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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 strains 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 20th 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 Urk period, that is, Urk 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 Urk 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, Adôr Funkenstein. 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 Urk, 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 administration, offered the most likely atmosphere at the time for the evolution 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 tablets, 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 semantic 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 Joëf Frat 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 notions 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 Wöller, the present study would not have been written, and to thank them for their great patience.
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 Nippur 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 from 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 Tellah. The excavations were characterized by a lavishness of slope and, despite the correspondingly slight attention paid to archaological methodology and the agitated demand for antiquities, however they were acquired, fell from abroad, some 60,000 texts dating to the third millennium were apparently recovered from administrative contexts. A further 20,000 exemplars, including nearly all those surviving from the pre-Sargonic lagash period, were plundered during regular seasons. 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 tables.

1 The conventions of text transcription 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 (e.g., for example, ASVOS 1: 91-12 and note 1, where inscriptions in cuneiform were retrieved and shipped back to European capitals in the mid-nineteenth century, together with the clay tablet archives of Assurbanipal unearthed in Nineveh. Below the archaological state which produced these finds were levels containing successively older objects, including earlier cuneiform archives. Beginning in the 1880s, 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 fed archaological, but above all philological research into the third millennium B.C. and into the developmental stages of early cuneiform. The Nippur archives from the archaological site situated in the temple district of Enlil remain our most important source material for understanding the intellectual history of early Mesopotamia.

2 The large site was situated about half-way between Baghdad and Ur on what Steinmetz has referred to as the border between Sumerian south with a strong tradition at city-states, and a Semitic northern Mesopotamia marked by regional policies. This location may have played a role in the "special status. Nippur was apparently accorded throughout the third millennium. Even in the archaological periods, Ur inscription, included in the lexical list of city names the toponym BU, Òd, Òl (Ur-BU), in second place after that representing the capital of Neo-Babylonia, Larsa. One finds that with relatively archaological levels in Nippur are merely still buried (for those remains recovered see K. Watanabe, "Nippur: The Definition of a Babylonian Canaan Near Assemblage," in U. Fischinger and W. Köhler (eds.), Gesammelte Nachr. 137-49). 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 setting in residence in the ruling families. The blessing of the Enlil oracle seemed no less critical to Babylonia monarchs than that of the Holy See to rulers in medieval Europe. Finally, the system of domestic trade (so-called taboa) induced by Shubad toward the end of the third millennium, partly to service the Nippur cult, underscored the importance that city enjoyed even in times of great centralization of power. See generally W. W. Hallo, "A Sumerian Anarchistic," JCS 15 (1960) 88-12; P. Steinmetz, "The Administrative and Economic Organization of the Ur III State: The Case and the Paradox," in M.G. Geller and R. D. Black (eds.), The Organization of Power: Aspects of Bureaucracy in the Ancient Near East, MAC, Chicago 1967, 161-180. (1983); and K. Jacobson, "Early Political Development in Mesopotamia," ZA 52 (1971) 9-40.


5 Early Dynastic IIIb, documented administratively for the period ca. 2400-2330. See J. van Buren in this volume.

6 The real text was found with few exceptions from the Ur III period. About half of these texts were acquired by the British Museum; the majority of which remains, like the majority of the texts from regular excavations in the Arheoloji Mek traces, unexplored. A list has been made to make both collections accessible to specialists; however, see most recently M. Signer, Masterpieces from the British Museum (London, 1992). The most complete of the early Ur excavations is the early Ur excavations, the University of Chicago. The British Museum (Budapest, 1963), for the early Ur texts, B. L. Deleuze, "Tablettes cunéiformes do Tello du Musée d'Istanbul," D'ANTEUR DES 3° DYNASTIE D'UR, I (1983). 1-13. (1983).


Figure 1: Map of Western Asia
Regions of dry farming are indicated by horizontal, irrigated agriculture by vertical hatching.
The settlement areas of the late Uruk period are light grey.
composed and written by scribes educated in active schools, who thus reflected the historical moment, and not the oral 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 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 IIB Fara period. 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 stage of our knowledge of early cuneiform at the turn of the 20th century. And at that 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 than known from the Babylonian alluvium. The French Assyliologist V. Schell 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. 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), and no successors to the proto-Elamite writing as was the case with the earliest stages of cuneiform, and although the language presumably represented by the script remains undeciphered, the still the numerical systems employed in the texts and in 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 Urk III/Jemdet Nasr (ca. 3100-3000 B.C., 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 Nasr and sold in Baghdad in a large lot to the rather numerous exceptions to his inspired rule of standardization 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. J. Gsell, "Method of Decipherment." JRAS 1975, 95-104, offers a sobering view of the prospects for further decipherment, based on conventional etymological methods, of such scripts as the proto-Elamite.

The chronology of these early texts is based primarily on a sometimes uncertain connection of tablets found in the late Ur III archaeological levels found in the excavations of Ur, specifically Urk IV and III. See below for details.

The small mound ca. 30 km to the northeast of Kish derives its name from the Arabic "hill of the Sheik," Nasr.
Tests from the Late Uruk Period

German excavators of Fara in 1905, and in a smaller lot sometime before 1915.\(^3\) The former "archaic," or "proto-cuneiform" tablets, 35 in number and at the time the oldest written documents available for study on earth,\(^3\) inexplicably disappeared in the collections of the Berliner Staatssammlungen, 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 1920s.

Somewhat better treatment was afforded the second lot. The Parisian dealer, E. Gejou, purchased these two dozen tablets sometime after 1915, and sold them in smaller groups, the first before 1920 to the Parisian antiquities dealers Dumont 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.\(^3\)

2.1. JENJET NASR

In the March of 1925, a Hilla dealer offered among other antiquities a number of archaic tablets from Jenjet Nasr to the excavators of the large mound Kish, E. Mackay and S. Langdon. Langdon, after himself traveling to Jenjet Nasr to confirm the existence of more tablets,\(^7\) 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 configuration, Langdon with his troop of between 12 and

\(^15\) Cf. V. Scheil, RA 26 (1929) 15.
\(^16\) 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) 131-133.
\(^17\) 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 Blue tablets of Nippur, these inscriptions are probably to be dated to the EBI period (cf. P. Donceel and K.K. Englund, Saxe 20 (1969) 137, and my remarks in ATU 5, 12\(^15\), against the most recent Uruk II dating by I. J. Gelb, P. S. Kienast and J. M. Whitley, EARLY LAND TENURE SYSTEMS IN THE NEAR EAST: ANCIENT KUDURUSS, Part C (Chicago 1991) 39-43). Indeed, the apparently conventional dating by the authors of all of this type of kudurru 1-11 till the Uruk II period is in each case questionable, for which see my remarks loc. cit.
\(^18\) The 12 loom tablets were copied and published with limited commentary by F. Thureau-Dangin in RA 24 (1929) 26-29. Five of the seven tablets bought by the British Museum were later included in the 1928 publication of the texts excavated at Jenjet Nasr by S. Langdon. The Herbert Weld Collection in the Ashmolean Museum: Pictographic Inscriptions from Jenjet Nasr [12] (Oxford 1928). All published and unpublished texts from the site have now been edited by K.K. Englund and I. J. Gelb, ASVO 1 (Berlin 1991). All the British Museum and Louvre tablets together with five tablets of Dumont 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 Dumont Frères were bought by James Braidwood of the Oriental Institute, Chicago, in 1925 (see ASVO 1, 79). Scheil published his copies of these latter tablets in RA 26 (1929) 13-17, including the tablet RA 26, 16, no. 3, which seems to have been lost or is in its way to Chicago. See now ASVO 1, pps. 24-52, to the tablets associated with the signs A (Oriental Institute, University of Chicago), AG (Louvre) and BM (instituted there).

\(^7\) E. Mackay, Report on Excavations at Jenjet Nasr, Iraq, Field Museum of Natural History, Anthropology, Memoirs 3/7 (Chicago 1931) 225.

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Figure 3: The "large building" of Jenjet Nasr

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60 workers discovered among other artifacts over 150 and possibly as many as 180 proto-cuneiform tablets in various rooms of a large building situated in the northeastern section of Mound B and described by him and others as the oldest palace known from the ancient Near East (see figure 316). Many of these tablets bore seal impressions. Unfortunately, the find spots of the individual tablets in the rooms of the large building were not recorded; the excavators merely marked a "T" on these 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. All texts and seal impressions from Jemdet Nasr and Kish have in the meantime been re-edited by J.F. Grégoire and the author, in collaboration with R.J. Matthews. Longdom became gravely ill at the end of the first Jemdet Nasr campaign and was unable to continue work there for the following year. L.C.H. 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 workers over a period of 10 days to recover a very few tablets, of which most appear to have been from postarchaic periods.

The archaic tablets from Jemdet Nasr date without apparent exception to the Ur III period and are remarkable for the breadth of topics they cover, including accounts of field 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 forming 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 at Jemdet Nasr, bearing evidence of the teaching of proto-cuneiform texts.

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 Babylo尼亚 found their way via the antiquities market into the possession of the Berliner Staatssammler. These for the most part fully preserved tablets were forgotten until A. Falkenstein began work in 1931 on the over 700 archaic documents uncovered in the three German campaigns at Ugarit conducted between 1928 and 1931 and was made aware of their existence by P. Jensen.

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
site.\(^{28}\) Written evidence suggests, however, that the tablets in fact derive from the site of Uruk some 30 miles south of Baghdad, to the north-west of Jemdet Nasr (see figure 1).\(^{29}\) This site, excavated in the war years 1940-41 by S. Lloyd and F. Safar, consisted 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 \(\text{KU}_1, \text{RA}_0, \text{UR}_1\), presumably representing the ancient settlement Urnuba.\(^{31}\)

The modest number of texts which can be ascribed to "Uruk" do not offer a secure basis for a judgment of the economic nature of the archaic settlement.\(^{32}\) Accounts deal with grain administration, small cattle, fish, and 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.

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\(^{28}\) ATU 3, p. 4, referring to no. 656 (now MSVO 4, 1.5).

\(^{29}\) J. Frifeld, "Excavation at Uruk: Excavation on the basis of serial and format, a view repeated and expanded upon by K.W. Green in "Uruk and Ugarit," ASR 8 (1978) 77-83, based on sign combinations, in particular \(\text{KU}_1, \text{RA}_0, \text{UR}_1\), contained in the texts which were common with inscriptions on tablets deriving from regular excavations at Uruk. R.J. Mathews has most recently in MSVO 2, 30-31, reviewed this issue, which is complicated by the fact that on one of the tablets the table is duplicated three times.

\(^{30}\) For a detailed discussion of the Excavation at Uruk, see Mathews, "Excavation at Uruk," ASR 8 (1978) 77-83.

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2.4 OTHERS

One small, and one large archive nearly complete the survey of these two groups from the archaic period which did not derive from regular Urk excavations. Two smaller texts come from excavations of Tell Asmar, demonstrating that elites were active in the Diyala valley in the Late Ur period. The second archive consists of 65 extraordinarily well preserved tablets from the former Einkennung collection. The archive deals almost wholly with the administration of an archaic brewery and related grain deposit; although this activity is poorly attested in the Urk texts, the archive was, based on the use of professional names highly reflective of the Urk professions list and on the common attestation of the brewery office ‘KI SM[ ]’, presumably pillaged from either Jamdet Nasr or Urk in the Late 3rd millennium.
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.57

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 slight 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 5400 represent archaic documents from those levels in the district Eanna of Uruk.58

The early excavation and work on the objects from the southern Babylonian site of Uruk are inseparably linked with the names of two German scholars. The archaeologist J. Jordan59 and the philologist A. Falkenstein60 formed the early core of a group of Germans who have

mounted yearly campaigns to Uruk since 1928, interrupted only, but often, by the effects of world and regional wars.61 The first German campaign took place in 1912,62 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.63

Excavation resumed in 192864 when, with financing of the Norderginnenschaft der Deutschen Wissenschaft, an organization created to secure short-term financing of projects which might otherwise have been infeasible or too German scholarship, Jordan began a large-scale attempt to recover the architectural remains of the major mound in the middle of the expansive remains, namely, according to later identifications, Eanna, "House of heaven" (figures 5. 6). A great appeal for the archaied Jordan lay in the fact that in this central district archaic building levels were partially exposed, without the often tedious layers of later settlement which had to be removed and dustily 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.65

57 The campaigns through 1936 are described in some detail by R. Nash, "Status of the Work in Excavation," ChN 20 (1937) 185-256.
58 See J. Jordan, MOOG 51 (April 1913) 47-76, MOOG 53 (April 1914) 9-17, and WDOG 51 (Leipzig 1928). In fact, Uruk had been the object of some historical interest since C. Faiers's visit in 1835, reported in his Travels in Babylonia, Mesopotamia, &c., &c., vol. 2 (London 1840) 199 (calling the mound "Warshuk"); W. K. Loftin conducted a short excavation at the site in 1855 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, Besl, "An Early Babylonian tablet," Vener. 50 (1912) 157-170; s. p. 29. The text BM 18511-1-217, a numerical table of a type heretofore unknown in Uruk, bears a strong resemblance to a specific type of numerical texts from Susa, Tell Brak and Tell Aswad (cf. A. de Vroon and F. Volter, "L'origine de la faute a Susa," ColD 1 (1918) 11-59, particularly p. 47. S.A. Jamin and J. Datis, "Early tables and tablets in Nineveh (...)," World Archaeology 17 (1986) 358; G. van Driel, "Tables from Tell Aswad," Vener. 86 (1982) 70-75, also was the first to publish a massa of Uruk (W.K. Loftus, Travels and Researches in Chaldea and Susiana [...] London 1857, letter 160-161), in which he had drawn together with H. Chabot 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 excavating site, examined and presented a detailed report of Uruk. On the 18th of December 1852, firstly, W. Andrae visited and drew upon a rough map of the site, and gathered some surface objects, including a Seleucid period cornell fragment from the Temple, see A. Koest, "Walter Andraes Besuch in Uruk-Warka vom 18.12.1902," Vener. 86 (1982) 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. Doughtery of Yale to assume control of the Uruk site in 1920, since Doughtery was unable to organize excavations due to the Uruk agreement, however, the director of antiquities in Iraq, S. Smith, retained excavation rights to Jordan.
60 The 1928 campaign was designated the first Uruk excavation. For official publications of the excavation, W 18721-2, 2134 and 2352, see ATU 5, pl. 1; see the report by J. Jordan, Uruk-Warka noch den Ausgrabungen durch die Deutsche Orient-Gesellschaft, WDOG 51 (Leipzig 1928); id., Erster vorläufiger Bericht über die von der Norderginnenschaft der Deutschen Wissenschaft in Uruk-Warka unternommenen Ausgrabungen (Urb I), APAW 1929/7 (Berlin 1930).
Over 200 archaic tablets and fragments were unearthed in the following campaign of 1929–30, 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, in the course of which over 650 texts and text fragments were recovered. The importance of these finds is 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, 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. Generally speaking, eighteen stratigraphic layers, counting from top to bottom, were identified within Eanna for the time before the Uruk III period. Layer I dates to the Early Dynastic, Layer III to the Jemdet Nasr period. 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 archaeological 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 archaic 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 superposition of diverse building levels reaching from the Uruk III into the Uruk IV strata in this area led the excavators first to assume they had uncovered here a homogeneous Uruk IV period monumental building, called by Jordan the “Red Temple.” Subsequent work, however, has weakened the case for a discrete architectural feature, 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 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 IIIa) are now generally assigned to the building sub-phase Uruk IVb, dated to ca. 3200 B.C. Large numbers of the pictographic tablets, however, are now ascribed to D. Sürerhagen to the stratigraphic levels Uruk IVc–b, and a small number of so-called numerical tablets (see below) to level Uruk V. Sürerhagen

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Figure 5: Plan of Uruk
Each square represents 100 x 100 meters. The district from which most archaic material was excavated is found in the middle of the mound. Its name Banba, “house of heaven,” derives from later identifications.
Figure 6: Plan of the central district Ennna
Each square represents 20x20 meters. The numbers of archeological tests found are indicated in the respective excavation squares. The highest concentrations of Uruk IV period tests come 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'.

Figure 7: The so-called Red Temple
Wall elevations and the find spot of important numerical tables are indicated.
bases this observation 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 Urk IVa 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 Urk IVa period.71

Toward the end of the third campaign, and again in the seventh, the Urk 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, or 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 Urk campaigns appeared in 1936 as the volume Archaische Texte aus Urk.74 In this study, Folkerts noted 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 texts could be roughly divided into two major categories. The large majority of the texts from the early Urk campaigns were shown to be documents from the administrative sphere of activities, for example, lists of personnel, records of rations distributed to officials, to workmen and to livestock, accounts of products deriving from agricultural households and from craftsmen. For fewer texts contained lists of signs and sign combinations which, the same as two comparable tablets already known from Jerablus (No.77 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 Urk excavations was transferred to A. Netzebeck.
of the object in excavation squares 20–20m was noted, and second a rough description of the relationship of 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 Emara 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. These stratigraphic aids, with few uncertain exceptions, 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 IV date, let alone among texts of the subdivisions of the construction level Uruk III in Emara. In these cases, Falkenstein, Nissen and others have attempted to define palaeographical characteristics peculiar to specific subdivisions 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 local formed substantially coherent and discrete administrative and lexical archives, that is, that tablets from an individual accountant or school unit will have been gathered, 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. 21-31 ("Determing the archaic texts from 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 earliest stratigraphy and architecture of the site in his Uruk: Die Staatshypotope [...], ALUVE 3 (Würzburg 1995) and Uruk: Die Architektur [...], ALUVE 1 (Würzburg, forthcoming).

82 Disregarding the gypsum tablets from the White Temple (see the discussion above), it appears that only the group of texts described 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 of Brandenburg’s karterist 4th or 5th century 1st millennium BC beside other fills of the temple C in the eastern flanks of Temple C. This information, however, is highly uncertain in light of the excavation reports.

83 H.J. Nissen, "Urma Dattelungs-krater" in ATU 2, pp. 53-62. The division chosen by Nissen are perhaps independent of the building levels Uruk IIC, since there was no stratigraphic justification for assigning representative texts to the writing phases he designated Uruk II,3.1. See my discussion below.

in the south of the country, and by a particularly close relationship to the then director of the Verkehrsmuseum in Berlin, W. Andree, but also by the developments in Nazi Germany and his own opposition to anti-Semitism; see Agrippa Chistie, An Autobiography (London 1977) 561-562. Incidentally, Jordan had good contacts with representatives of the German Reichsdenominations in the early years (see S. Wollberg, "Die Altzeit- und Orientwissenschaft im Dienste des deutschen Imperiums," Wissenschaftliche Zeitschrift der Universität Halle XX:2 [1971] 90-108) and presumably assisted in the planning of the Deutsches Orientkraus. The stated goal of his Oriental Studies was, according to a memoir from the office of J. van der Zee, Berlin [November 1941], "the re-evaluation of the German Democratic Republic" (cit. W. Andree). Falkenstein and H.J. Nissen belonged to the military staff of the Orientkraus, the Sonderstab Felmy. Jordan died in February 1945 in Berlin.

80 Noldeke was himself a follower of Hartmann who enjoyed some archaeological training with R. Koldewey in Babylon, GT, the preliminary excavation reports published by Noldeke, Heinrich, Zimmer, and other contributions beginning with UBE 4 (Berlin 1922 through UBE 11 (Berlin 1940), and the considerable number of articles and monographs dealing with specific topics in the Uruk work, including E. Heinrich, "Klassische aus den Orientkraus" (ADU 1 [1939] 1:4; id., "Die Entstehung der Uruk-Kraus in der Orientkraus", ZA 49 [1950] 20-44; if., "Die Tempel und die Tempelbaukultur in alten Mesopotamien [...], Berlin 1982); H.J. Nissen, "Die Tempel der Schicht Aschares IV in Uruk" ZA 49 [1950], 10-20; if., Mesopotamische Tempelbauten von der Frühzeit bis zum zweiten Jahrhundert", ZA 31 (1955) 1-50, if., Die Entwicklung der Zitaten [...], ADU 4 (Leipzig 1941); cf., Falkenstein, ATU II. The early monographs and reports on the archaeological work are currently being thematically revised in the series Ausgrabungen in Uruk-Warazin: Endberichte (ALUWE).

81 M.W. Green and H.J. Nissen, ATU 2. See above, n. 54, for further references.
3. PREHISTORIC Writings

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 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 even 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 Urkic expansion of the late Urkic 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 an object — 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 Urkic, from the Urkic 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 Urkic, which have either been lost or fallen prey to the vagaries of excavations and remained buried in Near Eastern tell, or were written on materials that could not survive the millennia as did clay and stone. This conservative argumentation ex silentio can, however, be disregarded. The precursors to proto-cuneiform are clearly found in the archaic period ascribed to Urkic itself, as well as from nearly every major Urkic 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.

3.1. Stamps

As Adams and Nissen have shown, the Urkic period saw a substantial population movement into the Babylonian alluvial plain, above all into the region surrounding the southern center of Urkic. At the same time, and well before the initial appearance of inscribed tablets, the first cylinder seals appear, replacing the earlier used stamp seals. These devices carried some motifs — from simple geometric incisions to highly plastic and naturalistic representations of animals and humans — and were impressed on a millable surface, in Mesopotamian 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 Urkic assemblages (some few examples are depicted in figures 9-10), and that the larger the settlement the greater the number of motifs attested there. The jackal
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.

