WICKEDÉ, A. VON
Prähistorische Stempelglyptik in Vorderasien, *MVS* 6, Munich 1990.
- WIGGERMANN, F.A.M.
Aan de wieg van het schrift: Mesopotamische spijkerschrifttableten uit 2900-400 v.C., Exhibition catalogue, *Vrije Universiteit Amsterdam*, 24.4.-9.6.1992.
- WILCKE, C.
Formale Gesichtspunkte in der sumerischen Literatur, *FS Jacobsen*, *AS* 20, Chicago 1976, 205-316.
Genealogical and Geographical Thought in the Sumerian King List, *FS Sjöberg*, *OPSNKF* 11, Philadelphia 1989, 557-571.
- WILLIE, O.
Handbuch der Fischkonservierung, Hamburg 1949.
- WILSON, K.I.
Nippur: The Definition of a Mesopotamian *Ĝamdat Našr* Assemblage, in: Finkbeiner, U., Röllig, W. (eds.), *Ĝamdat Našr*, Wiesbaden 1986, 57-89.
- WÖFFLING, S.
Die Altertums- und Orientwissenschaft im Dienst des deutschen Imperialismus, *Wissenschaftliche Zeitschrift der Universität Halle XX/2*, 1971, 85-95.
- YOSHIKAWA, M.
Review of Thomsen, M.-L., *The Sumerian Language: An Introduction to its History and Grammatical Structure*, *Mesopotamia* 10, Copenhagen 1984, *BiOr* 45, 1988, 499-509.
- ZETTLER, R.I.
Sealings as Artifacts of Institutional Administration in Ancient Mesopotamia, *JCS* 39, 1987, 197-240.
- ZIMANSKY, P.
Review of Schmandt-Besserat, D., *Before Writing*, Austin 1992, *Journal of Field Archaeology* 20, 1993, 513-517.