Figure 9: Common archaic seal motifs

Figure 10: Archaic seals with scenes of wild pigs; reconstructed seal impressions depicting lions and boars (a), lions, boars and ibexes (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) F. Boessneck in K. Quispel, Abh. 3, pl. 31, no. 79 [cf. D. Schram, MB II (1933-34)] 43, pl. 25b, and P. Assar, in G. F. Molitor, Vorläufer der geschichtlichen Archäologie (Mainz 1951) pl. 10, no. 164.
b) J. Jordan, MDP 2 (1981) 42, fig. 32 to MDP 2, pl. 34b, and Schram, op. cit., pl. 10, no. 165.
c) Boessneck, op. cit., pl. 23, no. 21; K. Quispel, Abh. 4, pl. 2, fig. 26; H. J. Leenstra, CA 49 (1950) 11, fig. 14, and Assar, op. cit., pl. 10, nos. 157-158 (arrow seal).
d) C. Legrand, MDP 16 (1972) pl. 19, nos. 245-246 (cf. id. Le Bas, Ind. 23 [1957] 100, fig. 20, no. 13; and id. Le Bas, op. cit., pl. 30, no. 695).
e) Boessneck, op. cit., pl. 16, nos. 245-246 (id. Le Bas, ind. 23 [1957] 100, fig. 20, no. 13; and id. Le Bas, op. cit., pl. 30, no. 695).
f) M. Grisey & M. Conde, From Uruk to Assyria (Louvain 1991) pl. 62, fig. 556a; id. Steinmetzer, AJA 84 (1980) 115, fig. 3.
g) Assar, op. cit., pl. 40, no. 199.
h) H. J. Kroonen, P. De Mooy and P. K. England, Freie Schulen und Techniken der Vorderasiatischen Steinmetzerei im alten Vorderen Orient (Berlin 1991) 43 (cf. seal impressions on a tablet from the former Lieberman collection purchased by the authorities of the Metropolitan Museum, New York, was originally drawn by Abdullah M. Kuhil, a commentary will be published by M. Paton and E. Assar).
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-1970s, 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 this 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 conventional Urk. Pto writing system presupposes earlier pictographic forms. Her research into the form and function of the objects she called "tokens" has provided a heated discussion of their meaning, with occasionally harsh criticism of her methodology and conclusions.90

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 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 Urk. In the 4th millennium, decorated in Schmandt-Besserat's terminology 'complex' tokens, i.e., clay tokens of plain and complex form which had been punctuated through and so probably hung on a string, or had been decorated with varying numbers of hatching incisions, or both, began 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.91

90 These small objects had been collected in Near Eastern excavations since the turn of the century; however, they were normally 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 pubei (tablets) in inner cavity, and bore on its outer surface a list of small cattle, altogether 48 head. It was clear that the tablets 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 tablets identified as counters by Oppenheim and similar clay objects within clay envelopes from Susa dating to the late Urk period (from 5000 B.C. and earlier), 'Anachronisms in Sumerian Inventories', ANEP 12 (1966) 15-23, and his student Schmandt-Besserat, finally connected these clay pubei with the innumerable small objects from pre-literate levels throughout the Near East which she had been studying in conjunction with work on the western Mediterranean ceramics. See her 'The Use of Clay before Papyryus', Expedition 17 (1974) 11-17; 'An Archetypal Recording System and the Origin of Writing', SMS 17 (1974) 321-329. The Envelopes that Bear the First Writings. Technology and Culture 21 (1980) 357-385; Before Numerals. Visual Language 18 (1982) 48-60; 'The Origins of Writing'. J. Written Communication 31 (1985) 21-45; From Tokens to Tablets. A Re-Examination of the So-Called 'Numerical Tokens', Visual Language 15 (1981) 27-134. These studies were revisited in her recent Before Writing, vol. II (Austin 1999), 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 1995 under the title of How Writing Came About). See the generally negative reviews by R.K. Englund, Science 260 (1998) 107; T. Michalowski, American Anthropologist 95 (1993) 906-922; P. Damrosch, Bio-Medical Journals 12 (1992) 935; J. Friesen, 0022-9164 (1966) 277-309; F. Zampetti, Journal of Field Archaeology 20 (1992) 235-257, C.S. Brown, CPSM Bulletin 37 (May 1996), 33-43.

91 One of the keenest critiques of Schmandt-Besserat's publications is that these early token assemblages represent a complex and interconnected regional system of accounting which is unsupported by the archaeological record, can be further interpreted, and which led to many inferences on the basis of small signs that could have remained unproven without damage to the basic ideas. Small clay objects found in large quantities of artifacts are difficult to be understood as a true accounting system. Small clay objects found in graves of adults, small stone objects found in children's graves, and stone weights found in tombs, were often offerings of value meant to last for eternity on the other side.
3.3. Clay envelopes

More recent excavations in Persian Susa seem to demonstrate that, in levels immediately prior to the Ur II period, administrators enclosed plain tokens in clay envelopes and sealed the outer surfaces of these hollow balls with figurative seals. In numerous late Ur II settlements, including Persian Chogha Mijth, southern Babylonian Urk 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 tacitly within the balls. These groups of tokens were thus the first contextually meaningful assemblages of accounting tools in the Ur II 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 Ur II 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 resistance particularly of museum staff and 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 ninety of the total of ca. 130 excavated clay envelopes remain completely intact. 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. Yet through 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 Ur III expansion driven by luxury demand in southern Babylonia would suffer if it could be shown that the clay envelopes from reputed late Ur II 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 is suspected in the case based on the little material currently available.

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A final report of excavations has recently appeared: P. Delougaz and H. J. Kavan (ed., by A. Azarnesh), Susa Muḥ, vol. 1-2, OIP 101 (Chicago 1990); see 11, pp. 120-133, 12, pls. 34-60, 134.
3.4. NUMERICAL TABLETS

At the same time as 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). 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 lamps 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) quickly assumed the form of Uruk IV pictographic tablets and are generally considered the immediate antecedent of the earliest true writing.

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Figure 13: Early numerical tablets. Two prehistoric numerical tablets from Jebel Anata (after G. van Driel, IS 14, fig. 9, 2, and 2) document the inscription of signs exceeding the limit known from later texts.

The Urak tablets in figures 15-16 contain interesting examples of features peculiar to this stage of writing and common to both Urak and Susa. A style with a rounded and 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 style of the style used to impress dividing lines between discrete notations, instead of the sharp edge of the 'ideographic' style.

3.5. NUMERO-IDEOGRAPHIC TABLETS

The most intriguing sign of contact between Urak and the Susians is the very early time of their respective development of separate ideographic scripts is evident in a number of 'numero-ideographic' tablets from both regions (fig. 10). These tablets bear the characteristics of simple numerical notations, seal impressions, but the inclusion of one, at most of two groups of ideograms, common to both regions, which represent discrete
3.2.2. The signs SAA M (right) and SAA M appear as a result of the use of the stylus shaft in drawing lines of case separation. They are not an ideographic feature of the Eblaite script, but rather are a result of the use of the stylus shaft in drawing. The presence of these signs on the tablets suggests a connection between the Eblaite and Ugaritic scripts, as both scripts use similar techniques for drawing lines of case separation.

3.2.3. The signs SAA M (middle) and SAA M (left) are also present on the tablets. These signs are similar to the ideograms used in the Eblaite script, and they may represent numerical values or other ideographic symbols.

3.2.4. The signs SAA M (right) and SAA M (left) are not present on the tablets, and it is unknown what they represent.

3.2.5. The signs SAA M (bottom) and SAA M (top) are present on the tablets, but their meaning is unknown.

3.2.6. The signs SAA M (left) and SAA M (right) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.7. The signs SAA M (middle) and SAA M (top) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.8. The signs SAA M (bottom) and SAA M (middle) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.9. The signs SAA M (left) and SAA M (right) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.10. The signs SAA M (bottom) and SAA M (top) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.11. The signs SAA M (middle) and SAA M (left) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.12. The signs SAA M (right) and SAA M (bottom) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.13. The signs SAA M (top) and SAA M (middle) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.14. The signs SAA M (left) and SAA M (right) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.15. The signs SAA M (bottom) and SAA M (top) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.16. The signs SAA M (middle) and SAA M (left) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.17. The signs SAA M (right) and SAA M (bottom) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.18. The signs SAA M (top) and SAA M (middle) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.19. The signs SAA M (left) and SAA M (right) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.20. The signs SAA M (bottom) and SAA M (top) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.21. The signs SAA M (middle) and SAA M (left) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.22. The signs SAA M (right) and SAA M (bottom) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.23. The signs SAA M (top) and SAA M (middle) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.24. The signs SAA M (left) and SAA M (right) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.25. The signs SAA M (bottom) and SAA M (top) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.26. The signs SAA M (middle) and SAA M (left) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.27. The signs SAA M (right) and SAA M (bottom) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.28. The signs SAA M (top) and SAA M (middle) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.29. The signs SAA M (left) and SAA M (right) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.30. The signs SAA M (bottom) and SAA M (top) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.31. The signs SAA M (middle) and SAA M (left) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.32. The signs SAA M (right) and SAA M (bottom) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.33. The signs SAA M (top) and SAA M (middle) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.34. The signs SAA M (left) and SAA M (right) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.35. The signs SAA M (bottom) and SAA M (top) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.36. The signs SAA M (middle) and SAA M (left) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.37. The signs SAA M (right) and SAA M (bottom) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.38. The signs SAA M (top) and SAA M (middle) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.39. The signs SAA M (left) and SAA M (right) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.40. The signs SAA M (bottom) and SAA M (top) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.41. The signs SAA M (middle) and SAA M (left) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.42. The signs SAA M (right) and SAA M (bottom) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.43. The signs SAA M (top) and SAA M (middle) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.44. The signs SAA M (left) and SAA M (right) are also present on the tablets, and they may represent numerical values or other ideographic symbols.

3.2.45. The signs SAA M (bottom) and SAA M (top) are also present on the tablets, and they may represent numerical values or other ideographic symbols.
Schmand-Besserat's work are not only graphically, but also semantically related in the
two archaic scripts, for example, the proto-Elamite "is seen clearly related to proto-cuneiform
meaning collectively 'sheep and goats'." A corollary development in the discussion put
in motion by Schmand-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. Gelb in his famous A Study of Writing in 1952, has been discredited.
It has not. The basis of the argument put forward by Schmand-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 Schmand-Besserat is really speaking of a two-dimensional representation of
plastic complex counters - have cited the sign UDU, representing both sheep and goats, as evidence of this archaic abstraction, there is little more discussion of further evidence.
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.

103 It is not obvious what these critics of the pictographic theory understand abstract signs to be, wholly artificial constructs or signs including abstract representations of original pictograms. Fitz, loc. cit., has, however, underlined the importance of indicating that most of the original signs were abstract representations of original pictograms. Fitz, loc. cit., has, however, validated the numerical signs themselves as abstract signs in this connection, there has, however, been little controversy in establishing the point that conventionally charged numerical symbols had a long history in prehistoric societies such as those of the 4th millennium B.C.

104 Indeed, all of these signs seem to be pictograms representing either complete or, according to the common graphic practice of artists and poets, 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 sense of proto-cuneiform signs was not simply as references of the objects they represented, presumably with the rapid development of multivocality in sign usage. This 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 also names derived from the language of those who created pictographic proto-cuneiform.

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Figure 16: Examples of number-pictographic tablets from Uruk and Susiana

much like the severaginal signs impressed with a single stroke and used, for example, to
quality 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 of Karkamis, 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
related 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

55
Essentially the same format is found in the least complex, and the oldest tablets from Mesopotamia, those dating to the Ur III period (ca. 2100 B.C.) and, based on current excavation records and on our best understanding of objects dealt through the antiquities markets, without exception from the Sumeria district in Uruk. Only the reverse 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, both). Each tablet was meant to convey a concise unit of information [see figures 17:1 and 19, W 15929,112]

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, 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, logograms, several do consist of signs which denote presumably beverages and dried fruits and so might indicate their use to tag shipments or stored amounts of these commodities. 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 books 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.

In addition, the inscriptions were carefully crafted and were inscribed into the clay tablets, sometimes in a way that the tablets hung like pendants from the objects they described. The tablets were then dried and burned, and their inscriptions melted and fused to the tablets' surface, creating a permanent record that was difficult to erase or alter. This practice ensured the preservation of the texts for future generations, and the use of this technique allowed for the creation of a rich and diverse corpus of historical and cultural information. The tablets were stored in archives and libraries, and were used as a means of communication, record-keeping, and documentation.

The tablets were inscribed with a combination of signs, including logograms and syllabic symbols. Each sign represented either a word or a part of a word, and the combination of signs formed the inscriptions. The inscriptions were written in a specific script, known as cuneiform script, and were carved into the surface of the tablets with a stylus. The script was written from right to left, and the inscriptions were often written in columns.

The tablets were used in a variety of contexts, including administrative, legal, economic, and religious. They were used to keep records of transactions, to document loans and debts, to record the distribution of goods and services, and to maintain records of offerings and donations. The tablets were also used to record the results of divination, to keep track of astronomical events, and to record the movements of the stars and planets.

The tablets were a crucial component of Sumerian and Babylonian society, and they provided a wealth of information about the society's history, culture, and economy. The tablets continue to be an important source of information for modern scholars, and they continue to be studied and analyzed to this day.
Figure 17: Tablet formats found in the archaic texts
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 17:2)\(^ {117}\); 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 entries\(^ {118}\). 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 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 Ur III period, that is, in the period of purported decline after the great building activities, and the presumable colonizations of the 'Urak expansion' ending in the Ur III period.\(^ {119}\)

The two account types in figure 17:6-7 represent high levels of accounting, found only in the Ur 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 MSWO 1, 185.\(^ {120}\) Various summaries 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 (1-3N\(_i\),+U\(_i\)) and that the counted objects "DUR" (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 DUR, and GI DUR, for each year; secondly, all the BA DUR, and all the GI DUR, are totaled, and finally the two sub-totals of BA and GI are summarized in a general total of all DUR.

\(^{117}\) The numerical value in the text format indicates the entry sequence, counting the cases I. from the top, and Ia, Ib, etc. within particular cases.

\(^{118}\) Fig. 17:3; the columns are in conventional translations qualified with the use of Roman numerals I, II, etc. Note that this simple multiple-entry format was that of the so-called linear 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 for eclipse in economic value any goods documented in such periods are qualified by clay envelopes and numerical tablets, insofar as we can understand their meaning (see P. Damhorst and R.K. Englund, Tape Yahya) – should act as a warning to proponents of an expanding southern Babylonian administration in the late Ur III period, followed by decline and withdrawal from regions bordering Mesopotamia in the Jemdet Nasr/Ur III phase.

\(^{120}\) See also the example MSWO 1, 95, in fig. 21 below.
In those cases in which the obverse did not offer enough space to complete all separate entries — represented by the letter 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 Jeremel Nais account, MSVO 1, 99, in figure 21, presents an example of such an accounting procedure. This is a phenomenon noted also in the Jeremel Nais period proto-Elamite texts from Persepolis. 121

With one or two possible exceptions, we have in the archaic cuneiform 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 subcases correspond to the adjectival, divisions of colophons to adverbial qualifications in more advanced syntax.

4.2. RESEARCH OF PROTO-CUNEIFORM

Our basis for judging the characteristics of the proto-cuneiform writing system is not small. Some 5,820 archaic texts and fragments containing close to 33,000 individual entries (cases) and 42,000 individual occurrences of ideograms are currently catalogued and transliterated according to values assigned the signs in the sign list ATU 2. Despite the impressive amount of material, it has not been possible to positively identify the language of these scribes who developed and used proto-cuneiform in the periodics Ur III and before Early Dynastic I, upheavals which might themselves have led Sumerians into the southern alluvium. 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, more pronounced for the auditor than for 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, common family names, and the like.

[Numbered references excluded for brevity.]

This is a view held by few in the field; see, for instance, C.H. Gordon, The Ancient Near East (New York, 1965), 3rd. A.L. Oppenheim, Ancient Mesopotamia (New York, 1954), 49, recognized the incongruities of proto-cuneiform in writing Sumerian; he believed, however, that the creators of the script, and their writings, dated to a period before Ur III. 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 last elder, either native or alien, civilization, which may or may not have had some relation to the foreign elements in the Sumerian vocabulary, the toponymical names of the region, and possibly the names of the gods worshipped there.
transliteration system these readings offer us, since it is often easier to make note of the sign denoted AMAR than its correspondence from the Forkenstein list ATU 1, 458. However, the graphically similar groups formed by Green are more difficult to discern, 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. If that is not the case, and it is not in this case in many sign identification 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.

In fact, following this supplemental differentiation, the current list of archaic signs gives us 655 numerical signs, and nearly 1900 ideograms. This more than doubling of the total published in ATU 2 in all likelihood rests on the side of caution, assigning separate codes to all signs whose contextual usage cannot be shown to demonstrate an allomorphistic relationship to a sign whose identification is supported by lexical attestations. Thus until it can be shown that signs related to the right or left, so-called transform 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 into a prescribed space, scribes are known to rotate a sign such forms receive distinct names (for example, TI, and TI). These types of rather obvious variations are numerous in the earlier archaic period Unik IV (see, for instance, the signs ENI and SANGA in figure 22) and can lead to an inflation of identified signs. Another example of probable overabundance are the many sign identifications resulting from the more or less pictographic renderings of animals' heads in the Unik IV period. In these cases, sign name differentiations were chosen as a stop-gap measure to keep some control of Unik IV as opposed to Unik III forms, remembering just the same that it is precisely the series of animal heads from the Fara signlist

125 This is also the major criticism of the radiocarbon dated cited below, n. 130.
126 The indexing of suspended signs was already underway by the time of publication of the signlist (see ATU 2, p. 367-356). New sign forms are for the moment being assigned consecutive numbers following the last attested number in ATU 2, ZA17263. 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 2; these relational files, in ASCII format but prepared for loading into a common database program, included a complete catalogue of all archaic texts, a signlist and a text file with all transcriptions, 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 visibility in these texts from European collections, and for obvious reasons a relatively lower visibility than 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://cuneiform.,humnet.ucsd.edu", with European mirror on the server of the Max Planck Institute for the History of Science, Berlin.

125 See below, section 5.1.
126 The editors, moreover, felt charged to limit their efforts to the archaic texts from Unik, leaving aside all evidence from the text corpus from Jemdet Nasr and from other collections.
which remains a major stumbling block in any attempt to write a paleography of cuneiform for the period 2500-2000 B.C.\textsuperscript{29} Unnecessary differentiations can, moreover, be much more easily dismissed at a later date than necessary differentiations retroactively introduced.\textsuperscript{122}

While compared with a logographic script such as classical Chinese with its 90,000-60,000 signs\textsuperscript{123} the current archaic sign list appears rather modest, is should be noted that like the Chinese script our proto-cuneiform is not 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 (variants, inverse, and in the Ur IV period the reverse image\textsuperscript{122}) and decorations with added strokes and dots (gurdu, sasgi\textsuperscript{122}). 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, 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 coals' 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 Fallenstein (TU) and Green and Nissen (TU 2), must be considered a more valid basis for judging the sign repository of the archaic period, which at this complexity might still assume the role of a reduced logographic, and not an ideographic writing system.\textsuperscript{122}

\textsuperscript{129} Speidel, U.K. 239-264.

\textsuperscript{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) 130-141, M. Kretzer, OIZ 89 (1994) 380-385, and P. Steinke, BCB 52 (1996) 89-173.

\textsuperscript{131} V. Max, "Modern Chinese Writing," in: P.T. Daniels and W. Bright (eds.), The World's Writing Systems (New York, Oxford 1996) 200, notes: "The number of logograms in 400 A.D. was from 9100 to 12,900 characters and in 26,500 to 75,333, to 33,200 in 1616. 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, 95% of the intended proto-cuneiform sign repertoire of 1950 are attested just once, 29% twice, and 1.3% three times; this means that more than half of the listed graphs represent just 2.5% of the total sign occurrences of 62,000 (ideograms and numerical signs).

\textsuperscript{132} See fig. 22, signs EN, SANS, and NUS.

\textsuperscript{133} The addition of one or more impressions of the blunt end of a numerical stylus might be included here, inexplicably called 'TAR' in TU 2 (see, for example, fig. 22, sign GURUS, but also NUN).

\textsuperscript{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 50 discrete graphs in a myriad of combinations, and that Babylonian ideograms introduced in later periods were rarely new, but merely combinations of old elements.

Figure 22: Paleographic differences. The table demonstrates some of the graphic development between the Ur IV and III periods. 1: straightening of abutted lines, 2: abstraction of ogival, 3: simplification of elements, standardization of sign orientation, 4: varia.
Counting signs might seem an effort 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 Urk IV–III, beginning with EN undeniable, which seems to represent the highest official in archaic administration. This sign is attested more than twice as often as the next most numerous sign, SE = barley. The sign BA of about the same frequency as SE represents an administrative function, presumably “distribution” or “inspection.” AN and NUN are both likely designations of duties (possibly An and Eri, respectively; notice that MUS = Inanna is quite low in this list). The object designations with the highest frequency are, not unexpectedly, SE = barley, followed by SAL = “female slave,” and UDUB = “small cattle.”

<table>
<thead>
<tr>
<th>Sign</th>
<th>Meaning</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN</td>
<td>“chief administrator”</td>
<td>996</td>
</tr>
<tr>
<td>SE</td>
<td>“barley”</td>
<td>496</td>
</tr>
<tr>
<td>BA</td>
<td>“distribution”</td>
<td>495</td>
</tr>
<tr>
<td>AN</td>
<td>“An”</td>
<td>485</td>
</tr>
<tr>
<td>NUN</td>
<td>“Eri”</td>
<td>456</td>
</tr>
<tr>
<td>MU</td>
<td>“overseer”</td>
<td>409</td>
</tr>
<tr>
<td>SAL</td>
<td>“female slave”</td>
<td>388</td>
</tr>
<tr>
<td>GA</td>
<td>“delivery”</td>
<td>308</td>
</tr>
<tr>
<td>SANGA</td>
<td>“accountant”</td>
<td>305</td>
</tr>
<tr>
<td>GAL</td>
<td>“large (person)”</td>
<td>353</td>
</tr>
<tr>
<td>E1</td>
<td>“household”</td>
<td>335</td>
</tr>
<tr>
<td>UDUB</td>
<td>“small cattle”</td>
<td>330</td>
</tr>
<tr>
<td>SU</td>
<td>“hand, receipt”</td>
<td>298</td>
</tr>
<tr>
<td>U1</td>
<td>“day”</td>
<td>286</td>
</tr>
<tr>
<td>TUG</td>
<td>“oil of cloth”</td>
<td>268</td>
</tr>
<tr>
<td>BAR</td>
<td>“y”</td>
<td>265</td>
</tr>
<tr>
<td>BU</td>
<td>“j” (snake)</td>
<td>252</td>
</tr>
<tr>
<td>SITA</td>
<td>“an official”</td>
<td>250</td>
</tr>
<tr>
<td>A</td>
<td>“water”</td>
<td>249</td>
</tr>
<tr>
<td>AS</td>
<td>“large household”</td>
<td>242</td>
</tr>
<tr>
<td>SU</td>
<td>“basket”</td>
<td>238</td>
</tr>
<tr>
<td>DJ</td>
<td>“y” (food)</td>
<td>227</td>
</tr>
<tr>
<td>PA</td>
<td>“supervisor”</td>
<td>226</td>
</tr>
<tr>
<td>KL</td>
<td>“place”</td>
<td>229</td>
</tr>
<tr>
<td>SAG</td>
<td>“human”</td>
<td>224</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sign</th>
<th>Meaning</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME</td>
<td>“a textile?”</td>
<td>223</td>
</tr>
<tr>
<td>GU</td>
<td>“ration”</td>
<td>220</td>
</tr>
<tr>
<td>MUS</td>
<td>“Inanna”</td>
<td>219</td>
</tr>
<tr>
<td>GAR</td>
<td>“grain ration”</td>
<td>212</td>
</tr>
<tr>
<td>NAM</td>
<td>“official qualification”</td>
<td>200</td>
</tr>
<tr>
<td>AB</td>
<td>“cow”</td>
<td>202</td>
</tr>
<tr>
<td>TUR</td>
<td>“small (person)”</td>
<td>197</td>
</tr>
<tr>
<td>DUG</td>
<td>“beer jug, oil jug”</td>
<td>196</td>
</tr>
<tr>
<td>IB</td>
<td>“household”</td>
<td>195</td>
</tr>
<tr>
<td>UNUG</td>
<td>“Ur”</td>
<td>190</td>
</tr>
<tr>
<td>NE</td>
<td>“red?”</td>
<td>186</td>
</tr>
<tr>
<td>SI</td>
<td>“3 [horn]”</td>
<td>183</td>
</tr>
<tr>
<td>DUG</td>
<td>“beer jug”</td>
<td>181</td>
</tr>
<tr>
<td>HK</td>
<td>“egg?”</td>
<td>180</td>
</tr>
<tr>
<td>SUEUR</td>
<td>“dried fish”</td>
<td>179</td>
</tr>
<tr>
<td>KU</td>
<td>“fresh fish”</td>
<td>176</td>
</tr>
<tr>
<td>TE</td>
<td>“an official”</td>
<td>162</td>
</tr>
<tr>
<td>GA</td>
<td>“milk bucket”</td>
<td>153</td>
</tr>
<tr>
<td>ERM</td>
<td>“wet”</td>
<td>153</td>
</tr>
<tr>
<td>MA</td>
<td>“string of fruit”</td>
<td>151</td>
</tr>
<tr>
<td>KL</td>
<td>“half measure of oil”</td>
<td>146</td>
</tr>
<tr>
<td>ZATU</td>
<td>“y”</td>
<td>132</td>
</tr>
<tr>
<td>SU</td>
<td>“leather”</td>
<td>131</td>
</tr>
<tr>
<td>APIN</td>
<td>“paw”</td>
<td>115</td>
</tr>
<tr>
<td>MAS</td>
<td>“male kid”</td>
<td>115</td>
</tr>
</tbody>
</table>

Another form of “sign-categorizing” 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 2-3 sequence, and so on. The some 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 III (Early) periods; a standardized sign system 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 Urk III period. For instance, professional designations attested in the ED IV L-phase [see below, section 5, and figures 32] invariably exhibit the sequence NAM/GAL/EN=qualifier, whereas other lists suggest that qualifiers precede inanimate object designations. 339

4.3. Characteristics of the Script

The physical characteristics of proto-cuneiform signs have been discussed in earlier publications. 340 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 SJU “hand,” ideographic meanings are implied which would reflect actions related to the pictogram. The original meaning of the Sumerian composite verb SJU “to give” “hand-and-approach” will have had no more impact on its understanding by native speakers than the etymological references in German middle schools to the literal meaning of begeben on students today. Thus such administrative uses of SJU 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 ASV0 1.11 and 36, is even more suggestive of its ideographic use.

339 See, for example, the combinations with TUG2 and GAAR in the list “Vessels,” below, fig. 23, and note the consistent sequences GAL/SMAR and JAAR/.UR in the text ASV0 3.11, below fig. 75.

Rememering that to achieve the original orienation 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 Urk IV and III periods in Urk. 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. Thus a simple count of 'heads' and 'tails' of archaic wedges will show that those impressions drawn against the flow of writing in the Urk IV period are dropped, and often replaced in favor of those drawn with the flow. Figure 22 attempts to demonstrate some of the common graphic elements evident in the Urk IV period which in the 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 out 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. Guttation and cross-hatching can be standardized to a series of parallel strokes. For example, the impressed dots in the Urk IV period sign KAS (probably borrowed from the numerical system used to qualify barley growts [below, figure 41]), formed parallel lines in the Urk III period sign [see figure 22:1]. Cross-hatching in the Urk IV period sign GA, representing the matting of reed baskets, was in the Urk III period made to conform to a vertical/horizontal pattern (figure 22:4). Further, the Urk III period, sign orientation was so standardized that variant orientations were no longer used, including, for instance, the mirrored forms of the signs EN and MUS. Attempts by Falkenstein and Nissen to assign, using less objective criteria, certain texts to paleographic subdivisions of the Urk III period have by and large been unsuccessful.  

4.4. The Sumerian Question

It seems an inherently reasonable assumption that proto-cuneiform script should have been invented and developed by Sumerian administrators. Despite the discrepancies 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 transferred 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 anomalies in cuneiform orthography which may or may not have grammatical relevance. First, as an agglutinating language Sumerian also forms derivatives and iteratives, as well as make 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 SU and GI, both of which according to their position in

141 This is most clear with respect to the major cultural diachronology of the Late Sumerian period, namely in the concentration and realization of community buildings, in ceramic design and typology, in the production and administrative use of the cylinder seal, and in the exploration 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 continuity of the same script as a general administrative tool, removal 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 Sumerian period. Some, for example, C. Alpgren, "The Sumerian Expansion: Cossicultural Exchange in Early Mesopotamian Civilization," Current Anthropology 30:1 (1989): 220-248, has emphasized the historical and cognitive importance of vertical symmetry in early ephoristic scripts, in "Some Thoughts on a Historico-Genetic Theory of the Letters of our Alphabet," in W.C. West (ed.), Writing Systems and Cognition [...]. Neuropsychology and Cognition (6: Duxfield, Boston, London 1994) 129-159, the same author reminds us of the tendency of letters in the Hanuman Greek. Roman lines of script development to look in the direction of writing, i.e., that the ideal letter contours are in vertical and horizontal direction of writing." 143 A. Falkenstein, ATU 1, p. 9, [with fig. 2] 144 See ATU 2, 53-55, and Archaische Bücherverwaltung, 21-23 + figs. 24-25, with a division into Urk III-3-1, reflecting, but not employing the archaic subdivisions Urk III-2. The subdivisions were based on few texts and on a presumed mixing in these of sign forms from both phases Urk IV and III.
The Nature of Proto-Cuneiform and the Sumerian Question — The Sumerian question

EN E₂ is on the other hand represented in about 30 archaic attestations, however only in texts from the northern settlement of Jeremāt Nasr together with Ti. ¹⁴⁰

MSVO 1, 196
obv. i 2
₁内马尔; EN₂ E₃₂ Ti

MSVO 1, 212
obv. ii 1a
₁内马尔; Kur₂ EN₂ Ti E₃₂

MSVO 1, 212
rev. i 3a
₁内马尔; E₃₂ Ti

MSVO 1, 212
rev. i 4a
₁内马尔; S₄₂ E₃₂ Ti E₃₂

MSVO 1, 213
obv. ii 2a
₁内马尔; S₄₂+K₂ E₃₂ Ti E₃₂

MSVO 1, 213
obv. ii 3a
₁内马尔+K₂ E₃₂ Ti E₃₂

MSVO 1, 213
rev. ii 4a
₁内马尔+K₂ E₃₂ Ti E₃₂

MSVO 4, 13
obv. i 1
₁内马尔 Ti E₃₂

MSVO 4, 36
obv. iii 6
₁内马尔 E₃₂ Ti E₃₂

While it may be that EN₂ 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. The Urk. III period text WV 21126, the only witness containing the initial lines of the archaic cuneiform text (fig. 24 below) ¹¹¹ attests in its turn to Jeremāt Nasr. The previously Jeremāt Nasr geographical list MSVO 1, 243 (tablet purchased by the author from a British Museum dealer, see MSVO 2, 2, 7 contains obs. iii 4 an apparent reference to this settlement with the entry A ₂内马尔; Ti). The Urk. IV period administrative text WV 9579°, obs. i 10 contains the entry ₁内马尔; Ti. MEM; D₄₂ K₁ EN₂ DiNaS₂, E₃₂ Ti. Although there is no association between EN₂ and the Tiglath IsIN₂. To note the probable ascription of the same place-name in the Abu Salabikh text OIP 39-40 (see WV 4 i 4 4 6 4 5) ¹¹²

¹¹¹ Note that the text MSVO 1, 213 represents a copy of a section of 212, thus reducing the number of real attestations in Jeremāt 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 EN₂ in the sign combination reflects a scribal or regional variation. See the following footnote.

¹¹² MSVO 4, 10 and 56, certainly the latter and partly both deriving from Uruk excavations, write the combination with the variant form EN₂ (more than two horizontal strokes inscribed in the sign). The case before above in obs. iii 6 of the latter text contains the notation ₁内马尔; E₃₂ Ti; the sign D₄₂ K₁ parallel to sī₂ was used to qualify even/bulls and calves in the lexical list of domesticated animals and is believed to represent the demotic designation (see). In turn the name of the archaic cuneiform text from the Abu Salabikh text OIP 39-40 (see WV 4 i 4 6 4 5).”

¹¹³ The text was first discussed in M.W. Green, “A Note on an Archaic Period Geographical List from Warla,” JNES 35 (1976) 293-294, with a reading — based on an archaeological photograph — of the second entry of EN₂; this reading formed the basis of H.J. Nissen’s short discussion of the sign combinations EN₂/ K₂ in Omane in Tawart at Uruk,” OHM 54 (1983) 228. My subsequent collection of examples from the Iran Museum, Baghdad, ISHO 31 [1968] 131-127, 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 EN₂/ K₂. This was in turn to be noted to the recent comments of T. Jacobsen, The II, in: Enûma, 15: Sibill, 229-336. The recognition of the archaic form of the text is generally accepted (note that the variant K₂ should represent some type of horse, in particular as attested in the Jeremāt Nasr text, for which see R.K. Englund and J.P. Galgani, MSVO 1 s.v., P. de Reucker’s discussion of this matter in BH 52 [1990] 700, an unattested), Jacobsen in this article (p. 279, citing the earlier opinion of A. Delattre, Pamphlet 356-1) incidentally analyzes the name Êbildi as ‘lord winds’, against current opinion that the name represents a popular Sumerian etymology for a substitute name Sīli-III, whereas the Akkadian suffix ... derived from Sīli implies the existence of an additional component. The name Êbildi has already noted in MSVO 2, 34, the element K₂, was in the Jeremāt Nasr city seal impression replaced by the sign NUN, and that the reading of Enlil in an

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 now reinterpreted in administrative context.

A certain Sumerian bias might explain the early identification of a presumed example of Sumerian multivocality in the archaic script by the Assyriologist and Archaeologus. A. Langdon’s ¹⁴⁴ As an excavator and epigraphist of the first large group of archaic texts unearthed in Mesopotamia, those found at the northern mound of Jeremāt Nasr, Langdon isolated among the many apparent personal designations of the Jeremāt Nasr texts the sign combinations EN₂ Ti, which he analyzed as a common Sumerian form E₃₂ Ti, ‘May Enlil give life’. This personal designation would share two characteristics with Sumerian papyrographical 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 personal names consist of sentences with subject and predicate, or of other recognizably grammatical elements. ¹⁴³ A correct analysis EN₂ Ti would, moreover, provide us with clear evidence for the multivocality of the sign ARROW in proto-cuneiform,¹⁴² namely, that the word for ‘arrow’ should be a homophone of the word for ‘life’, ‘to live’. As has been noted to contribution, this homophone construction is known only in the Sumerian language.

A closer look at the combination EN₂ Ti, however, makes this analysis of the name unclear, if not improbable. Of the ca. 50 attestations of the sign Ti, it 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 EN₂ Ti (WV 17729, rev. i 3b). ¹⁴⁴ This positive divine name

Langdon was, in fact, focused on the Sumerian origins of Mesopotamian culture as to venture in "A New Theory in the Problem of Sumerian Origins", JNES 1, 529-536, that plane cuneiform builders of the Early Dynastic period were a "reconstruction of the culturally reorganized indigenous inhabitants of South Mesopotamia", although, to the contrary, plane cuneiform bricks may have been the earliest contribution of Sumerians to Mesopotamian building.


The sign itself is a pictogram of an arrow and a bow. This would more probably be called a paronomastic use of the sign, since the multivocality is defined as the use of a graph paronomastically and paronymically (the same graph represents variable, phonetically distinct words). Only after a growing ambiguity — increased by the enlarged repertoire — has to be called to question. Multivocality has led to the invention of a new sign, a different way of writing Ti, ascribed to the Sumerian script by some scholars (see below, n. 158).

A. A. Popper, "Die Zeichen En₃ und In₃ in den proto-sumerischen Texten aus Drehert Nasr," BMJ 21 (1990) 141-145 (translation of the article which appeared in Periérwachsung, ab 1990) 57-30, thus analyzed the combination EN₂ Ti. It is written as EN₂ Ti, "House of the god En₃," or as EN₂ Ti, "House of En₃ Ti.", The one is the English value of the word "lord", and the other is the English value of the word "life", depending on the context of the philological concern. Some support of this interpretation may be drawn from a comparison of in particular entries AB₂ EN₂ Ti, in the Urk. III period text WV 14355 obs. i 2 and EN₂ Ti in the Urk. III period texts from Uruk (WV 17729, rev. i 38) and from Jeremāt Nasr and elsewhere (for example, MSVO 1, 196 abv. i 2, 212 rev. i 3a, 26, and MSVO 2, 13 obv. ii 2, 30 abv. iii 6). Both AB₂ (later reading @student) and EN₂ Ti represented households normally headed by gods. Enlil was a settlement in the northern Diyala region, thus probably in at least commercial contact with the region

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The control of goods and agricultural land. The natural choice of interpretation would seem to be that GI = /γ/ and thus the homophone of the Sumerian administrative term γεε, to (cause to) return. It is, however, difficult to explain the qualification with GI and BA(2) of two quantities which are subsumed in a common total, since a Sumerian identification of BA as 'divide' would result in the consolidation of entries such as SUL.GABA, 'income and expenditures'. Moreover, GI and BA can quickly porcals of land in arboe accounts, suggesting that both interpretations may need to be revised. Other attempts to identify within the proto-cuneiform sign repertoire phonetic elements, 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. 154

A sophisticated attempt to locate Sumerian in archaic Mesopotamia derived from an analysis of ancient numerical systems. In 1922, M. Powell first stated his conviction that since the 123.

J. v. DAI, "Ein spätpaläobabylonischer Katalog einer Sammlung semitischer Briefe," ÖZS 58 (1989) 446, suggests a reading popi, -arab, -arab, interpreted further as 99-98, 98 - 98, 98, of the professional designation PA NINNA, RAD, ZA. Known in the heading texts edited by M.W. Green: "Animal Husbandry at Ur in the Archaic Period," JNES 39 (1980) 1-35, to qualify a person responsible for various animals, or to be a possible Sumerian reading of the sign MA (derived from Sumerian written as isolate), variant 2. 152. RAD is a different sign (NUNA.ZA2) the author means 'AN', a simplified form of RAD. PA is likely the designation of the administrative function of the person involved. NUNA, RAD, the designation of their charges.

M.W. Green suggested in ATU 2, p. 174, that the sign MA together with the sign DARIA, or FRIG represented a Sumerian phonetic determinative. Aside from the fact that MA is only occasionally a Sumerian value of the sign (reading popi), a type of fruit, a meaning of 'meat' is not known, we have good reason to believe that MA represented a noun which with the anlagen DARIA, or FRIG were led into captivity. The same use of MA (the sign is pictographically to represent the card on which fruits were dried) is found in the sign SAG - MA found is only one Ur text, but in a number of Jered Nais accounts (ATU 2; 2152.217. Whether the sign MA attached to URI represents the Sumerian noma γεε, γεε, "a number of other possible phonetic signs of proto-cuneiform signs which would indicate a spoken Sumerian at the time of cuneiform script development. Unfortunately, the context and continuity of application of the signs cited by both have not been sufficiently documented to lead to firm conclusions about their phonetic significations. The reading of /γ/ for AN, as a phonetically motivated indicator of the sign ANA, is itself a corollary of grammatical distinctions of Old Sumerian texts, while we cannot say whether this sign meant 'another' in the archaic texts (nothing speaks for this interpretation, and only the form AMA, [ASA-AN] survives into the EO texts from Ur), or whether, for instance, the sign ANA is rather a semantic determinative. The same weakness applies to the sign MEN consisting of EN written within GR, here, we would 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 /γ/, since over-prefixed phonetizations are unlikely (c.f. J. Bauer, AFO 30-31 [1995-96] 79-87). It is likely that the reading of MEN as /γ/ is not en, or is not, of the long list of "certain or fairly certain phonetic indicators given by Seiler et al., cited, only NA in NINNA and ZA in ZZ is not evidenced in MR. 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 (ESGAR) appears to be a longword for feminine is not sufficient grounds for assigning to it a phonetic value - in SGT 59 [1995] 700 to no. 149 (and compare p. 701 to no. 184), UAK 490 is indeed related to go. An.", Seiler et al. believe the majority of the Sumerian vowels vocalized by Green to the cuneiform-signs are attested in ATU 2 are proven. I have indicated above (p. 147) that the use of semantic and phonetic indicators should follow on a lengthy development of multifarious. It may be noted in passing that a homophonic relationship appears to exist between the signs AN and ERI. In ATU 2, p. 33, W 9123,21, 21231.
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 documents. Sumerian-based lexical attestations of number words, the archaic script must have been invented by Sumerian-speaking speakers.119 This theory seems disclaimed both by the historical facts and by Sumerian numeracy. On the one hand, it is likely that the Sumerian number word series originated in the inscribed sexagesimal system rather than the other way around.120 On the other, there is greater evidence for a vestigial rather than a sexagesimal basis to those Sumerian number words attested in the third millennium.121

The strength of the assumption that Sumerians developed proto-cuneiform and that the script was used to write texts in Sumerian122 seems so imbedded that it even hampers discussions of the inadequacy of cuneiform in representing the phonetic structure of Sumerian words. Both C.P. Boisson123 and, following him, M. Scherrer124, have in recent publications underscored the difficult phonological situation with respect to the graphic realization of possible consonant clusters in initial or final position in Sumerian words.125

We might have mentioned the major technical difficulties 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 entities, moreover, the position of number notations relative to ideographic notations is fairly rigid. This 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 GI₂ = '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 isolable sign combinations with particular importance. Such texts as WV 29999 1 and WV 20274 2 in figure 65 below, as well as the series of texts ASVQ 1, 2122.2-24, present us with inscrutable lists of personal designations, and yet the sign combinations in these text entries appear to be incomparable 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 multivocality comparable to those found in early Chinese and Mayan, but more importantly in the approximately contemporaneous documentation from Egypt.126 Candidates for a determination of a Sumerian

119 ZA 62 (1972), 172.

120 See P. Damrow and R.K. Englund, ATU 2, 130. The attestations of Sumerian number words of the series of multiples of 60, that is, 2 x 60 = ges₂min, 3 x 60 = ge₃₂min, and so on, of 10 x 60 = ge₂₃₂min, and of 60 x 60 = lu₂₃₂, are with the exception of attestations of the last sign, derived not from third millennium, but rather from first millennium scholastic texts, which 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, those would not end in forms of oneself 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 precursive culture and the simple as-giving of a descriptive terminology to these signs.

121 As Powell and others have stated, the rather well attested Sumerian number word sequence below 60 exhibits a vigesimal structure, in which u = 10, ni₃₂min = 20, etc. = 30 (as appear derived from nis₃₂min, "twenty - ten", with base of initial n in vowel harmony of a stem with a long n as proposed by A.P. Rillié in 1922, for which see LAM Dictionnaire, "Some Reflections on Numerals in Sumerian", JCS 103 (1983) 85-92), min₃₂min = 40 ("twentieths, two twenties", nins₃₂min = 50 ("fifteens, two twenties, ten", ge₃₂min = 60 (possibly derived from min₃₂min, three twenties", with suffixes, reduction of the stem, incidentally, may have been on early "finitivity" in Sumerian, since it would at the same time stand for many twenties, the number word 'e₂₃₂, 'these', being a dualistic matter of language. M.A. Powell, Visagile Language 6 (1972) 17-18 has noted, however, the following complications in this interpretation: 1) a syncope of /v/ is rarely observed in Sumerian, and 2) lexical attestations of the number word lo₂₃₂ would write Nis₂₃₂, and NIS is never used for /v/ or /w/ ([some grammarians do believe NI might not be a normalized vocals /v/]. Note further that it would be difficult in the proposed etymology to explain the /v/, instead of the word for lo₂₃₂, most recently discussed by P. Steinkeller, "MUL-GE₃₂min = a Sumerian Numerical O₂₃₂; ZA 69 (1979) 170-176. 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."

122 See also A. Faletti, ATU 1, 57-62, and R.K. Kraus, Sumerian and Akkadian, (in Amsterdam 1970) 53, A. Corriveau, "Leçons et leçons linguistique et Mesopotamie", in: A. Sauvage, S. Morga (eds.), Histoire des Idées Linguistiques, Vol. 1: De naissance des métalanges en Orient et en Céadit (Lige-Brussels 1989) 100, identifies a "great argument for attributing to Sumerian the editors of texts for the period immediately following [Unit IV] (called Unit VIII of Jerard Nais, circa -3000) because they contain lists of words which are without doubt Sumerian, ... [my translation, my emphasis]."


125 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 ineptitudes found in the representation of their language through the use of that writing system, however, Scherrer writes that "Boisson carries one possible argument against the assumption of consonant clusters in Sumerian, namely that cuneiform was developed for Sumerian and so must have been linked to the language, with the case of the Linear B syllabic script, and indicates further that the Sumerian words are certainly inadequately represented ..." Such clusters are in current grammars considered anathema to Sumerian phonology, a view based, however, largely on a neoclassical analysis of a text from the Tell Asmar, published in the Nippur scholasticism. M.A. Civil has often, for example, in Studies on Early, Dynastic Lexicography, "Arab 21 (1981) 108, arguing against this, see also his important survey of the presumed Sumerian syllabary in Tell Asmar's Lexicon on Phonochemistry, JNJS 32 (1972) 57-61, and The Sumerian Writing System: Some Problems; OS 42 (1973) 21-34. emphasized the very preliminary nature of our understanding of Sumerian phonology. See also G.J. Selz, ATU 17 (1995) 253-31, to this etc., who presents further evidence for consonant clusters in initial and final position in Sumerian (ed. et al., CE 87 (1992) 40). M. Yavolante, "BIB 86 (1981) 13 107-118."

126 The inscribed labels found in the Nilu delta settlement of Abuqub and recently edited by G. Drayer, Urn en Qolab; Das pradynastische Königsgrab U. und seine frihzeitliche Freimzugszeit, AV 86 (Jahrseimaging, demonstrate the already developed nature of this script rather, however, largely on a neoclassical analysis of a text from the Tell Asmar, published in the Nippur scholasticism. It has been shown that many of the products tagged by these labels were imports from Palestine and Syria, of which at least poles 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, indispensable administrative tools serving as precursors of writing in Mesopotamia. Such so-called bills of lading 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 latter 3rd millennium to build a list of sign combinations from the archaic material amenable to equivalent analysis. Texts from succeeding settlement periods in southern Mesopotamia show that 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 Ur 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. The most obvious example of the latter phenomenon is the use of the sign MU, Sumerian /mu/, "name", to denote a prefix-pronominal in finite verbs, for example, the sign combination MU DU, literally "NAME FOOT", can be demonstrated to represent the verbal chain muïn- "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 du- ga, in which the latter phonetic element represents the syllable-final consonant of the verb du- (ga), "to speak", combined with the independent element with nominizing force, that is, /du/ + /a-/ allomorphic variants of the sign /ga/ in a phonetic as well as from a grammatical standpoint. A consideration of some readings of signs, finally, could present alternative, though very obscure candidates for the language behind the archaic texts. Doubtless most Sumerologists have passed at such readings as /bi/ of the sign KAS and any number of other readings noted in the course of sign "occultation". 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 kas-). The most plausible explanation would seem to be that such readings represent loans from an unknown language: put another way, it might be the word for beer in archaic Urk. In the same vein, we might wonder why Sumerian /fut/ is written with the sign gir-ga, a pictogram of an aquatic bird, and not with du-, the pictogram of a boat. One possibility /gif/- /or- /gif/ might be the name of an animal in a lost language, and its pictographic representation was chosen as a rebus by ED Sumerian intruders.

102 See the early treatment of the verbal forms from Fara by B. Botta, Tabletten samenschen des Sumerischen ([Paris 1937] 9-14) and the current review by M. Keel in this volume.

103 In fact the period preceding the Urk. II period after an apparent gap of some 200 years, represented as a typologically advanced by texts on tablets found both in Urk. and, much larger numbers, in archaic levels of its seems to contain substantial numbers of sign combinations which can be so interpreted. See preliminary R.A. di Vita. Studies in Third Millennium Sumerian and Akkadian Personal Names. I. Sumerian SM.16 ([Rome 1956] 22-24) and add such examples as MES.PA-DA (ET 2, p. 35, no. 507), URU-PA-DA, MES.KUR-BA (p. 38, no. 710), etc. I have profited widely discussed the ED. I texts with K. Aabehamsh in Berlin.

104 Such writings as ab.nu- "tawar", might represent "sleep less" into Sumerian from a connotatively archaic language, whose word for prayer was "sip", as has been suggested elsewhere (B. Landsberger, "The Beginnings of Civilization in Mesopotamia." In Three Essays on the Sumerians, SANE 1/2 (Los Angeles 1976) 16.

105 While these explanations might appear all too ad hoc, there are a number of concrete examples from the archaic texts of signs whose graphic referents cannot have represented the objects they denote, and so might present us with evidence for a vocabulary of the language "Archaic". The sign AB in its Urk. 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 depression of the Persian Gulf and the large swamp of southern Babylonia. However, the Jerbit Niahe texts give very strong evidence for interpreting the sign to represent a (temple) household, consonant with the reading /es/ of the sign and thus explaining the confused identification of the pictogram. Again, the archaic sign GURUS is a clear depiction of a sled, and appears in the Urk. IV period pictographically supported by apparent wheels or at least logs. Yet the large cuneiform text which is the largest single text of the Urk. IV period, ASVO 1, 1 (below, figure 69) places this sign in clear context together with SAI, "female slave", such that its interpretation as "male slave" seems binding, consonant with the reading /gurus/ of the sign. I would suggest that /es/ and /gurus/ or /gur/ were homophonic for "sea" and "household", and for "shad" and "worker", respectively, in the posited language "Archaic", and that the rebus use of the signs (es/ household, gurus/ worker) was borrowed into later Sumerian. Accordingly, it would be reasonable to assume that, since only in the ED I texts (of the SIS 4-6 levels in Ur, with some further texts from Urk. and other sites) do we find apparent evidence of Sumerian rebus-notations, and there at once in some numbers, the Sumerians entered the southern alluvium shortly before the period represented by these levels, bringing with them the diagnostic planocuneus brick. [31]
Approximately 670 of the 5820 arkaic texts and text fragments unearthed in Babylonia share specific features identifying them as lexical lists. Such lists are above all recognizable by the strict and simple format of separate cases arranged in 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 $\text{Na}$, according to the signlist ATU 2 - Na). 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 Parität). Finally, these texts from Uruk are 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 signs with those found in canonized lists copied from later periods in the third millennium.

### 5.1. Form 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 field situation of nearly all archaic texts from Uruk, and to my knowledge of all text sources, see above section 2 and H.J. Nielsen, ATU 2, 211-213; R.K. Engberg and H.J. Nielsen, 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 Uruk lists are divided into two collocations including, as a total of the two entries, numerical notations with two or more of the signs $\text{Na}$ (which represent '60') prove that the sign $\text{Na}$ 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. Nielsen, 'Sammarungen zur Literaturtradition Iren Uruk' in J. Jlauwer (ed.), 'La lingua di Ebla (Naples 1981) 97-110'; id., 'Rimants zur Uruk IV und III Fornamen,' in. M. Butt (ed.), 'The Sotai Lists' in E.A. Bankveld, 'Lexikalische Listen,' BAA (1983) 659-664; and most recently R.K. Engberg and H.J. Nielsen, ATU 3, 93-97 (cf. the comprehensive review of his volume by N. Valois, BBR 55 (1985) 43-24).

176 Only two such texts from the late Uruk period have been found outside of Uruk. L.C. Watkin's 1928 Nimrud I/m campaign unearthed the fragment MSVO 1, 242 (= S. Langdon, OECT 9, 104 & BASS 1931: 606, no. 37) 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, 67, 79, and X, with a list of synonyms, was purchased in 1974 from the Persian antiquities dealer J.E. Gage, who had himself bought a group of 14 tablets from the dealer Demetri Ferris. This group of documents was said to have derived from illicit excavations in Iraq conducted before 1915; see R.K. Engberg and J.F. Grigore, MSVO 1, 1-7. The Tablets witness is of particular importance as our only uncontroversial evidence of the use of archaic tablets outside of Uruk. Indeed, well to the north close to the large settlement Khafajeh, 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 Khafajeh, large numbers of archaic tablets, 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 folds described from top to bottom. An inspection of the preserved bits and pieces demonstrates that the dividing lines pointing 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 erasure for the physical impression of signs, just as in later periods signs generally 'hung' from this latter. 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 or 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 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's 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. I am aware of no exception in the archaic lexical material to this rule. The individual entries of all archaic lists generally begin with the sign $\text{Na}$, representing the basic unit '1' of the sexagesimal numerical system. The actual entry consisted of one or a number of ideographic or numerical signs representing an enclosed concept. Depending 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 qualified, for example, definitions of physical composition referring to colors, to age, to size, and so on; signs presumably standing for abstracts 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 ATU 3, A all consist of a numerical

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

178 See inspection of press 3, pl. 4, W 11596.0; on the obverse, metal on the reverse face of the tablet; in both cases, columns reading from left to right, pl. 23, W 12906, pl. 24, W 12906, pl. 35, W 12130; pl. 30, W 21075, pl. 43, W 22020, 2; note that, in accordance with administrative practice, the tablet was initially rotated around its vertical axis to continue inscriptions of individual entries, then returned to its original obverse position to be raised 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 Na, and representing '00', that is, the same opaque impression, but made with a rounded end of a large stylus. Both signs correspond to the vertical wedge I representing '1' in entries of the lexical lists of the second and last millennium, and were in all cases simply visual and sensory aids in counting the number of lines inscribed on tablets, so as to be able to note line texts 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 "1", followed by two ideograms representing a designation of a profession in the archaic Urk period. The list of these ideograms, either SAI, or NAM, seems to represent a qualifier of the second sign designating an office. No Urk III period writing of these kinds — on average over twenty witnesses per line — deviates from the sequence SAI, NAM, 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 that led A. Deimel in his initial publication of the Fara texts to identify them as "school texts," 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 several centuries between the earliest archaic lexical witnesses from the Early Dynastic I period represented by the SIS 4-8 level texts from Ur[114] and the highly conventionalized and in many cases nearly completely preserved lists from the Early Dynastic IIIb period in Fara and Abu Salabikh seem to mean suppressing in modern terms. But the absolutely clear correspondence of texts from both periods allows us no doubt as to the uninterrupted use of these lists in scribal schools. We must imagine the movement and expansion of schools from

110 See below, fig. 32. The first entry is only an apparent exception to this rule: NAM / SIS is simply the conventional name given the combination SITA / GIS, NAM, it is to be noted, however, that the common sign NAM, otherwise always assumes first position in the sign sequence of a professional name.

111 The sign might be a pictogram and represent some sort of predatorial or "beast of office," and so bear graphic and semantic relationship to the sign KU /LUR. If there has been some speculation about whether this sign might have assumed the function of a non-burial headdress and so borne a linear relationship to the sign NAM in later, Semitic, practice, the etymology of this word is still debated but must seem to assume that it is to be analyzed as either "an-anam" or "an-anam," in both cases Semitic stemative phonemes meaning "what it is," "it is," and so forth. This Semitic etymology of all, however, must seem to assume that the sign NAM, represented a discrete object or an abstract concept in a non-Semitic language, phonologically realized as /nami/ and, that this phoneme assumed the same function as, for example, /kam/ in Akkadian or /ram/ in German. That the sign NAM, functioned as a qualifier in the list was best supported by the fact that in the Urk IV period witness W 9050, the sign was omitted in the list entities.

112 The Urk IV period witnesses W 9050, I and W 20421, 1 (ATU 3, pl. 23) are less consistent, as are Urk IV period administrative texts, for example, W 6601, ab. 1; and W 8979, ab. 2, I (SUA NAM, KAB), W 6650, ab. 1, 2, W 8160, ab. 1 (both KAB NAM), W 8650, ab. 1 (KAB NAM), and W 8274 (with URU NAM).


114 The witness E. Barroso, REV 2, Archivum Textum (London 1934 nos. 14), 204, 205-206, all contained copies of this profession list [list A], nos. 344 represents the only substantial archaic witness of the list. The SIS 4-8 texts can be placed in the ED I period and so only roughly dated to ca. 2700 B.C.

[Image: 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 YU [~<---].]

one political or economic center to another, bringing with them the same lexica and lists of exercises. Documentation of these schools is the stuff of legend — 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 archaic 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 individual 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.
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, all list witnesses derived from excavations within this area. Although H.J. Nissen has often warned against an unlabeled acceptance of an argumentum ex silicio that scholarly activity was confined to the Eanna district — very little of the Late Uruk levels outside of the Eanna district have ever been excavated — and later lexical material was as a rule found in private contexts which, the great preponderance of lists from the area, including find loci with up to 190 lexical fragments representing all known lists, 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 man, 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. 470 tablets and fragments identified as lists, only 11 are with some certainty from the Uruk IV period,103 a further 5 may belong to this group. Only three lexical lists are securely attested in the Uruk IV period. The list v, A seems sufficiently represented by five texts,104 of which one, W 9656.h1, was nearly complete, with 9 columns containing an average 9 entries each. Uruk IV versions of the lists "Vessels" and "Metal" are represented by two, possibly three texts.105 Three further texts seem to contain so-called vocabularies, lists of signs possibly arranged according to graphic criteria.106 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 v, 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 the corresponding periods in time, 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 (v, A. A nearly 180 tablets and fragments, Metal over 80, and Vessels nearly 100).107 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 1.5 Uruk IV period lexical lists would be 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 a clear instance of a real expansion in the composition and use of lexical lists in the period following the earliest development of writing,108 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

103 The larger W 21761 is a discovery in the square S 8/VIII (see also H.J. Nissen, ATU 3, 1514, on a probable craft center; see also Nissen, Boll 5 [1970] 151). W 21761 was probably removed from its original deposit site in antiquity. That tablets were excavated in primary deposits is proven by the fact that pieces of the same tablets were found in different loci, see H.J. Nissen, ATU 2, 26.5.

104 Beginning in the Old Babylonian period, lexical material can be found 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.

105 Lexical lists formed the majority of tablets found at the loci W 15693 (75 texts, of which at least 64 could be identified as lexical lists, W 20268 (38 texts of which at least 183 were lists); to the number, the 7 lexical tablets accessioned under the excavation number W 20258 should be added, since both 20258 and 20268 were identified as deriving from the same local and W 21208 (of 47 tablets lexical lists).

106 Stratigraphical evidence supports the dating of two of the eleven, W 9200.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 3, pp. 14-16.
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**Lexical Tests and Archaic Schools — Development of lists during the late Uruk Period**

- OIP 09, 1.3, 482, 487
- OIP 09, 4, 7-9
- OIP 99, 13-17
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- OF 09, 25-27
- OF 09, 27-28
- OIP 09, 10-12
- OIP 09, 1-11
- OIP 09, 56
- OIP 09, 56
- OIP 99, 23-24
- OIP 99, 23-24
- OIP 99, 23-24
- OIP 99, 23-24

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**Figure 24. Major lexical lists of the 3rd millennium BC.**

Conspicuously absent in the earliest levels are the lists of gods that clearly attested in the Early Dynastic period. These compositions may represent an innovation of Early Dynastic traditions.
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 files 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 between it in the excavation square Nd XVII.1. Of the 193 tablets and fragments identified in this find, fully 190 were witnesses of lexical lists (ca. 30% 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: UU, A with 52 numbers (ca. 30% of a total of 175), 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 (1.5% of 30), Tribute with 25 (43% of 56), Plants with 2 + 1 together with the list Tribute (W 20266, 44a) of 4, Vessels with 17 (20% of 92), Metals with 17 (30% of 53), Grain with 1 (of 9), Cities with 7 (43% of 16), and Geography with 8 (70% of 11). Further 29 texts containing unidentified lists (of 121) completes the archive. Of the lists whose witnesses are attested in numbers of statistical significance namely, UU, 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 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 categories:

- 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)

The terminology used in Early Dynastic I given by this list is not helpful in dating the tablets stratigraphically.

See Nissen's discussion in ATU 2, pp. 41-61.

The somewhat amorphous categories of 'vocabulary' and 'practice texts', as well as the 172 texts and fragments which according to their location 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.

Figure 25: WV 21 126
The text contains the first lines of the archaic City list, beginning with the toponyms representing Ur, Nippur, Lulû and, in fourth place, Uruk (reverse unreadable).

Figure 26: Composite copy of the lexical list "Cities"
5.4.1 Places (see figures 25-27)

All 16 witnesses of the list of city names derive from the Uruk III period. 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). The significance of this sequence is not obvious, but since many of the toponyms contain elements of divine names ("NANNA, [URL] part of URL/Ur, UTU [U] part of ARARMA, [larsa], or are coterminous with divine names [EN.KID. = NIBIRU, ENIL, AB.KU.LI = NINNA, NANSE], may reflect a mythological or cultic hierarchy, that is, beginning with the household of the moon god NANNINA, followed by that of the earth god ENIL, the sun god UTU and so on.

Figures 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 20766.1 (ATU 3, pl. 2-3, 15) with the composite drawing of the list A list in fig. 22, below.


5.4.2. Animals

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

The first of these lists deals with oxen (GU), cows (AB), calves (AMAR) and possibly, wild bulls. 206 Each section of the list consists of entities representing the various animals and a static sequence of signs which apparently quantify the animals as to their age, color, etc. A second complex sign combination representing fish, their forms of preservation and probably methods of preparation, as well as descriptions of fishing gear and means of transport. 207 Fish were as a rule represented either with the sign KU, (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. 208 Two texts, of which one is completely preserved, 209 contain in SE entries 210 a list of pigs (SUBUR). 211

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 canonical in later cuneiform tradition; 212 these first lines apparently list the designations of trees, and the larger, but uncorrected second section deals with wooden objects. The sign GIS 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 marker, since witnesses reproduce 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 vine designations, and might represent some sort of agricultural custom. 213 A third list (figure 29), one of the best represented of all archaic lexical compositions, contains three sections. The first (1:1-62) 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 (II:53-84) of sign combinations which represent prepared foods, including various soups, porridges, and cheeses, and the third (II:85ff.) of designations of presumable textiles. 214 The pictograms of vessels in the first section of the list were drawn from an administrative repertoire of impressive complexity. 215 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; 216 it would appear that the first section of the list 'Vessels dealt with containers of dairy products,' 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, and an inscribed sign which qualifies the dairy product in the vessel, were not attested in the administrative texts, it is likely that their appearance only in lexical contexts was a matter of paradigmatic completeness, i.e., that the composers of this list included all products

[1988] 147-148 (222), and below, n. 397.


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

Figure 29: Composite copy of the lexical list "Vessels"
which might imaginatively have been stored, but which not necessary were ever really in vessels, or 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 various prepared cheeses.216

The regular inclusion of the signs TUG₂ and TUG₂dur, 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, GL₂, Gl₂, and NIE₂, 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 GIR₂), and tools (among others the sign NAGAR₂, "bit."217 The witness W 22 104.0 demonstrates that after this list of metal objects a list of stone objects in the form of beads, designated by the sign NUN₃U₃, was appended. This section contains the earliest clear attestation of the mineral lapis lazuli, written NUN₃U₃ KUR₃ ("beads of the mountain [or 'blue-beads']") 9, approx. Sumerian za₂.DU₂,218.

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 form 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 GAK₂ ca₂, corresponds to the ED sign UAK₂.K₂, and the neo-Sumerian combination g. . UAK₂.K₂. 216 C. P. Donovan and R.K. England, ATU 2, 1522f; R.K. England, CHN 64 (1965) 381 and 385 (at least the Ur III correspondence of archaic GAK₂ has been shown to be a direct copy and no more or less like cheese praised in simple healing songs for its high protein level and low spoilage).

217 See ATU 3, 63-64, 136-137, and the ED III witnesses SII 8 and P III 99, nos. 12-17; MEE 3, nos. 29-70, 75-79 and 75-79; CBS 14182 (identified by A. Weisskopf, in 1953, S 3670 (identified by M. Civil and G. R. Spiesz, RAA 46, and the Old Akkadian text O.R. 7. 20, Iraq 31 (1969) 37-7; cf. I. Adam. 1931-128). Since, unlike the list of forest and wooden objects, this list did not contain a general introduction with designations of metals, all objects which were specifically so qualified were probably made of copper. A series of objects are qualified by the sign S. E. with, probably denoting an alloy combining copper and another metal (lin.), see H. Watzinger, in R. T. C. O. E. D. 1981 (1981) 37-38; 218 C. P. Donovan and R.K. England, ATU 2, 1522f; R.K. England, CHN 64 (1965) 381 and 385 (at least the Ur III correspondence of archaic GAK₂ has been shown to be a direct copy and no more or less like cheese praised in simple healing songs for its high protein level and low spoilage).

219 See ATU 3, 16-17, 98-99; ATU 4, 46-49; and the ED III witnesses MEE 3, nos. 65, pp. 253-255 (edited by M. Civil, Oktar 21 (1983) 167, cf. 174 (1984) 168 and 169, and the Old Akkadian texts MOP 18, 21, and MOP 27, 196). Whether the witness WV 22 104.0, 8 is seems to offer a clear progression in [i-]-[j]- [i]-[j]-, followed by NIE₂, the sign KUR₂, qualifying measures represented by NIE₂ in this text is curious; it might denote a small, round grain, or have some other semantic or phonetic [i-]-[j]-[i]-[j]- meaning.

5.4.1. Literature

An archaic lexical list of 94 lines (see figure 30) contains the earliest work of written literature on earth.217 This archaic composition, derived entirely from 37 witnesses of Ur 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 describes as tribute the Sumerian gods,218 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 N₂, 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 text, introduced by the numerical sign N₂, 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 Nippur,219 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 N₂), the text contains a series of entries (lines 3-20) 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 51-58 repeat line 46 of the earlier section of numerical notations and ideograms; this passage repetition would reflect a common rhetorical technique in the oral traditions of Sumerian, very broadly employed in Mesopotamian literature,220 and so be a strong indication that the text is an example of early literature.

217 See ATU 3, 63-64, 136-137, and the ED III witnesses SII 8 and P III 99, nos. 402 (but possibly containing the beginning of the text) 489 and 485; MEE 3, nos. 47; pp. 153-154; MWN 3, 13; an oracle on an Ur III witness of the same text (DNT 676) is in preparation by M. Civil, and the Old Babylonian version SIT 42:11 1957 and the remains by M. Civil and R. B. Biggs, AS 60 (1966) 103.

218 After the lines 30 and 38 was inserted 3za₄, nam₂.gur₂, sum₂ (only in the Old Babylonian version), after line 72 za₄, gur₂, gur₂, (Early Dynastic) or 3za₄, gur₂, gur₂, nam₂, gur₂, (Old Babylonian). Unfortunately, even these later additions remain ambiguous; we might hazard translations giving, e.g., improving or "making and brought in as tribute", respectively, of the latter insertion to the introductory lines 57-59, (this line, gur₂, gur₂, nam₂, gur₂, gur₂, gur₂, gur₂) of Cylinder A of Gudea (D. O. Edzard, forthcoming? / Enl and the World Order 443-454, C. A. Börje, "Enl and Ninmanina" and "Enl and the World Order") (revised dissertation, 1969, 113, II 446-447).

219 See above, n. 222.

220 The Sumerian texts, for example, commonly contain a long passage with a proclamation of the heroic act to which 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 be conform with later traditions of literary introductions. The notations I. 27-30 // MNH, and NAR, are not understood, must have included the description of what was to happen with the goods listed. Lines corresponding to these form later periods remain, unfortunately, difficult to interpret (SH//NAR//GAR, LURU 15 SAG 2 // [E] and LURU 3 SAG // [Old Babylonian]). See C. Wickes, FS Decesars, AS 20 (Chicago 1978) 212-13, for a concise description of the "epic repetition" in Sumerian literature.

The signs I. 2, in both cases might represent temporals elements meaning "When...". The sign ADG of the archaic version, I. 1, corresponds in the form version to a.D.G., perhaps "asardu"; the meaning of the combination XI, SAG is unclear. In I. 2, the combination ADG, HAL could refer to the correspondence pirate from later tradition, meaning "secret", as J.C. Heineichen, op cit., suspects; ABGQ would in this sense refer to the temple administrator who, according to the "secret" Compano of the Akkadian Gilgamesh epic, tablet X 9-10; comparison with the text of the "king's letter" (see most recently S.B. Neegev, AS 16 [1964] 30).
The section following line 58 contains notations with ideograms whose meaning is unclear. Such repetitions of certain sign combinations as GI, GI ZI, GI ZI, SE, EN, SE, ZI, or lines 64-66 or EN, SE, SE, ZI, 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)[225]; 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 substantively different system, or level, of religious belief.

5.4.5. Persons

The first of two lists containing designations of persons consists of an apparent mix of personal and professional names. 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 (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),[226] 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 Ur II[227] 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 420 entries, of which over 130 are preserved in the archaic witnesses now available.[228] 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 paleoarchical development in the first half of the third millennium. Indeed, this list more than others with its nearly complete Ur IV period foreunner text[229] 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 34)[230].


Cp. J. Jeremias, "Near Eastern administrative text WSVCO 1, 112, with entries of personal designations in the same sequence preserved 116.3.1 of this list.

See ATU 3, 14-19, 67-88, and the edition by E. Arci, La lista di professioni "Early Dynastic LUJ" [...]. (Naples 1982), based on O. Pettinato, MEE 3 (1981) 3-22 (compare the "Significati di Ebla in EARLU A: Rapporti intercensioni tra i due listi", O-Ant 22 [1983] 167-178). The name derives from the Sumerian designation for "man", IZI, which was the last element in a lexical list from later scribal tradition known as IZI = IA = "man" = "given one". Various compendia dealing with this topic known to members of the priest Marduk for a Sumerian Dictionary were listed in a presumably chronological sequence and named (as far as IA, A rough E).

The exact length of IZI, a remains uncertain. The colophon of "IZI, 1on on the reverse surface of the witness W 20517a, 2o, expresses that the list contained 60-61 lines, and the best preserved tablet W 20526, 1 contains from 90-100 entries.

ATU 3, 1, 23 (and II), W 0556,1; see ATU 5, p. 90. Another four fragments from the IZI, A list date to the Ur IV period. The five Ur IV witnesses do not give us sufficient material to build a canonical version for the period, and W 0556, 1, deviates substantially from the canonical Ur III period, so that it will still appear that no archaic lists were completely standardized before Ur III period. As an exception, the original orientation of the signs is kept in this figure in order to better follow the development from pictograms to abstract signs.
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

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

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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.

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a preliminary edition of the Lu₂ list, defended the theory that this list reflects in its internal structure the administrative hierarchy of archaic Uruk. Accordingly, the first entry in the list NAMESDA 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 NAMESDA = Akkadian šarru, 'king', the designation NAMESDA 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 Erlenmayer collection contains extraordinarily well preserved accounts with clear evidence of the high rank enjoyed by those persons or

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223 MSL 12, pp. 4-8.
224 MSL 12, p. 93.
## Texts from the Late Urk Period

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<th>Neo-Assyrian</th>
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**Figure 34:** Paleographic development of selected cuneiform signs

Offices represented in these entries (figure 35). The large measures of grain represented by the numerical notations entered together with the officials titled NAM, URU, GAI, BAD=NIN, KIN.NI, GAI, TE and GAI, SUG, KI, imply that these officials belonged to the upper ranks of the administrative hierarchy. Several signs, above all NAM, and GAI, are found in combinations in the Ur III 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 archeological scribes is obvious, given the thousands of administrative documents from archeological levels in Urk 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 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 Urk IV period tablet W 9393-d (see figure 36) was formed, and one of its facets 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 single dealings or random associations, beginning with three impressions of the rounded end of the small style, representing ‘30’ in the sexagesimal system, followed in two cases by a small round impression set over an oblique impression of a large round style, 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. However, in this case another tablet found in the same locus suggests that we have in W 9393-e (see figure 37) a small collection of school accounts. Although the text W 9393-e (see figure 38) appears at first glance complete and consistent with a large number of accounts known from both the Urk IV and the Urk III periods, closer inspection shows that it is irregular. The sequence of entries of such commodities lists 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 Urk 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.

The three accounts W 20274, 27-292 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

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205. Consider in this connection the text W 20223 (R.K. Englund and J.H. Nissen, ATU 7, forthcoming) with dividing lines drawn on one surface, but with no apparent inscription, and the many so-called tablets, tablets which were formed in the usual, line-counting way, but which remained unscratched (see, for instance, ATU 5, pl. 52, W 9312, or pl. 115, W 9695, p. V). The first tablet of this series in fact began and ended with a short notation: p. 20 of W 9656, pl. V. The list of unsuccessful accounts, be they from functioning bookkeeping officers or from hands of suffering students, can be seen in a large number of inscribed tablets which were so marred 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 9695, or pl. 10).

206. Another example is the text W 20517, (J.AU 7, forthcoming). The account, bound together with three fragments of the clay, 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.

207. See the copies and photos in ATU 2, pl. 27-28.
cases the sign GI, that of the first column a combination of the signs EN, KA and further signs. While the reoccurrence of the sign combination EN, 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 replications are to the contrary to be understood as simple variations of a given account template and that all three are copying exercises.\(^{229}\)

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

\(^{229}\) The reverse face of W 1941, 3 (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. If impossible to say whether the known account duplicates W 20274, 27, 27 (see R. Englund, BSA 8 (1953) 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 distinct 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 assured the same function as, for example, copies retained at letters.

\(^{240}\) The Ur III period account from the antiquities market is to be provenanced to Ur at Jemdet Nasr. See above, n. 51.
6. ADMINISTRATIVE SYSTEMS

Despite the grave difficulties in deciphering the linguistic contents of the archaic texts, their numbers and consistent structure make them powerful informative sources of socio-economic 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 later 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. Finberg 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
OPPOSITE NUMERICAL MEANING TO DEPHENGER SIGNS FROM LATER TEXTS. THESE CORRESPONDENCES WERE SEEN IN:

1) THE FORM OF SIGNS IMPRESSED WITH STYLLS OF DIFFERENT DIAMETERS. THE NUMERICAL SIGN SYSTEM
BEST DOCUMENTED IN THE THIRD MILLENNIUM, THE SEASATIONAL SYSTEM (SEE FIGURE 4), CONSISTED
OF SIGNS MADE BY IMPRESSING THE ENDS OF TWO ROUND STYLLS INTO THE SURFACE OF CLAY
TABLETS, EITHER PERPENDICULAR TO THE SURFACE, THEN RESULTING IN ROUND IMPRESSIONS, OR AT AN
ANGLE TO THE SURFACE RANGING FROM 45° TO 30°. THE OBlique IMPRESSION OF THE SMALLER
OF THE TWO STYLLS REPRESENTED THE BASIC UNIT "1"; THE NUMERALS 2-9 WERE IMPRESSED BY
SIMPLY REPEATING THE NUMBER OF IMPRESSIONS REPRESENTING "1". A ROUND IMPRESSION MADE
WITH THE SAME STYLL REPRESENTED THE BUNDLING UNIT "10", AND THE UNITS 20-30 WERE IN THE
SAME WAY WRITTEN BY SIMPLY REPEATING THE IMPRESSIONS representing "10". THE NEXT STEP
"60" WERE REPRESENTED BY AN OBlique IMPRESSION OF THE LARGER OF THE TWO STYLLS, ITSELF
REPEATED UP TO 6 TIMES TO REPRESENT THE NUMBER "360". THE SIGN FOR "600" COMBINED AN
OBlique IMPRESSION OF THE LARGE STYLLS "600" AND A PERPENDICULAR IMPRESSION OF THE SMALL
STYLLS "10". THIS LATTER SIGN COULD BE REPEATED UP TO 6 TIMES TO REPRESENT "3000", AND
THE SEASATIONAL BUNDLING UNIT "3600". FINALLY, WAS REPRESENTED BY A ROUND IMPRESSION OF
THE LARGE STYLLS. EXACT CORRESPONDENCES TO THE GRAPHIC FORMS OF THESE SIGNS WERE LOCATED
IN THE ANACHRONIC TEXTS; MOREOVER, CORRESPONDENCES WERE SEEN IN:

2) THE CONSISTENT ADHERENCE TO THE SEQUENCE OF NUMERICAL SIGNS EMPLOYED IN A COHERENT
NOTATION. A SEASATIONAL REPRESENTATION, FOR EXAMPLE, 1382 DISTINCT UNITS, COULD BE
IMPPRessed BY INSCRIBING TWO "600" SIGNS, 3 "60" SIGNS AND TWO "11 SIGNS IN ANY ORDER,
SINCE IN THE SEASATIONAL 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 — Served TO REPRESENT THE VARIOUS BUNDLING UNITS OF A NUMERICAL
SYSTEM. THE UNAMBIGUOUS CORRESPONDENCE BETWEEN 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 WOULD DOUBTFULLY HAVE PLACED SUCH COUNTERS TOGETHER, BOTH MENTALLY AND PHYSICALLY.
FURTHER, THE EVIDENCE FROM IMPRESSIONS MADE ON CLAY TABLETS FROM SUSA, NOT
UNEXPECTEDLY SUGGESTING 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 LAST Uruk PERIOD
AND CARRYING ON THROUGH THE THIRD MILLENNIUM, THE COUNTERS, 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.²⁴²

²⁴² See above, section 2.

²⁴³ The Chinese abacus is a modern example of the physical representation of higher and lower quantities. The relevant of the proto-cuneiform sign SAPA may be a tallying board, with columns of numbers, in one register, and the lower part of the board to store counters.


²⁴⁵ Langdon discussed in OECT 7, 63, the "ordinary" system believed to be dominant in structure. He cited, however, the addition 20 + 20 on the obverse face of the text 10B (now in MSV 1, 90).
The decimal structure of the archaic grain capacity system was consequently believed by Langdon to be restricted to the sequence of the three signs $N_{41}$ ( ), $N_{42}$ ( ) and $N_{43}$ ( ) in the relationship

$$N_{43} = 10 \times N_{42}, \quad N_{42} = 10 \times N_{41}.$$ 

This, as it turned out, fallacious identification formed the basis of all subsequent Assyriological publications of grain accounts — certainly the vast 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 (WCT, text A) during a 1973-74 sabbatical in Milwaukee, and went on to read O. Neugebauer’s AKT 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

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.\footnote{See in particular his ERBM I, pp. 7-10, and II, pp. 19-27, to the texts BIN 8, 3 and 5.} His
strongest piece of evidence supporting a new interpretation of the data was an apparent grain account edited by A. Falkenstein in 1937. In a format well known in parallelism 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 1N₉, 1N₁₀, 2N₁₀, which can be translated as 60 of the (grain rations containing) 1 (of grain); (grain in vessel); 2 (of grain in vessel). This calculation contradicts the assumed numerical relationship 10N₁₀ = 1N₀, since it is well known the measure represented by the sign N₀ was 1/40, or that represented by N₁₀, so that 60 x 1/40 = 15 and not 20, as 2N₁₀ would imply. Instead of relying on complicated technological explanations to dispense with this contradiction, Friborg tested in further calculations in this and other texts the seemingly obvious hypothesis that N₁₀ was not equal to 10N₀, but rather to 6N₀. This assumed value of N₁₀ proved to be correct in all archaic grain notations (figure 37 demonstrates the use of summation to clarify the relationship between N₀ and N₁₀ in the two systems in Urk texts, figure 38 the bundling steps in a more complex grain calculation from Jemdet Nasr). The 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 two years after Friborg 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 delineate the numerical systems attested in the archaic texts from Urk. Although in number this group of texts was substantially larger than all other archaic texts together, the poor state of preservation of the Urk texts was such that the numerical notations they contained could not be identified.292

292 A. Falkenstein, OLZ 40 (1937) 410 note 6 (now = MSP 4, 66. and see below, I 75).

293 Published in AR 12, pp. 113-146. See now for a theoretical consideration of our results P. Damerow, Administration and Representation: Cuneiform on the Cultural Evolution of Thinking (Dordrecht, Boston, London 1995).
Figure 4.1: Numerical systems used in archaic texts

often only be understood in the light of an analysis of the better preserved accounts from Jerneiat Nasr and elsewhere. Thus the work of Friberg on the grain capacity system, and that of the Russian scholar A.A. Vajman on the two numerical systems used to qualify discrete objects, namely, the sexagesimal and the so-called biesexagesimal 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

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ideograms. The formal graphic structure of the systems (see figures 39-43) 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 even 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 (S) capacity system, the area (GAN, field) system and the still unclear EN system (based on the use of the sign EN with a numerical sign characteristic of the system. NJ, 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 arithmetical 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, trees, 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 permitted cattle of a certain accounting year or for dating a subset in a metrological system used to qualify amounts of clay, oil, the S 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, whereas 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 SE for malt, and S* for crushed barley. The GAN system was used to record measure fields.

253 The rationale behind the sexagesimal system has been widely discussed, unfortunately without issue. The name is something of a misnomer, since the system easily consists of bundles of 10 and 6, leading to Voyce's unsuccessful attempt to introduce the terminology "ten-six counting system" into this discussion. The divinity by thirty and the fact that in the archaic period an ideal month of thirty days was employed in administration suggests that the sexagesimal system was tied to time calculations.

254 A.A. Vajnman was the first to differentiate between the sexagesimal and bisexagesimal systems, see the article cited above. He defined a "modified ten-six counting system": we have chosen the term "bisexagesimal" to make more explicit the use of a new sign "consisting of two signs representing 60" in the sexagesimal system set back to back and rotated 90 degrees.

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 precise 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 prehistoric device used to reckon time - not minutes and seconds, but months and days. For the unenlightened 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, U system).

The first Assyriologist to devote serious attention to the formal make-up of archaic time notations was A.A. Vajncman,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 corpus 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 U6, "daylight". Langdon (commentary in CECT 7 to the sign nos. 172-177), confining U6 and N6 to a division of 60, in grain notations, believed that the notations of the form U6+N6, were daily grain notations, the notations U6+N6 possibly daily notations; finally, to N6+U6 he remarked that a "comparison of [these signs] with the Sargonian form SEC 230 makes the identification [with 11-month] certain". Falkenstein indicated in ATU 1, p. 48, his belief that the graph N6+U6 represented one day. It is largely incorporated these errors into his sigil or Manual epigraphic dictionary.

256 See A.A. Vajnman, Acta Hist 22 (1976) 19-20; id., BM 20 (1980) 114-120. Vajnman erroneously refers to a notation (U6+N6)+N6, in the text CECT 7, no. 84 (now MSVO 1, 121, line 43 here), which according to collation and contextual calculation must be read (U6+N6)+S N6.
The formal characteristics of this system based on the sign $U_0$ (considering the sign’s later semantic range from day/night 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 ($N_{II}^d$) to the left of $U_0$ 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 $N_{II}$ and $N_{III}$ 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 $TAR$. This sign was shown to represent the addition of $1/10$ to a given quantity in grain notations. [216]

Thus the text MSVO 1, 121 (figure 43, top), can be reconstructed in the following way:

\[ \text{obs. 1} \left[ (U_0 + N_{II}^d) \cdot 8N_{II} \cdot 1N_{III} \cdot 1) \text{GIRGRUND} \right. \]
\[ a2 \left[ (U_0 + N_{II}^d) \cdot 4N_{II} \cdot 2N_{III} \right. \]
\[ a3 \left[ (U_0 + 3N_{II}^d) \cdot 3N_{III} \right. \]
\[ b \left[ (U_0 + 2N_{II}^d) \cdot 5N_{II} \right. \]
\[ c \left[ 3N_{II} \cdot 2N_{III} \cdot N_{III} \cdot SE_{II} \right. \]
\[ d \left[ N_{III} \cdot N_{III} \cdot N_{III} \cdot TAR \right. \]
\[ 1 \left[ 1 \text{NUNUG} \right. \]
\[ 2 \left[ 1 \text{NAMIEŠDA} \right. \]

[257] See ATU 2, 145-146, and my “Astronomical Timekeeping in Ancient Mesopotamia,” JESHO 31 (1988) 121-185. We have now notations for up to $10N_{II}^d + U_0$ in the year 9 ($U_0$ + cardinal and ordinal stages of these time notations were not graphically differentiated; W 14731.1, v., in JESHO 31, 130), up to $U_0 + 2N_{II}^d + 7N_{III}$ (37 months; MSVO 3, 29, see below, fig. 60) and up to $U_0 + 2N_{II}^d$ (20 days; W 26274.90, in JESHO 31, 139). Small mixed notations of the type $U_0 + N_{II}^d + 8N_{II}^d$, for $x$ months, are known, and none of the type $8U_0 + N_{II}^d$, for $x$ years, are known instead. Numerical notations representing up to 37 months were inscribed within the sign $U_0$, the only candidate for a mixed ‘year/month’ notation known to me is the difficult $2N_{II}^d + U_0 + 6 + 1 N_{III}$... in MSVO 1, 90, discussed below, section 6.3.4.

[216] The sign, in ATU 2 under TAR (and see here fig. 43 to MSVO 1, 121), could in fact be the curvilinear character corresponding to the sign $N_{III}$, both = $\frac{1}{10}$ of $N_{II}$, 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 fee (Sumerian $2\,\frac{1}{2}$, 10 and 15, 10 gold), but also in the phrase sign bearing, for which see K.R. Veenhof, FS Birn (Paris 1985) 294-297; see K.K. England, “ESHO 31 (1988) 151-152?" by temples and other administrative units in late Mesopotamian tradition.
Texts from the Late Uruk Period

It seems that according to the first case of the account the person designated T1 GIR;gur1u is responsible for the distribution of grain over a span of 18 + 4 = 3 days, represented by the mixed notation (U1+N) + 3Np 295. These 35 days are translated into a corresponding measure of grain at Np (= /10i Np) per day for a total of 3N, 2Np, Np, or 35 Np's of grain. To this an amount equal to /10 was added, 296 thereby giving the sign TAP. That the grain measure corresponding to the numerical sign Np was really the basis for this and other time/grain calculations, 297 and that the addition of /10 was an implicit operation in consolidated accounts, can be demonstrated in the following text MSVO 1, 122. This text records the second case of its obverse surface a time notation 3N, + U2, equivalent to three years, followed by a grain notation corresponding to 1188 Np.

\[ \frac{1}{10} \times 3 \times 360 = 1080 \] 1188 Np, or: Np + 9Np, 4N, 4Np, 4Np, to which measure the notation in the first case is added for the total on the reverse. 297

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

\[ \frac{1}{10} \times 3 \times 360 = 1080 \] 1188 Np, or: Np + 9Np, 4N, 4Np, 4Np, to which measure the notation in the first case is added for the total on the reverse. 297

295 The first Np of 3Np is directly impressed, as longa also copied it in OECT 7. Vipola apparently read his U1+Np+Np+Np, from a photo, and did not observe the connection with the following grain notation. In fact 3Np = 2Np - 1/10 should result in Np = Np-Np (i.e., 3Np = 2Np - 1/10), Np-Np-Np-Np might have resulted from the difficult calculation of 1/10 of 2Np + Np, scanned at 10Np+Np+Np+Np. In N1, however, had to be changed to either Np or Np.

296 Compare MSVO 1, 80 (OECT 7, 729) and MSVO 4, 1, 89 (\[ Np + Np + Np + Np \] 1188 Np, grain units, 3 years); this is perhaps the account which was copied from the second case of MSVO 1, 122, was shown, and, calculating with a daily grain measure of Np instead of Np, the account MSVO 1, 90 (\[ Np + Np + Np + Np \] 3Np, Np, Np, Np, U2, 1188 Np, grain units, total of 5 years) and \[ Np + Np + Np + Np \] (\[ Np + Np + Np + Np \] 4Np, Np, Np, U2, 1188 Np, grain units, 4 years), and \[ Np + Np + Np + Np \] (\[ Np + Np + Np + Np \] 4Np, Np, Np, U2, 1188 Np, grain units, 4 years). The time/gain ratios of the last two, however, do not add up to 1/10, but the result is a number which can be offered, assuming interpolation was not involved.

297 M. Freiberg has suggested in Stenographic Reimbursement of the Old Assyrian Period).
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 the Urk 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 N₃₃₀ from the grain capacity system. In particular, the text NASWO 4, 27, 27 proves that the quantity of grain represented by GAR \( \text{N₃₃₀} \) was a third measure employed as a general daily distribution in the archaic period. This \( \text{N₃₃₀} \) is, as we know, ⅓ of the basic unit \( \text{N₈} \), and this \( \text{N₈} \) is inscribed within the sign \( \text{U₄} \) to represent one administrative month of 30 days.

No administrative texts attest to a division of the day into subunits, aside from the plausible interpretation of the signs \( \text{U₄} \) 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 Inanna\(^\text{267}\); however, the lexical ‘Plant List\(^\text{268}\) 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.\(^\text{269}\)

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\(^{260}\) See JESHO 31, 162-164. The first case reads 4N₃₃₀ SEU₄ 2N₈, and 4N₃₃₀ GAR, “720 .. grain units in 24 months: GAR, equal to, that is, 24 months - 30 days = N₃₃₀ = 720 N₈ = 4(30 N₈).

\(^{261}\) Below, fig. 68. The inscription was first correctly read in JESHO 31, 162-164. The first case reads 4N₃₃₀ SEU₄ 2N₈, and 4N₃₃₀ GAR, “720 .. grain units in 24 months: GAR, equal to, that is, 24 months - 30 days = N₃₃₀ = 720 N₈ = 4(30 N₈).

\(^{262}\) Note the attestations of the presumably morning and evening Venus (Inanna) in such texts as ATU 5, p. 2, W 3233, b, pl. 5, W 6288; likewise, in W 20724, 27, (unpublished) and in W 21271 (fig. 44 here) with at least both notations. An administrative view of the designations of morning and evening might be attested in the text W 20272, 1 (see below, fig. 50), which contains the summation col. 1 N₃₃₀ 4N₈ U₄ GISU GIBIL KAR N₂₃ SIG GISU GIBIL KAR 2N₈ SEU₄ LDU, SANGA, SUMU-XAI, SAR PAP, SURUHPAK, HU_3, NUN, that is, “900 sheep inspected” in the morning .. 540 sheep inspected in the evening .. altogether 1340 sheep inspected by the exchequer; SANGA ...

\(^{263}\) See above, section 5, and compare the ED III list ST 7, vi 19-22 (7 - U₄), 24 (7U₄) and 25-27 (7U₄, 27) (unrelated).

\(^{264}\) See JESHO 31, 165-168, following edition of the final list of the witness W 20363. ED III 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 (ma’asaru).

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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 predating by millennia the appearance of artificial timekeeping on an urban society, is found much later, beginning in the ED III (pre-Sargonic lagash) period. The Jamdat Nasr texts characterized by colophons including the notation SU, GIBIL (discussed below, section 6.3.4), however, may be cited as possible evidence of a calendar beginning with a ‘new growth’ festival (‘feather’ [sign SU]) and ‘month’ might have been homophones in the uncertain archaic language of Urk. An account of textiles from Urk, dating to the Urk III period, might contain evidence of a calendrical calendar in the south (figure 44). The account books entries of wool, cloth, et cetera, subscribed in 10: sections with notations which are in other contexts suspected to represent cultic festivals, including EZZEN U₈ AN MU₈₂ (festival of the morning Inanna), GIBIL NUN (‘New growth’ [festival of Enkil], EZEN, SIG AN MU₈₂ (festival of the evening Inanna), E₂ NAGAR UR, ‘(Lord … festival of Nanna), and SU NUN ‘… (festival of Enki); all translations highly speculative.)
6.3 Administrative Offices

Following a relatively secure identification of a series of radiocarbon, 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. These include accounts dealing with archaic fisheries, with domesticated animals and animal products, with presumably storable labor, with grain and grain products, and with the administration of fields.

6.3.1. Fisheries

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, 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. Fish, on the other 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 products, and are, moreover, easily digestible. The modest effort requisite to their exploitation makes fish an ideal meat substitute for the often protein-poor diets of poor communities. The biotope stretching from the Persian gulf into the swamps, lakes and canals of Sumer offered an extraordinary potential in fish, crabs and turtles.

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 fish products—discussed below, 6.3.2. While written documents from the archaic period refer only to very sparing information, material finds from archaeological excavations, historical reports, and ethnographic studies do act to bridge some gaps in our knowledge about the nature of this exploitation.

the poorest trays on average consisted of 570g of fish and 430g of meat, while the richest consumed 890g of fish and 280g of meat, that is, marginally more fish, but more than six times as much meat.

276 Tewel reports from the 19th century already made this point, for example "Aus einem Brief des Dr. Satan an Prof. Nippur, 29 April 1870, An Bord des Maim auf dem Tigri," DVM 24 (1870): 471. "Fish are as abundant in the Euphrates, that these animals are nearly nothing; while I was underway to the Marmar camp, 2 1/2 - 3 foot long fish, that is, a fish of the highest quality, jumped off itself into the boat." Most recent available data on fishing in the inland waters of Iraq (see A. al-Husseini, Optimal Utilization of the Water Resources of the Euphrates River of Iraq [Baghdad: University of Baghdad, University Microfilms, Ann Arbor 1979]) estimate a yearly catch of 20,500 tons:

<table>
<thead>
<tr>
<th>Water</th>
<th>Source</th>
<th>Catch in tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hammar lake</td>
<td>Euphrates and Tigri</td>
<td>9,200</td>
</tr>
<tr>
<td>Shatt al-Nahr</td>
<td>Euphrates and Tigri</td>
<td>1,320</td>
</tr>
<tr>
<td>Abu-Dabbas</td>
<td>Euphrates</td>
<td>400</td>
</tr>
<tr>
<td>Karim marsh</td>
<td>Euphrates and Tigri</td>
<td>2,000</td>
</tr>
<tr>
<td>Shumayliya</td>
<td>Euphrates</td>
<td>420</td>
</tr>
<tr>
<td>Balabbara reservoir</td>
<td>Euphrates</td>
<td>960</td>
</tr>
<tr>
<td>Euphrates</td>
<td></td>
<td>160</td>
</tr>
</tbody>
</table>

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 species, since, aside from the short-term utilization in Iraq fisheries due to decades of war conditions, long-term damage to the main breeding grounds between the Syrian border and the Euphrates is being guaranteed by dam construction with no consideration of fish locks.

277 Compare, for instance, Herberta 1:200 according to J. Faux (ed.), Herodotan Historia (Munich 1963). "These Babylonian tribes live entirely on fish, which they catch and dry in the sun. The dried, apparently unskilled 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 BC, described the methods of saltwater fishing employed by dwellers of the gulf coast south of Babylon who built walls of woven reed thatch in the water close to the beach. Doors on these huts 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." [Biblica historia 3,21. cited according to J. F. Bodelhahn, Animal and Man in Bible Lands (Leiden 1950) 72; see below, n. 315, for a description of modern fishing methods in Babylonia.]

128
Tests from the late Urk Period

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 contexts. There is little doubt that careful processing and analysis of these remains from excavations of archaic settlement levels in Mesopotamia, beginning in the Ubaid period in the fourth 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," and F. Safar discovered that in Temple VI of the settlement "by far the greatest part of the pavement-debris consisted of the bones of fish and small animals, evidently brought to the shrine as offerings." Beyond very cursory identifications of some fish families, however, no detailed analysis of these bones was ever conducted, 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 fish represented in these earliest levels representing a period of interregional expansion, in particular into the Persian Gulf. Equally frustrating are reports of fish finds from the Ubaid III period, and Lloyd and Safar report again the finds of large numbers of fish bones, and G. Cros uncovered on Ubaid III period level 3.35 m below the surface behind the 'Maison-des-fleurs' of Girou which contained whole yellow bundles of fully preserved fish skeletons, complete with scales and stomachs.

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

Lloyd's study of the fish remains from Eridu was conducted with the help of the late Professor Erich Wolfgang, who identified and described them in detail. Lloyd and Safar discovered that the fish remains were used as offerings in the temple of the goddess Ninmah, who was associated with the fishing industry. The remains were carefully preserved and were found in the Temple VI of the settlement. The bones of fish and small animals were extensively used as offerings, and the remains were carefully processed and placed in the temple. The bones were not discarded, but were carefully buried in the temple's foundations, as evidenced by the discovery of fish remains in the temple's foundations. The remains of fish bones were found in the temple's foundations, indicating that the fish remains were used as offerings in the temple of Ninmah. The remains were carefully processed and placed in the temple's foundations, indicating that the fish remains were used as offerings in the temple of Ninmah. The remains were carefully processed and placed in the temple's foundations, indicating that the fish remains were used as offerings in the temple of Ninmah. The remains were carefully processed and placed in the temple's foundations, indicating that the fish remains were used as offerings in the temple of Ninmah. The remains were carefully processed and placed in the temple's foundations, indicating that the fish remains were used as offerings in the temple of Ninmah. The remains were carefully processed and placed in the temple's foundations, indicating that the fish remains were used as offerings in the temple of Ninmah. The remains were carefully processed and placed in the temple's foundations, indicating that the fish remains were used as offerings in the temple of Ninmah. 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The archaeological evidence for the exploitation of fish resources in Urk should have come from that city itself. E. Heinrich reported the existence of complete fish skeletons in Urk,‖ the bones of which were apparently discarded together with nearly all of the pottery in the same context which might have gone for in dating the archaic tablets from this area.\(^{295}\)

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 a much fuller picture of the types of fish which were being brought into urban centers, so into Giršum,\(^{296}\) Urk,\(^{296}\) Lagash (Ah-Hiba)\(^{296}\) and Abu Salabikh.\(^{296}\) Of four identified families in Lagash, two—the gunthers (Pomaduchidae), also found in proto-Elamite Faraškabad—and the sea-bream (Sparidae)—were saltwater fish from the Persian Gulf, the other two—catfish (Siluridae) and carp (Cyprinidae)—were 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, sea-bream, two mullets (Mugilidae), and one each of herring (Clupeidae), catfish, gurnard, and of a Persian Gulf barracuda (Sphyraena jello) with a reconstructed length of 120-130cm.

The importance of fish to consumers in southern Babylonia is clear from written documents. The archaic fish list\(^{299}\) 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 picturesque signs, as for instance the best attested sign SULURU, which seems clearly to have designated the fish state of the preservation of the fish.\(^{300}\) The sign is best understood as a representation of a fish which has been split, headed and gutted, and dried, before it was delivered to urban administrators who drew up the accounts in archaic Urk (figure 49).\(^{301}\)

Whereas the objects designated SULURU as well as other probable designations of fish and fish containers were qualified with the sexual-gender sign (figure 47), the object

\(^{295}\) Umm el Jimal, I, 1965, fig. 3. Discussing the dump in the excavation square Od XVI 4.5, directed to 'Uruk Inc.', the author noted that 'the impressions of complete fish skeletons could be seen in the area of the rooms...195, 196 and 198 in the mud floor.'

\(^{296}\) C.C. Hear, NIP 81-82.

\(^{297}\) H.L. Levin, UBB 11 (1960) 17, discusses a large room or courtyard in the square Od 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 background of the fish with scales, bones and vertebrae were clearly recognizable.' Early Dynastic carches in Urk were also documented recently (M.W. Green, ZA 72 (1972) 176, WV 1972 24: 2-9; 15: 0, kù nus sag, gaš, ku bi 10 gin, ku Alap 1, tim. 15' head' in ca. 3000 liters of fish, 10 shekels, 'fish of Alap'.

\(^{298}\) A series of identifications of fish remains from excavations directed by D. Homers in 1970-71 were published by K. Madar, Early Dynastic II Animal Utilization in Lagash: A Report on the Excavations at Tell Al-Farašša, Meso 41 (1982) pp. 29. Six bones of heads of Sparidae are recorded (a total, and five opercular fragments of large Sparidae); the heads were thus not removed.


\(^{300}\) See above, section 5.

\(^{301}\) The later Sumerian reading of the sign, corresponding to the Old Babylonian period to Akkadian period, '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 the trousers (\textit{garubus escuclus}), but also by some the 'less fish' (see D. de Rougemont, notes A 1664 and 1665).
The administrative documents from Jerudet Naṣr contain no identifiable records of a fishery unit of that household, a series of presumed rationing texts contain, in a standardized sequence of products, entries representing as many as 120 units of the fish Sūhir. In nearly all of these texts, the following entry contains a numerical notation drawn from the derived biseqasimal system. 198 This numerical system might then have replaced in Jerudet Naṣr bookkeeping biseqasimal notations representing numbers of KU or in texts from Uruk. 202 There is a possibility that the ‘discrete’ numbers qualifying these fish are only discrete on the surface, that is, that the basic unit N, in each of the notations represents a measure or conventional number of (possibly processed) fish. This seems 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 of values of fish in the later third millennium in Babylonian, the correspondence of 1 DUG, vessel of dairy fat and 12 Sūhir attested in the Uruk III period text WV 200941, I see figure 47), suggests that Sūhir 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 should have been value equivalent to some hundreds of fish. 203 Evidence from Jerudet Naṣr seems to suggest that the Sūhir was divided into 10 sub-units of fish. 204 Some metrolological division must be assumed in the case of the numerous containers of fish recorded in the Uruk documents, without exception qualified with the biseqasimal system. These containers are represented by the signs G4, and ZATU759, which according to the text WV 10408.40 formed a semantic category together with the sign AK, an apparent pictogram of a container made of molded reeds. 205

202 See section 6.1 above. The text includes MSVO 1, 93, 103, 108, 109, 111 (laci); 150, 157 (nuclear due to a break, but see the numerical notation in the first case of the tablet’s third column), note the invention of this sequence in the text MSVO 4, 14, possibly from Uruk. Only the receipt MSVO 1, 116, 157 can be excluded from this list; the small number of Sūhir (together 71, 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 "7" notation.

203 The text WV 17870 obv. 4 contains the only clear notation of this system together with a probable object designation, the unidentified sign ZA[U]7576. 204 Coole 1 Uruk-Iṣchāshum, p. 192, table 20, assuming an approximate relationship of 10 liters of butter per shelfed silver. For the identification of containers used for butter oil, see below, section 6.3.2.

205 I am referring here to the parallel and possibly double accounts MSVO 1, 146 and 150, the entries in Texts 2b and 2c, respectively, which contain the notation SnY Sūhir. All evidence suggests that when the division of the basic unit N, represented by the numerical sign N, rotated 90° clockwise did not refer to a number in number of, or, in the case of the WV 17870 obv. 2, 154 (laci) to be disregarded.

206 The fragments WV 6705 c (ATU 5, pl. 12, with the notation 4N2 9A SūhirUsuru), and WV 99656 (ATU 5, pl. 95) with N2 N2 N2 N2, present to quantities of fish, but their poor state of preservation leaves room for doubt. The numerical sign N2, here proven to be borrowing from the biseqasimal system probably representing 0, N2 = 7200 (2-3600) and in the Uruk III period replaced by the sign form Ni2, is also found in the Uruk IV period notation N2 N2 X Sūhir in the text WV 99652 (ATU 5, pl. 81). The notation N2 N2, based on the small table before N2 N2 was written, however, suggests that the notation was intended to be biseqasimal.

207 UAT 2, 15 obv. ii 7: 5N2 N2.
Figure 47: Administrative documentation of the archaic fishery.

The texts shown here and on the following page record the delivery of archaic fishery goods, consisting of the split and dried fish SLUR (3b), a fish fish KUR (6b), and common or possibly binds fish

GILU (4b), GILU (4b), and all products represented by the signs (6b), (5b), and (3b) must. The relation of 12 SLUR per DUG (a container of clay for) documented in the text W 3074.1

on page 136 is unclear.
The former sign $GA_{m}$ represents a type of basket, in all likelihood also made of reed$^{266}$; 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 $GA_{m}$, including that of the dried fish, $SU\text{UR}$, but in larger numbers with the signs $KU_{m}$, $GIK$, and $SU\text{UR}$.

Beyond sign combinations of $GA_{m}$ and fish pictograms, signs which may have some abstract meaning but which are probably designations of processed fish were inscribed within $GA_{m}$. These include $U_{i}$ ('sun', 'day', 'white$^{269}$') and $BI$ ('fish$^{269}$') and are found in accounting contexts which secure their identification as fisheries products.$^{267}$ The meaning of the sign $ZATU\text{Z}7\text{Z}$, also found exclusively in a context of fishery deliveries but not attested textually, is unclear, but its referent is likely to have been some kind of container.$^{268}$

The sign $ZATU\text{Z}7\text{Z}$, counted separately, was written with and without an inscribed sign $KU_{m}$, but always in connection with fish.$^{269}$ Despite the dangers inherent in purely graphical identifications, it seems difficult to imagine that this sign is not related to the so-called $\text{A}_{ZH}$, the presumed fish traps of the accounts of pre-Sargonic Girsu$^{270}$ which were apparently used to

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266 The sign is then also the natural precursor of the baskets represented by the signs $LNI_{m}$ and $LNI_{n}$, $GLI_{m}$ - 22 recorded in fisheries accounts of the pre-Sargonic Girsu period, which according to such texts as DP 201 i 3-4:1 pisan, 0;1,mun.kur / 1 pisan, 0;1,ku, $GAR.KI$ and VS 14, 143 i 3:1 pisan, 0;1,mun.kur had a capacity of one Old Sumarian barrel (26 l) $\times 8$, ca. 54 liters.

267 The sequence $SU\text{UR},KU_{m},U_{i},KU_{m},ZATU\text{Z}7\text{Z}$ (2N$\text{ur}$-U$_{i}$ KU$_{m}$ in the list witness W 20394.49 (ATU 3, pp. 97-98) places the sign in a clear context of time reckoning. 2N$\text{ur}$-U$_{i}$ represents two years' or second-year (above, section 6.2), and SU$_{ur}$ seems in Jemdet Nasr accounts to represent a time unit less than a year, possibly a month or season.

268 Attested in the fish list I. 94 (ATU 3, 97), in the broken Uruk IV period account W 9856 (ATU 5, p. 91) and the Uruk III period account W 19284 (unpubl.; according to the Iraq Museum register of April 1985, this text was in the Nasirya Museum prior to the Kuwait war, Mr. Bokari, R.J. Hoffner, and J. N. Postgate, Iraq Heritage: Antiquities Stolen from Iraq's Regional Museums, Inscription 2 [London 1992] p. 150, reported the text stolen from the Nasirya Museum [reference kindly provided by R. Jones]). The meaning of SU$_{ur}$ here is not obvious; the sign is also found in the fish list I. 19 (ATU III, 93:4 KU$_{m}$) and in I. 80 as a part of the sign $HI\text{SU}\text{UR}$ of Sumerian I. 4, p. 94, W 21916.2 abv. i 4, where it seems to represent a fish head, as a part of the sign composition $HI\text{SU}\text{UR}$, probably representing a bird's egg, and inscribed within a form of the sign $TA\text{L}_{m}$, a type of swallow. Swallows are often inscribed in a linear form of 'sweet', later tradition of fish deliveries would make a better case for an interpretation of the sign as 'egg', since birds' and turkeys' eggs (and not fish heads) were delivered from the marshes by fishermen.

269 The notations 2N$\text{ur}$, 3N$\text{ur}$, ZATU\text{Z}7\text{Z} in W 17879 a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z in W 20274.5 rev. i 2 (a compilation of abv. I.2 and 3) prove that the object represented by this sign is, like other fish containers, counted separately.

270 See, for example, the accounts W 15 1955 (unpubl.) abv. i 3-4: 20500, 20501, 20502 which pass this unpubl. account records in each of eight cases a relationship of 20 ZATU\text{Z}7\text{Z}:KU$_{m}$ per 1 UR$\times$N$\text{ur}$; this might suggest that the unidentified later sign was related to a yearly (action 1; with N$\text{ur}$ = 'one year'), of the fish represented by ZATU\text{Z}7\text{Z}:KU$_{m}$, for which the extant account W 24034.1 (Boh 22, 115), in which, 20-120 ZATU\text{Z}7\text{Z} SAG corresponded to recorded numbers of apparent textile industry tools 21005 (unpubl.) abv. i (SAG ZATU\text{Z}7\text{Z}:KU$_{m}$), 51107 (go 47 here) and MSU 6, 11.

271 Up to 600 such fish containers were recorded in single accounts (DF 328), from the Girsu, the fish were delivered in the so ZH$\text{A}_{m}$, all by freshwater fishermen.
transport fresh fish from the wadis and marshlands of the desert to the cities. Fish delivery accounts suggest that the containers like the car is used in days, but not otherwise in the archaic administrative texts of the use of fish in the fish market. The sign ZATAR represents a category of containers including the GUR, but was more likely an 'open' basket, which would have been of particular use in the canals.

Such fish were often characterized as wadi, 'purifying water', presumably referring to their containers being delivered in clean water vessels. The fish was delivered in containers, such as the ZATAR, which was used in the desert fish market.

The Sumerian 'Home of the Fish' relates a song praising the welcoming qualities to esteemed fish of such a fish, as it is a term used for a 'fresh water fish', such as the ZATAR, which was used in the desert fish market.

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have very limited information about the types of boats they used.\textsuperscript{232}

6.3.2. Domesticated animals and animal products

It is likely that from the archaic period through 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 boats 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.\textsuperscript{234}

Sheep and goats (\textit{UDU})\textsuperscript{235}

Large numbers of medium-sized herds of sheep and goats were exploited for their wool and hair, for their dairy products, and for their meat.\textsuperscript{236} 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 center, and shearing centers, of the Mesopotamian alluvium. The demand for textiles from non-


3) Turciet, Balshat graeca aevo, see; J. Booseneick and M. Konkak, op. cit. 149-150, shell from an archaeological deposit with symmetrical drilled holes suggesting its use as a (compare letter tabloid) object and reused, probably imported from the north (according to Booseneick; see however R. Braidwood, SARC 51 [1959] 48, Jarno ca. 6750-2500 B.C., and 59, Paleissex in: 10.000 B.C. further P.P. Tushil and C.A. Reed, Fallen in Babylonian Anthropology 63.92 [1974] 81-146, fauna from Fallissex in: 59, Paleissex in: 10.000 B.C.

4) Caspian tapir or pig, Mesopotamia, see R. T. Redding, op. cit. 230a, fig. 64, p. 237; Booseneick, and M. Konkak, op. cit. 149 [Rassite].

The very fast recovery of the remains of small animals may explain the missing evidence for soap water turkeys, of which over 4000 bones were unearthed in excavations at Uruk-an-Nar (third millennium, see E. Hach, \textquotedblleft Reactions of Prehistoric life at Uruk-an-Nar\textquotedblright; in: M. Taddio, ed., South Asian Archaeology 1977, vol. 1 [Museum 1977] 601-606. All of this pre-Sargonic Giria fishery accounts were apparently delivered by the giria fishermen, ibid., ibid.

2.3.2. Settlement patterns and administration of small cattle in the archaic period was first adequately treated by M.W. Green, JNES 39 [1980] 1-135, 63, Archi, Bookkeeping, pp. 89-93.

3) The primary dairy products butter and cheese are dealt with separately below.

4) Animals represented by the sign UDUN, formed a standard entry of lists of possibly sacrificial offerings in accounts for the archaic period. best documented in the two texts (in these lists) with the author in J. H. N. and P. Sknary (eds.), Changing Vexen on Ancient Near Eastern Mathematics (Berlin, forthcoming). Note also lines 6-7 of the lexical list (see above, section 5, and ATU 3, pp. 133. 160-161) with the entries ODU, UDUN, and AN-URU, both representing a sheep' goat and tallow used in buttering and in butchering the animals. Corresponding entries follow, recording butcher's knives for large cattle, and gutting and striking knives for fish (ibid. 69-72).
Figure 49: Uruk III accounts of herds of milk cows and sheep
The two texts above contain accounts of small herds of cows (5-6 animals) and a notation representing delivery duties of dairy for 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 KISNV of dairy fat per twenty ewes (1/20 = 1/1, 5 = 7/2).
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.

Although we have no recourse to a lexical compendium listing the signs representing small cattle, 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.

Nearly all of these texts represent inventory accounts drawn up each year to assess the size of the herds, the number of offspring, and the amount of presumable butter oil 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 forms 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 lambs belonging to each flock. In the following, third case, the responsible shepherd is named. It seems likely that the sign combination SE + *NAM, at the bottom of this case is a professional name designating a "leader" [7]. In the second column the lambs were separately registered according to their sex. The qualification of both male and female lambs with the notation 1N + U, BAR (→.), literally "one year, outside" indicates that the animals were born and survived into viability during the accounting year. 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.

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


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 named delivery expectations of butter oil (see below), it is impossible to say what proportion this relationship means. It seems most likely that the lambs registered were those which had to be delivered to the herds, either physically delivered to the owners, or simply added to the accounts and thus becoming, on paper, adult members of the flock in the following year, for which the herders continued to bear all responsibility.

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 KISAM, (→.), 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 KISAM stood in an even relationship to the ewes respectively recorded, namely, in a relationship of one KISAM to 20 ewes. These list 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, the KISAM 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.

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

To be noted in M. Stol, JAS 7 (1993) 100, and RIA 8/3-4 (1994) 104. Butter oil from ewes was not recorded in accounts from the late third millennium; 1N + U, GRAM, and GRAM (→.) represented that of goats. Archaic shepherds recorded in the text considered these were required to deliver the capacity equivalent in milk fat of one of the oil vessels represented by the sign KISAM, per 15 (JNES 39, 24, no. 2, W 20274,4), 20 (JNES 39, 22, no. 6, 21, no. 4, 22, no. 7, 20, no. 1, 22, no. 3 and 24, no. 9, W 20274,3, 15, 38, 55, 60, and 61, respectively; see fig. 19 in W 20274,15 and 25) or 30 (JNES 39, 20, no. 2, W 20274,85) ewes.
only difference being the use of the sign KISI, to qualify the container of apparent dairy fat to be delivered to central offices by the herders. This 'purified' form of KISI, 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 Urk (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 1/2 goats per vessel KISI, recorded in the texts W 17679, ad, 20274, 41, 65 and 148 (NES 30, 126-29, nos. 22-25). For comparison, goats' horns in the Ur III period were exchanged to deliver between 1/4 and 1/4 of a shekel (gold) of bull oil per nanny goat (see R.K. Englund, OrNS 64 [1995] 328, 339)).
The nature of this exploitation must be deduced from the 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 provinces 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.

All third millennium textiles dealing with domestic production distinguish between the raw material wool (Sumerian šu₃₄) and finished products (tu₃₄). While both articles were distributed as rations according to unclear rates of disbursement, complex accounts prove that state-controlled exchange mechanisms dealt primarily in wool.

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 relevance 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 linked 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 on average wool-producing sheep was expected to produce 2 mana (ca. 1 kg) and dependent workers required 2-4 mana (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 tu₃₄ 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.

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324 See Th. Jacobsen, 'On the Textile Industry at Ur under Ibbi-Sin.' Studia Orientalia boomi Pederse ...


326 Groves 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 weaving used in textile production. For instance, the weaver's pattern of a piece of cloth apparently used to wrap and possibly keep moist an archaic tablet from Ur is clearly visible on the tablet's surface. The pattern on the face of the tablet WV 12700 (unpubl.) exhibits a weave using warp and weft, presumably that used to produce the simple garments distributed to state dependents and traded outside of Mesopotamia.
The rest of this section of the vessels list consists of entirely formalized double entries: 'qualifier' TUG₄₋₅ / 'qualifier' TUG₆₋₇. Neither this nor attestations of these signs in administrative documents offer sufficient context to allow a judgment of the difference in meaning the two garment categories TUG₄₋₅ and TUG₆₋₇ imply. The qualifications of the categories include signs representing color, apparent designations of the type of weave used in cloth production, and signs of unclear meaning.

Preserved summations of several administrative accounts prove that the signs SIG₃₋₄, DARA₄₋₅, SUL, GADA₃₋₄, and TUG₃₋₄ - 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. The collective designations of these objects allow both the construction of semantic categories and the isolation of qualifying signs such as these 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. 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 sheep and other grain products, dairy goods, and probably those representing fish baskets, proves that sexagesimally counted discrete units were in fact further divided into smaller units.

250 The standard sequence of colors white (SU), black (GS), yellow (IG) and red (NE) is well attested both technically and in administrative context; for instance, the sections of this label 'together with the sequence F₂, NNE, U/S, Ch₃₄₋₅ + cow/bull/kill (II 1, 1 4, 27 30, 55, 56, AT 3, 69, 7), the 'pigtail' TUG₂₋₅ has CH₅₋₆, SUBUR₂₋₃ (AT 3, 1/53-10, and above, fig. 28) such accounts as W 21662/1 contain a particular formal with each representing various qualifications of textile products, in this case DARA₄₋₅ including the color qualifications SUL, NNE, GLUG₂₋₃ (checked ?) and G₂₋₃. So for example lines 99:100 with GAR NNE₃₋₄, BUR₁₋₁ (——) in the lines 101—104, and LUM₂₋₅ in lines 2 13-114 (connection to later Sumerian gizz.zu.sena seems, however, excluded by the use of the sign A instead of expected NUNUR₂₋₃, XA₂₋₅.

251 For example, W 2072/41 (AT 2, 7, 25), W 2074/24 (unpublished) and W 2161/7 (above, fig. 44), it may at least be assumed that the signs SU, as well as GADA₄₋₅, designated measures of specific textiles, since the objects they represent belong to a semantic category together with those represented by the signs TUG₂₋₅; if included in a summation on the account W 21671, however, the signs GADA₄₋₅, and, often associated with GADA₄₋₅, ME, give the phonetic impression of representing tools used in the production of textiles, for example, in the production of yarn; in the case of GADA₄₋₅, the sign might represent a device used in combing and drying and cleaned line - remembering that phonetic identifications are highly speculative.

252 P. Dominé and I have indicated in ATU 2, p. 129, that the signs DARA₄₋₅ and SI₂₋₃ 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. Even the categorization makes impossible the identification of a number of signs found (SIG₃₋₄) under the terms SIG₃₋₄ in the sign lists AT 2 list as variants of SIG₂₋₄ since they are qualified by the bi-sexagesimal system and are thus to be connected to the category of signs representing dry grain products collectively qualified by the ideogram GAR (cp. ATU 2, 133-134).
Texts from the late Uruk Period

Figure 52: Simple receipts for cattle
This upper series of tablets contains apparently notations representing receipts for one cow (sign ἡ) and one or two bulls (sign ἃ), the lower series notations representing receipts for one calf (sign Ὠ) and for mixed cattle (ʔ, sign combination ἢ ἃ.)

Administrative Systems - Administrative offices

Cattle (cows, bulls, oxen, AB, GU) 256

Cattle, in the general sense of the term including bulls, oxen, cows and calves, were standardized under the sign combination AB+GU (ʔ ἢ; figure 51). The signs were clearly pictographic: the sign GU was the representation of the head of the bull or ox with horns upwards, 257 the sign AB, was the representation of a domesticated female cow with downturned horns, and the sign AMAR was the representation of the head of a hornless calf with ears held upright. 258 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 KUR (ʔ) and GAL (公网), might represent the male and female sexual organs. 259

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 ARIN and oxen represented by the sign GU, and thus offer meager evidence of the former use of cattle. 260 Meat, too, is poorly attested, or at least poorly recognizable in this period. 261 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. 262 The earliest texts record few 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.

257 No graphic differentiation is obvious between breeding bulls and castrated oxen, both apparently = GU (the few bulls kept for breeding in pre-Sargonic Girsu were called simply gu, obv. "bull of the cow").
258 A. Folkema noted in ATU I, p. 52-53, 101, the pictographic development, beginning in the Uruk IV period, of the signs AB, GU and AMAR. There is some resemblance between the sign GU and seashell tokens found in context with clay envelopes; see above, n. 101.
259 See also above, section 3, to the lists 'Cattle' and 'Fatties'. In the latter composition, cows and oxen or bulls were recorded in a relationship of 1:1:1, if GU, GU, the numbers might represent an ideal service ratio employed in archaic cattle breeding.
260 See, for example, the two texts ATU S, pl. 86, W 8656, and pl. 100, W 9656, with counted ARIN GU, apparently assigned to temple households. The inscription of the latter text is duplicated in the second column of the reverse of the former. See generally F.R. Kraus, Staatliche Viehhaltung im altbabylonischen Landesamt (Amsterdam 1906); K. Kutz, "Zur Terminologie der Viehwirtschaft in den Texten aus Elba", in L. Cagni et al, La lingua di Elba (Naples 1981) 321-333, to large herds of sheep and cattle owned by palace economies in Mesopotamia.
261 The very meager bone remains from Uruk of Bos taurus identified by J. Boessneck, A. von den Driesch and U. Sieger, Boe. 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 50 of the 238 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.
262 The lower 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 5.3: Examples of complex accounts of cattle.
The three texts depicted above and on page 187 both date to the Uruk IV period and register numbers of animals noted on the texts' reverse faces. W 7277, p. 100 a total of 34 cows and bulls. The two Uruk III period texts on page 157 both contain accounts of small numbers of cattle, qualified with signs known from II period list 'animals' (W 14375), and with sign combinations known to represent the signs of the animals (W 14361: two through five-year-old bulls).
Texts from the Late Uruk Period

Cattle as discrete objects were as a rule registered in proto-cuneiform texts in the sexagesimal system. 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 uninscription.

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 52, 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 heads of adult and young cattle, probably separated according to the function of the individual animals, were recorded in other accounts (figure 53, W 9656, ev.). 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 $N_{3}$ of which in sexagesimal notations generally designated $1/4$ of a discrete unit. Thus the fourth case of the text’s second obverse column contains a notation $N_{3}$ $N_{3}$ representing one cow and one calf.

Uruk III period accounts of heads of large cattle are very rare and register only modest numbers of animals. The preserved sections of the text W 14295 in figure 53 contain notations representing just 8 head. The age of animals was recorded in some accounts; the text W 14295 (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 $5N_{3}$ + $U_{4}$, $4N_{3}$ + $U_{4}$, and $2N_{3}$ + $U_{4}$, $GU_{4}$). 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), record small numbers of cows together with their offspring, qualified SAL+AMAR and KUR+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.

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503 The exceptional use of the sign $N_{3}$ in the Uruk IV period to designate immature animals is discussed below.

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


506 The latter animal was included on the text ev. 1 among a group of four animals qualified as AMAR.

507 For a description of archaic designations of years see above, section 6.2. The standard age sequence for Uruk bulls/cow attested, for example, in the theoretical account TCL 2, 3449 B. J. Geijsbeek, JCS 21 (1967) 64-69; see also JCS 21 (1967) 64-69; see Archaic Bookkeeping, 97-102. Also in the tablets TCL 2, 3449 B. J. Geijsbeek, JCS 21 (1967) 64-69; see also JCS 21 (1967) 64-69; see Archaic Bookkeeping, 97-102.

508 W 30274, 12 and 6.3 were first published by M.W. Green, JNES 39 (1980), 32, nos. 33-35; see now Archaic Bookkeeping, 89-92 with fig. 71.

509 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 Uruk III data of the discussion above, n. 367.

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Figure 54: Containers of dairy products in the Late Uruk and Early Dynastic Periods Above the Uruk Frieze (after P. Gorny, Iraq 53 [1991] 126-127). Below: ceramic caps 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.
Figure 56: Metrological relationship between ŚLAmA₂ and DUG₂.

Dairy products

The two dairy cattle accounts depicted in figure 49 in both the totals on their reverse focus on one jar of dairy fat²⁷⁰ (hence DUG₂) per two (W 20074, 15) or four (W 20074, 43) milk cows, that is, possibly 2.5 liters per animal. The first eight lines of the archaic lexical list 'Vessels' in fact consist of entries with the signs DUG₂, KSI₂₂ and other signs which represent containers of fat used in the administration of archaic dairies.²⁷² These signs, including NI₂, DUG₂ and UKNI₂, are often found inscribed together in administrative documents.

²⁷⁰ See the articles cited above, n. 333.

²⁷¹ The sign DUG₂ representing a ceramic jar without a spout, was consistently distinguished from the signs DUG₂ including the representation of a spout. This fact and the contextual inscriptions of both signs suggest that the former jar will most likely have contained semi-liquid, the latter jars, above all beers. A large number of signs were impressed in DUG₂ 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 SE₂ (bottle), NE₂ (oil), AL₂ (alcohol), etc. See also, section 3. The oil tanks, believed themselves to have represented concrete containers, have been found in clay envelopes from Uruk and from Khafaje, and in Syria. It may be noted in passing that few chemical analyses of the inner surfaces of these Uruk pottery vessels have been performed, and thus little hard evidence is available which would either support or refute the functional hypothesis 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 Rheinisch Landesmuseum Bonn, ed., Proceedings of the 18th International Symposium on Archaeometry and Archaeological Prospection, Bonn 14-17 March 1978, Archéo-Physique 10, 1978 (Cologne 1979) M. Frangipane has reported some preliminary identifications of these elements in samples from late Uruk levels at Eridu (personal communication).

Figure 55: Accounts of dairy products

Simple accounts of dairy products from the Uruk IV period (below) and a large account from the Uruk II period (above, written unscribed), see ATU 2, pl. 55, and Archéologie du Moyen Orient, n. 96, of products from animal husbandry, including the signs for dairy fat (DUG₂) and cheese (SAK₂₁).
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 $\text{NI}_\text{II}$ with DUG$_3$ in such texts as W 9206.c and W 9579.ah, and of $\text{NI}_\text{II}$ in the same case with AB$_3$, and with DUG$_3$ in the text W 6565.aq [all figure 55], demonstrates that this sign should represent a container of dairy fat from its first use in the Uruk IV period. Only indirectly associated with the sign representing dairy fat, DUG$_3$, is on the other hand the sign GAAR 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, is as a clear precursor of the Fara and pre-Sargonic Lagash sign LAK 400 - itself replaced in Ur IV documents by the sign combination $\text{g}a\text{ HARR/UDUG} -$ , posited to represent a unit of cheese. Whereas all 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 GAAR (dry grain products) and KU$\text{III}_\text{II}$ (fresh fish) as another product central to the archaic rationing system.

$^{574}$ The sign, the real referent of which is unknown, is in later cuneiform documents the general designation of oils of all kinds.

$^{575}$ See above, section 5 with fig. 29.
Contents 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 N₃₆⁻ discussed above as a designation of immature cattle in the sexagesimal system as a rule qualified ⅔ of some discrete unit(s) above all the contents of vessels and baskets. Notations in a number of Uruk IV period texts suggest that the sign N₃₆⁻ in the sexagesimal system could also represent a smaller fraction than ⅔ of an object, although the objects so qualified in these notations are, unfortunately, not always clear, although E26 seems attested in at least two of the accounts. 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 N₃₆⁻ together with the sign combinations SI₃₆₆-GAR₃₆₆ or SI₃₆₆-GA₃₆₆, the former explicitly written in the first four cases of the first column, the latter 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 SI₃₆₆-GAR₃₆₆ and SI₃₆₆-GA₃₆₆ in the second column the final total N₃₆⁻, DUG₃₆⁻ qualified with SI and the sign GU₃₆⁻, meaning: ‘20 SI₃₆₆ can thus be identified as a pictographic representation of the mass-produced ‘Blumenthal’ which followed and for some time in late..."
Unik levels coexisted with use of the beveled-trim bowl GAR, it represented a measure equal to \( \frac{1}{4} \) of the amount of liquids or semi-liquids contained in the vessel DUG.\(^{231}\)

The third, Unik 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 \( \frac{1}{4} \) of the unit 'jar'. A large number of accounts, including the largest of the archaic Unik corpus (figure 59), contain notations in this metrological system which exhibits the structure

\[ 1 = N_2, \text{vessel } (DUG) + N_2 = 2 = N_4, KU_4 \]  \( \text{Figure 59: W 20074.39} \)

The largest administrative document in the archaic corpus from Unik contains an involved account of the delivery of dairy fats to a temple household donated by the sign DUG.\(^{231}\)

The text W 20074.72 (unpubl.) seems to contain an addition '2N_4 = 1N_4, SIA_4, GAR_4 = 1N_4, 1N_4, DUG', implying that, as might be expected, \( N_4 \) also served in this system to represent both \( \frac{1}{4} \) of a basic unit and \( \frac{1}{4} \) of \( N_4, SIA_4 \).

\[ 1 = N_2, \text{vessel } (DUG) + N_2 = 2, = N_4, KU_4 \]  \( \text{Figure 57} \)

\[ N_4, KU_4 = 5 = N_2 \]

(corresponding to the basic unit \( N_4 \), crossed by a horizontal stroke; see figures 58, 61)\(^{232}\)

The full structure of this metrological system (figure 58) may represent a development from the Unik IV system with, dependent on context, \( N_4 \) equal both to \( N_4, KU_4 \) and to \( N_4 \). The meaning of \( KU_4 \) in this connection is, aside from the fact that it indicated a half measure, not obvious.\(^{233}\)

\[ 231 \text{ W 20074.6 in fig. 57 offers a simple summation of three entries with numbers of a container of fats represented by the sign DUG. The only known duplicate administrative texts from the archaic text corpus, W 20074.33 and W 20074.89 (figure 57), contain somewhat more involved accounts, yet the reordering steps exhibited by both are easily recognizable as simple additions of whole numbers and fractions from the same metrological system. Including only the 3 units qualified as } 8A 100, \text{ in the second occurrence of the first case of each kn's obverse face, the addition is: } 3 + 1\frac{1}{2} + 1\frac{1}{2} + 1 + 2 + 3 = 13 (DUG) \]

\[ 232 \text{ No dairy accounts known to me contain a notation with five or more } N_4, \text{ in compliance with the expected replacement of } 3N_4 \text{ with } 1N_4, KU_4 \]

\[ 233 \text{ I might draw attention to the fact that tokens often related to this sign have been found in clear association with sealed clay envelopes in Unik and possibly within still complete envelopes from Susa (see above, section 3).} \]
The numerical and metrological systems used to qualify measures of dairy products mirrored in their complexity the pictograms designating the different products themselves (figure 66). According to data derived from excavations, above all measurements conducted on the masses of bevelled-rim bowls found in late Uruk settlements, and in accordance with textual evidence, the most plausible current working hypothesis of the absolute capacities of these various units is the following:

$$\text{GAR} = 1 \text{ N}_\text{L} \quad \text{M} = \text{SEAS} \cdot 1 \text{ N}_\text{L} $$

$$\text{N}_\text{L} = 1 \text{ N}_\text{L} \quad \text{KUR} = 1 \text{ liter }$$

$$\text{N}_\text{L} \quad \text{DUG}_{\text{L}} = \text{ liter }$$

Pigs (\text{SAH}_{\text{L}}
, \text{SUBUR}_{\text{L}})\text{.}

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 IV-a present the best evidence, consisting of various depictions of the hunting of boars both by savage professionals and by administrative elites. 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 Ul (figure 62). Although archaic cylinder seals and reliefs depicted only wild pigs, osteo-archeological identifications as well as proto-cuneiform tablets demonstrate that the exploitation of.

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247 See above, fig. 10. Impression IOa depicts two boars standing or running amongst conventionally drawn reed hedges, reinforced by what may be the wanted rules of Uruk. ("Shallot") accompanied by two eggs. According to the tell sources, pigs were delivered by fishermen, certainly from their fishing grounds in the mainlands of southern Babylonia. See Ul 11 (1917), 174-177 = 17274.

248 IOa: H.-R. Hall, la sculpture babylonienne et assimilée au British Museum. An Asiatique 11 (Paris-Brussels 1928) pl. 1, no. 2, BM 118465, and id., The British Museum Quarterly 2 (1927-1928) 12-14 + pl. VI (probably from Ul). IOb: P. Delougaz, Pottery from the Diyala Region, BIF 63 (Chicago 1952) pl. 90c (from Khafaje, today drawn to my attention by U. Morgenstern). In their habitat in the reed thickets of the southern plains, wild pigs were particularly menacing and certainly no easy bag for either a professional hunter. Aggravated boars, feared for their strength and ferocious charging power, or disoriented sow 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. Theiger, The Marsh Arabs (London 1904) 34-43, 169-169; A. Bute, A pilgrimage to Persia ..., London 1881 122-128, H.T. Hat, The Monuments of Iraq, University of Michigan, Museum of Zodography, Miscellaneous Publications, see 100 (Ann Arbor 1959) 57-59; D.L. Harrison, The Monuments of Arabia, vol. 2 (London 1968) 372-373.

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 pig-rearing to archaic bookkeepers is most clearly underscored by a lexical composition described above, section 5, of 38 designations of pigs and their features. All entries in this unique Ur III period list from Ur (WV 12.130, figure 6.5) include the sign SUBUR (𒄭), pig,208 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,209 it may be worthwhile to review the reasons behind the identification SUBUR — pig made by P. Damerow, H.J. Nissen and myself.

Not only the clear graphic relation of this sign to the sign $\text{S\-\text{A}-\text{N}}$ is it the same sign minus the guli of the back of the depicted animal’s neck, i.e., the bristle mane — but above all the sequence SUBUR, $\text{N\-\text{A}-\text{S}}$ SUBUR (𒃗) and $\text{N\-\text{A}-\text{S}}$ SUBUR (𒊲) of the first three cases of the text210 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 SUBUR in the text which would be incompatible with other interpretations, for instance, SUBUR = dog.211 The lines rev. i 1-2 and 7-8 with $\text{A\-\text{S}}$, SUBUR; NE, SUBUR and CH, SUBUR, UJ, SUBUR, i.e., "cow/reddish SUBUR" and "black/white SUBUR," for example, contain adjectival phrases 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 3 with SE, SUBUR, the sign $\text{S\-\text{A}}$ seems to represent a product delivered by herders, best attested together with sheep and goats — possibly dung, a highly desirable fuel used in cooking and heating in antiquity.212 The entries iii 6-7 with SE, SUBUR and GURUŠDA SUBUR also provide hard evidence, since it would be difficult to imagine the purpose of fattening a dog (assuming a correspondence of SE SUBUR to later SAMS\-\text{A} or a fattener GURUŠD\-\text{A}) of dogs — or of humans for that matter.213 Finally, it may be noted that the archaic entry GAN, SUBUR of line 7 of the lexical list ED. Ur. A is apparently known in all witnesses from later periods, beginning with the witness from ED III Ur, replaced by GAN, $\text{S\-\text{A}}$.214 It is thus probable that the two signs cocodiced during the hiatus between the late Ur III and the Early Dynastic periods.

While evidence for a so involved terminology of pigs and organization of pig rearing as would seem to be implied by the existence of a lexical pig list including 38 entries is not known from later periods,215 still the nature of archaic lexical lists as often fanciful paradigmatic.

4, and 58, obv. i 261, i 2 and rev. i 14 or 18 (I 14), does not assist in identifying the meaning of the sign, but would certainly not exclude the meaning pig, Cp., for instance, MSL 8/2 (Kane 1960) 20, ii, I 15-166; 81, Moa, gamad, sig, gag, gil, [possibly in the sense of "untanned"] magan-pig (and see the Old Babylonian correspondence in SL 51 + 2, 1 197; sl.39 5, Saron, "Samirium").

208 See above, n. 390.

209 The fact that the list was so long seems most to have motivated Steinkeller in AIO 42/43 (1959-60) 212, 213-214, to doubt our identification — although swine are recorded in I 15-163 of the 14th tablet of the lexical series 1A61-62 — but rather that is, in IV 15-33 entries (including insertions) representing pigs of different colors (white, black, red, speckled, yellow), habitat (food ticket), quality ('lodge', 'royal', 'fattened' and origins (see B. Landsberger, Die Fauna des alten Mesopotamien nach der 14. Tafel der Sumerianer AUSL. 1931) 10-13. 108-120 ed. I. E. S. Edwards, MSL 8/2, 19-21). This section of IV 14 implies that pigs were indeed dealt with in earlier lexical lists in the same paradigmatic and analytical completeness (note that most of the IB 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 drawn from folktales and not from Green (see above, n. 392).
2) Steinkeller does not know the meaning of most of the sign combinations accompanying SUBUR in the list and so cannot control that they were not even remotely connected with pigs or pig products (p. 212). In fact, the combinations listed above unquestionably represent qualifications of domicated animals and not casually connected with pigs.
3) UZU 30 is not undoubtedly SUBUR. The reading of this sign was, in fact, only determined byopting for one of the two signs which in the foro period seemed to have replaced it in line 7 of the lexical list.
name-generating exercises—a phenomenon well documented from later periods but also known, for example, in the archaic list of domestic animals298—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 and milk, 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 document the keeping of herds of wild pigs (archaic sign ša mà, conventionally read SÁHU₂₁₂₃SUBUR[ša]₂₃). The Uruk III period

[Text continues with additional details and references to other sources and references]
account (figure 64) does, however, offer a good general outline of pig-yarding in the archaic period. The text apparently records the distribution of animals from a large herd of 65 pigs into four groups of adults assigned temple units in Urk 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 assigned to temples in the temple lists. 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.452 The reverse of the partially destroyed account can be completely reconstructed. The first of these 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-case. Individual entries of numbers of pigs were qualified with the sign conventionally read BA [H-'distributed' or 'inspected'] or through the addition to their corresponding numerical notation of horizontal strokes (system S'), apparently designating slaughtered animals.453 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 64 BA animals and 11 counted using system S'; the addition of these two entries results in the final total of animals, qualified in the left (left) column of the reverse as "altogether (UDU/AB.A) 65 grains-fed, SE.P 7 pigs." The animals are also qualified in the text according to their age; young pigs in their first year denoted 1 1/2; SA.MA.H.A.B.A. were not assigned one of the two households recorded in the first two cases of the reverse.454

Figure 64: Pig-yarding account
The copy and translation of the archaic Urk text W 2394/8 follow A. Canaan and M. W. 22 (1991) 1, (use of initials here and in the translation due to copyright restrictions). The known drawing combines a close reconstruction of the tablets on the reverse of the tablet.
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, KUR, and the signs are probably pictographic representations of human genitalia, the first sign designating the female and the second the male person. The compound sign called GEMEI in the sign list ATU 2 represented both male and female laborers, the same way as the sign combination 6 SAL, KUR, "cow bull", see above denoted "cow" in dairy accounts. The text W 23999, 1 depicted in figure 65 contains an account of eight humans designated in the summation SAL + KUR in 6.4. 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. 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.

460 This compound was first recognized by A.A. Vojsan, "Die Bezeichnung von Stieren und Stierinnen im system der proto-cuneiformer Schrift", Betr. 20 (1946) 121-133 (German translation of his Russian article in VDI 1974,2, 133-148; see also id., VDI 1081/4, 81-87 = Betr. 21 (1900) 116-123), to represent male and female humans; the list of signs showing the composition of archaic accounts is to be retracted. See now the treatment of the signs in proto-cuneiform and proto-literate texts in P. Domanski and R.K. England, Tape Taya's, 24 and 53-57.

461 Based on this account, it has been possible to identify a number of other archaic texts of the format and parallel contents, including the second account in fig. 65 (and its female version) in Nansu, 1, 212,214 (see also Archaic Bookkeeping, 72-75). Note also the close correlation of the children qualified SAL + KUR in W 23999, 1 (cf. the entry obv. 1 3a: ZN + 1 NUNU + \*U, KUR in W 22742, 4 as a possible further corroboration; the qualification in later periods was \\*U, 4b for the animals qualified 1 NUNU + \*U and the animals qualified 1 NUNU + \*U, SAL + KUR for large and small cattle and pigs, respectively. This is not to say that the designation SAL + KUR will have qualified infants in their first year, but rather probably children which were "non-evdatable," i.e., too young to be set to some task. H. Wolski estimated in Die Situation der Frauen und Kinder am Rand eines Entkommensverhaltens zur Zeit der III. Dynastie von Ur, "AfS 15" (1984) 46, that children will have been employed during the Ur III period beginning at the age of 5 or 6.

462 These together with further sign combinations in comparable texts should, as invariable designations of individual persons, play a role in any attempt at language description 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.
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," until further text finds offer us a better basis for understanding.

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their exact status are, however, bracketed into larger accounts. Such texts as W 9027 (figure 68), 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 figures of 20+ individuals in those entries are added on the reverse of the tablet in a total of 211+ SAI+KUR.

Several archaic texts from Jeremit Nairi more precisely qualified laborers designated SAI and KUR, with signs SAG+MA (39) and ERIM (40). The latter sign was a pictographic representation of a yoke and presumably denoted tethered captives of war, consistent with reliefs from later periods depicting yoked enemies being led into captivity. 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 GU, "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 SAI and KUR.

Further data regarding the administration of dependent laborers can be culled from accounts of their vicissitudes. Since no less than in later periods those laborers will have been given only enough to guarantee 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 9027 (figure 67) consists of entries divided into two notations. The first represents 1' of the garments designated TUGU+BAD+BAD followed by sign combinations representing apparent persons or officials, the second is only numerical and represents . . . 120 = 360. We can assume that this otherwise unqualified notation stands for grain rations since this is the particular field of application of the bi-sexagesimal system, and given the fact that the administrative timekeeping system of
the archaic period operates with a 360-day year it may be posited that the counted rations represent one 'holy year.' Unfortunately, no other accounts exhibit this grain/girl 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 comparable to later tradition. A. Diemel first recognized in 1933 the potter's reference of the sign GAR (sumerian 'ninda' and Akkadian 'correspondence' or 'economical' bowl) 415 since H.J. Nissen's discussion of the beveled-rim bowl, a so-called diagnostic ware dating from the Middle Urk period, but at its most common during the Late Urk period and found in great masses in archaic levels of Urk, which he interpreted as being a rationing bowl represented by GAR, no consensus has been reached in the field as to its ultimate function of these devices. Suggestions have ranged from the reasonable bread-baking mold, to the less plausible vessels for yogurt or sausages. 416 Clearly 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 N₄, down to a measure represented by N₁. 418 in the archaic grain capacity system. The ideograms do have a specific metrological equivalent in archaic accounts; however, with some variations, it corresponds to the numerical sign N₄₀₉, equal to 1/20 of the sign N₄ in the capacity system. 419

413 Note that the same solution 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 grain, but the numeric numerator suggests that the textile products S₁₂ and T₁₂ₓ, BAd-BAd, and the small cattle UDU were held in the account as discrete objects and not consolidated into a common value equivalent such as grain.

414 Two small, accounts, W 21016,4 and 21019,4 share common notations of 3N₄₀₉ (= 360 positions); their frequency score, however, raises a judgment of the purpose of these occurrences impossible.

415 I.S. 2, 587.

416 Indeed, the discussion of the function of these bowls continues unabated. Beyond R.K. Englund, Administration in Early Mesopotamia, JESHO 31 (1968) 121-183, in particular pp. 162-164, with the treatment of the test MSVO 4, 27 (fig. 83 b), 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 on the most recent evidence of A.R. Millard, The Beveled-Rim Bowls: Their Purpose and Significance, Iraq 50 (1988) 49-57, and G. Baccellarì, Silti alia Dea di Wynnum: Il Caso della Beveled-Rim Bowls, in: P. Matthiae et al. (eds.), Resurrecting the Past [...], Izmir 1990, 17-40.

417 The product GAR seems to stand in contrast to GL₂₂, (decorated boxed bowls); see MSVO 1, 109 abv. ii.13, 111 rev. ii.10, and compare the summation rev. i.1 of grain products booked in ATU 5, pl. 38, W 9123, 4th GL₂₂, ZATU₂₂, and GAR with the similar qualification of a total in the test WY 9165,4.

418 See above, fig. 41.

419 See P. Domarev and R.K. Englund, ATU 2, 153-154; and add MSVO 1, 140, abv. i.1a, with an explicit N₄₀₉ qualifying a GAR reconstructed according to the parallel MSVO 1, 138, and Archiac Backancements, p. 42, fig. 38, abv. ii.10. For L.K. Englund, JESHO 31, 162-164.

420 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. Mayrung and P. Domarev (eds.), Changing Views on Ancient Near Eastern Mathematics (Berlin, forthcoming).

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. Long-term 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. 421

421 E: See E. Ince, JESHO 31, 162-164; see above, n. 266.

422 See still ATU 2, 133-154; and the literature cited above, n. 385.

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 \(SE_6\) (a picture of a barley spike), of a numerical notation using the grain capacity system, or of ideograms which denote a grain product, often collectively qualified with the sign \(GAR\) (a picture of a beveled-rim bowl probably used to hold a daily ration of grain) or \(DUG\) (a picture of a clay jar with spout) representing dry grain products and beer, respectively. For example, the account MSVO 3, 29 (Figure 69), contains a large grain capacity system notation\(^{422}\) 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 \(SE_6\) and the largest month notation known from the archaic text corpus, namely, a notation representing 37 months.\(^{423}\) Even though we are not in a position to interpret the final meaning of the ideographic notation accompanying these signs,\(^{424}\) 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 Ugar, record in eight cases amounts of grain again qualified with the sign \(SE_6\) and with sign combinations representing the first through the eighth year of an unclear administrative period (Figure 70).\(^{425}\) 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.\(^{426}\)

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\(^{422}\) The text identification refers to the archaic tablets of the Eriduwyaya collection (see above, n. 419), to be edited forthcoming by P. Damrow and myself in the volume MSVO 3.

\(^{423}\) Recognizable in this final sign \(N_1\) (as the repetition of the sign \(N_4\) we term would also exclude both the cuneiform and the suzerainal system from consideration).

\(^{424}\) That is, three years plus one month. Whether this is in any way reflects on archaic iconography in a three-year cycle, as was common in late administrations, is a matter of speculation.

\(^{425}\) They might reflect an exchange transaction account consolidating the grain used in the building office of the official \(U_2\) SIM (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.

\(^{426}\) 1-\(N_3\) \(U_2\), whereby in the second text \(N_3\) \(U_2\) is replaced by the simplified \(N_1\) 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 notation and summations in the archaic 10-year Ur III account TCI 2, 5499, for which see Archaic Bookkeeping, pp. 99-102.
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 bi-meansesimal notation representing 598 discrete units is qualified by the sign GAR, so denoting grain rations. In the second, a sexagesimal notation representing 59 units is qualified by the sign DUG, so denoting ears of barley. The function of the text seems indicated on its reverse face. The sign BA (§) 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 is 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 four 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 BA.A and in many administrative accounts. The sign combination EN, 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. The reverse side of the tablet contains the usual sum of the entries, qualified by the signs SE, and BA (presumably "grain distribution"), and further sign combinations "KU SIM" 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 SIM" 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.

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427 We know this notation, which in another context might be bi-meansesimal, is from the sexagesimal system, since all archaic notations of vessels which cross the '120 barrier' continue with the '60' (§), and not with the '120' (II) signs characteristic of the bi-meansesimal system.

428 Note the close approximation of a 10:1 relationship between dry grain products and ears of barley, which may themselves have had a capacity of 100 grains. This ratio between barley and beer. The barley was brewed at the rate of 1:1 (one bushel of grain per measure of brewed 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 NUG, these sizes would imply that the two notations of GAR and DUG, were roughly value-equal.

430 Each sex also offers straightforward evidence of calculations in the capacity system. In MSVO 3, 64, the addition of 2 units of the size 3, 22 units of the size 1, and 2 units of the size 2. The total can be seen to be fully consistent with the replacement rule of the capacity system discussed above, section 6.1, of NUG = 3NUG, and NUG = 10NUG.
Figures 72: MSVO 3, 64 and 58
These two formalized accounts contain notations on their obverse faces representing grain distributions. For example, MSVO 3 has notations of barley and malt recorded on the reverse, indicating that these quantities were distributed to specific individuals. The notations are often accompanied by symbols and numerals, which may represent specific quantities or units.

Figures 73: MSVO 3, 52 and 51
The two tablets, represented on the right, are inscribed with formalized accounts of grain distributions. In the first case, MSVO 51 contains notations of barley and malt, along with a symbol that may represent a specific unit or quantity. The notations are recorded on the reverse, indicating that these quantities were distributed to specific individuals or offices. The symbols and numerals used in these notations are likely to represent specific quantities or units, and may be accompanied by additional notations that provide further details about the distribution.
Another pair of accounts from the Eichenauer collection, MSVO 3, 52 and 51 (figure 73) offer more explicit information about the function of the official "KU SIM". Since these two and a series of further accounts identify "KU SIM" as an official responsible for the processing and distribution of large measures of cracked grain or goths on the one hand (represented by notations in the derived capacity system $S^*$), and of malted barley on the other (represented by notations in the derived capacity system $S^*$), we have concluded that he is responsible for a brewery directly related to an archaic central administration.\footnote{402} 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 SIM". 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 (\textit{gimil}) instead of BA, is found in the unprovenanced 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 $S^*_E$) and numerical notations in the basic capacity system and/or emmer wheat (numerical notations in the derived system $S^*$)\footnote{403}, 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 $\text{g}/\text{g_{m}}$, 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 broads and simple rationing measures, and into barley beer. Lagers 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 table depicted in figure 75\footnote{404} is in fact not one of these accounts; it is, instead, one of several archaic administrative exercises, as is obvious by the very long and round numbers represented in its individual cases, and by the fact that no persons and no designations of the purpose of the tax are recorded.

The first column of MSVO 4, 66, records numbers of dry grain products counted with the biregional system, followed in each case with the amount of grain used in their production. In the first case, the production of 65 units of the product $\ldots = \frac{1}{5} 1\text{.} 0\text{.}9\text{.} 1\text{.} 9\text{.} 1\text{.} 0\text{.}$ required $65 \cdot \frac{1}{5} = 12 x$ (and since $x = 1$ in the grain capacity system) $= 2 x$. The same kind of calculations are made in the following cases with ever larger numbers of ever smaller grain products,\footnote{405} ending not with a number of the capacity numerical system, but with its ideographic equivalent, the sign $\text{GAR}+\text{SN}_{	ext{AG}}$ 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 $\text{N}_{\text{AG}}$ ($\text{g}$) representing $\frac{1}{5}$ of the basic unit $\text{N}_{	ext{S}}$, $\text{g}$. 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 grains used in their brewing.\footnote{406} These clear calculations thus demontstrate the close relationship between numerical systems employed in archaic accounts to qualify discrete objects and the capacity system used to qualify measures of grain:

\begin{tabular}{llll}
\hline
\textbf{obv.} & \textbf{i} & 1 & $1\text{N}_{\text{S}}$ & $1\text{N}_{\text{S}}$ \\
 & 2 & $1\text{N}_{\text{S}}$ & $2\text{N}_{\text{S}}$ \\
 & 3 & $1\text{N}_{\text{S}}$ & $1\text{N}_{\text{S}}$ & $2\text{N}_{\text{S}}$ \\
 & 4 & $2\text{N}_{\text{S}}$ & $1\text{N}_{\text{S}}$ & $1\text{N}_{\text{S}}$ \\
 & 5 & $1\text{N}_{\text{S}}$ & $1\text{N}_{\text{S}}$ & $2\text{N}_{\text{S}}$ \\
 & 6 & $1\text{N}_{\text{S}}$ & $\text{GAR}+\text{SN}_{	ext{AG}}$ & $1\text{N}_{\text{S}}$ & $2\text{N}_{\text{S}}$
\end{tabular}

\begin{tabular}{llll}
\textbf{rev.} & \textbf{i} & 1 & $\text{BA GAR}$ & $1\text{N}_{\text{S}}$ & $1\text{N}_{\text{S}}$ \\
 & 2 & $\text{SN}_{\text{AG}}$ & $\text{GAR}+\text{SN}_{	ext{AG}}$ & $1\text{N}_{\text{S}}$ & $2\text{N}_{\text{S}}$ \\
 & 3 & $\text{SN}_{\text{AG}}$ & $\text{GAR}+\text{SN}_{	ext{AG}}$ & $1\text{N}_{\text{S}}$ & $2\text{N}_{\text{S}}$
\end{tabular}

\begin{tabular}{llll}
\hline
\textbf{The grain calculations}\footnote{407} & \textbf{obv.} & 1 & $60 \times \frac{1}{5} x$ & $12 x$ & $2 x$ \\
 & 2 & $120 \times \frac{1}{5} x$ & $24 x$ & $2 x$
\end{tabular}
Figure 74: A comparison of the additions in the two grain accounts MSVO 4, 45 and 43.

<table>
<thead>
<tr>
<th></th>
<th>120 x 1/10</th>
<th>(50)</th>
<th>8 x</th>
<th>1 x</th>
<th>2 x</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>300 x 1/10</td>
<td>(50)</td>
<td>15 x</td>
<td>2 x</td>
<td>3 x</td>
</tr>
<tr>
<td>5</td>
<td>600 x 1/10</td>
<td>(50)</td>
<td>24 x</td>
<td>4 x</td>
<td></td>
</tr>
</tbody>
</table>

Rev. 1 1 1200
1 x 1 x 5 x

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 arcaic brewing offices, the amount of malt added to the beer during its processing. 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.

The oblique stroke added to the signs of the system 5 is presumably the pictographic representation of the sprout from the individual kernels, just as the dotted impressions of the system 5 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 notations qualified by the signs SEN, SEN, seni, and DUG, [16], [17], and [18] 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. 415

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 account 440 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 Eilemmyer 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 3, 66, five different numerical systems were used in the accounts: the sexagesimal system for the cereal products, the tetragesimal system for the beer containers, and three different systems for the measures of cereals. 441

The grain calculations in MSVO 3, 2:

| obv. i | 10 x \( \frac{1}{10} \) = \[16\] | \( 5x \) | = \( 1 \times \) |
| 2 x \( \frac{1}{10} \) = \[16\] | | = \( 2 \times \) |
| 3 x \( \frac{1}{10} \) = \[16\] | | = \( 1 \times \) |
| 4 x \( \frac{1}{10} \) = \[16\] | | = \( 0 \times \) |
| 5 x \( \frac{1}{10} \) = \[16\] | | = \( 0 \times \) |
| 6 x \( \frac{1}{10} \) = \[16\] | | = \( 2 \times \) |

| obv. ii | 30 x \( \frac{1}{10} \) = \[16\] | \( 5x \) | = \( 1 \times \) |
| 30 x \( \frac{1}{10} \) = \[16\] | | = \( 3 \times \) |

415 Beers qualified SEN were brewed with the addition of malt at the rate of 1:1 for both types GAUK and TUT. The beer qualified simply DUG, was supplemented with malt at the rate of 2:3.

440 Note the same check mark added to the sign GI at the bottom of the first column, and to GI in the fourth column 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 grains and malt.

442 Different amounts of unground barley were required in the production of the basic units. Saguwa (\( \frac{1}{10} \)) and DUGU, 60\((\text{gi})\), in the first case (obv. ii), 30 x and 30 y required the equivalent of 8N\( \frac{1}{2} \) grains, or an average \( \frac{1}{2} \) N\( \frac{1}{2} \) grains per unit; in the second (obv. iii, 1), 120 of the former and 60 of the latter products required the equivalent of 26N\( \frac{1}{2} \). Since the exchange of x and y with the faster \( \frac{1}{2} \) would in the second case result in \( 180 \times \frac{1}{10} \) to 24 instead of the recorded 26N\( \frac{1}{2} \), the solution which fits both equations \( 50x + 30 = 8\)N\( \frac{1}{2} \) and \( 120x = 60y = 26\)N\( \frac{1}{2} \) will require x = y. This solution, which also harmonizes with what we know from other containments of the products concerned, requires that x = \( \frac{1}{10} \) and y = \( \frac{1}{10} \) N\( \frac{1}{2} \) for \( 120x = 32\)N\( \frac{1}{2} \) - 120y and \( 120x = 26\)N\( \frac{1}{2} \) - 60y, or \( 60y = 6\)N\( \frac{1}{2} \), or y = \( \frac{1}{10} \) N\( \frac{1}{2} \) with, directly, x = \( \frac{1}{10} \) N\( \frac{1}{2} \).

51800 x \( \frac{1}{10} \) = \( 360x \) = \( 3x \) = 1x 0 2x 442

60 x \( \frac{1}{10} \) = \( 60x \) = 1x 0 444

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 Nasr 443 offered in figure 78 are good examples of this process. 446

442 Note the deviation from the norm of GAR = \( \frac{1}{12} \) N\( \frac{1}{12} \).

444 See above, n. 442.

445 Cereal grains found inside pots at Jemdet Nasr were discussed by H. Field, "Ancient Wheat and Barley from Khaf, Mesopotamia," American Anthropologist 34 (1932) 303-309.

Figures 76: MSVO 3, 11 and 6
The large account on page 104 represents the consolidation of at least two texts, one of which is depicted above (not particularly easy to decipher in the base of the sign GH). In the former text, missing in the latter, a personage indicated that the respective city had been cleansed for occasions. The counted measures of beer (eg., 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 tabulated and qualified with the execution of the grain product, barley grains, and malt required for their brewing. The entire account was signed by the responsible officer YEA SIM.
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 bissaragasmal system for dry grain products and the sasargamal for jars of beer, and the measures of grain needed are, as seen before, qualified with annotations from the below capacity designations designating grains and, in the case of beer, malt. A double dividing line below the last grain notation in obv. ii separates this section from a second section with entries recording non-cereal objects. These include animals and animal products (dried fish [SUNU], see above, section 6.3.1], sheep and goats [UUDU, see above, section 6.3.2], containers of animal fats, textile goods and dried fruits. With the exception of the still poorly understood notation N₃₈ from the derived bissaragasmal system, all notations derive from the sasargamal system. The final, iconographic section describes the function of the text. This notation seems to include a toponym N₃₈+RU (possibly the archaic designation of Jemdet Nasr), a time notation 2N₉₃, SU, GIBI and a qualification of all the recorded products, GI₃, which may be translated 'tations'.

447 The total of the amount of barley given in the bissaragasmal system in the reverse of the tablet, allows us to consider that the first of the two beer notations as 20 base jars [100 I.1.₉₁₄₁], requiring (2N₉₃, N₃₈, N₃₉, 3N₃₉, 2N₉₃, 3N₉₃, 2N₉₃), or 8 of the units N₃₈. This means that each jar of KAS requires 1/2 N₃₈, or perhaps just 1/3 of a jar of barley. The second beer is qualified with the sign combination 2N₃₉, 2N₃₉, requiring 1/3 N₃₉ of grain in each of 10 jars. The same 1/3 N₃₉ is also attested as the grain quantity necessary for the production of a jar of beer in the text MSVO 4, 65 (fig. 79), with obv. ii 2N₉₃, KAS, 3N₉₃, 2N₉₃, i.e., 300 + (3 x 6) - 5 = 100 x 3 p., per N₃₈. There seems to have been a rule concerning the inclusion of whole 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 kept in a large group of Jemdet Nasr tablets sealed with the so-called City Seal (RU). Mathews, MSVO 2, 34-36, and see above, fig. 87). Based primarily on typography and later on the signs MA together with length measurements (see above, e. 110), 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 UY 59 of 244 texts), 2) a characteristic entry sequence in the large city seal text group, PN / N₉₃ / RU / N₉₃, N₉₃, 2N₉₃, 2N₉₃, 3N₉₃, 3N₉₃, for the example, 3N₉₃ + U₉₁₄; 3N₉₃ + U₉₁₄, exhibits the pattern PN / GNI / GN₁ / GN₂ / GN₃, known from other texts, and 3) the combination N₉₃/1U is often attested with AB₂₂, which may be the 'strange building' of Jemdet Nasr (see above, section 2) as well as with SANGA₂₂, 'baker/keeper'. It cannot be excluded, however, that N₉₃/1U refers to SANGA₂₂, official of Jemdet Nasr.

451 In a position otherwise occupied by signs denoting years, N₉₃/1U, the double stroke 2N₉₃ 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 decipher the archaic administrative time notations for years, month and day (above, section 6.2). We have in this system the numerical notations 1N₉₃, 2N₉₃, 3N₉₃, 4N₉₃, in MSVO 1, 3K, 6D, and 1N₉₃, 2N₉₃, and in MSVO 1, 90, the complex notation 3N₉₃/1U, 3N₉₃/1U, 3N₉₃/1U, SANGA₂₂, SANGA₂₂, for example. R. Mayer and T. Devamare (eds.), Changing Views on Ancient Near Eastern Mathematics (Berlin, forthcoming).

452 See above, n. 380.
Figure 78: MSWO 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 narration of its entries. Only the entry rev. i 10 (N-2, 2N1, N2, NA) is not justified by parallel accounts.
Figure 79: Complex grain accounts from Jeredet Naga.
The two texts MSVO 1, 107 and 108, contain accounts from the same level of bookkeeping as MSVO 1, 93, discussed above. These accounts on page 201 represent a level of consolidation of such texts as MSVO 1, 93 and 107-108: each column of these 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:

<table>
<thead>
<tr>
<th>obs.</th>
<th>1</th>
<th>4</th>
<th>=</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>6</td>
<td>3</td>
<td>1/2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>1/2</td>
<td>1/2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>138</td>
<td>23</td>
<td>4 1/2</td>
<td>21/2</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>1/2</td>
<td>1/2</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>40</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

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 grains necessary for their production, followed by a second recording quantities of beer together with both measures of grains 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 subscripts.

The text MSVO 1, 107 (figure 79, page 200 bottom) represents a shortened form of the two accounts MSVO 1, 93 and 108, merely transcribing the totals of a separate ledger. The text includes all the elements of full accounts, i.e., notations representing barley grains (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 (GR) and of jars of beer together with their respective grain (and malt) equivalents (second column) and notations representing non-grain products, including both small coffee 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, clearest of all details. The first entries in each account represent relatively large measures of milled grain (and malt) used in the production of dry grain products and beer444, 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? 445] and with products from the textile manufactories. The apparent delivering agents [9] of the goods listed are high officials of the central administration of Jemdet Nasr.446

These accounts offer a wealth of information concerning the processing of grain and the constitution of beer, bread and other cereal products – as it is obvious from a perusal of

439 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.

444 We can assume that only those columns which include a notation representing a measure of malt (in MSVO 1, 95, only i and iv) in 90, 98, i and iv derived from accounts including beer processing.

445 including, however, a number of undeciphered ideograms, among them in MSVO 1, 96 obs. i 41: MAR, i 5: KUDU, 1 6: IV and ii 9: KU-gumī.

446 See below, with figs. 83 and 87.
figure 80 – Which fed the archaic communities of Mesopotamia. More importantly, the accounts formed part of a complex system of vowing that both the high, and of course the lower, level of organization. Some, as J. Frischer has suggested, might also reflect a specific aspect of the temple household organization known from the later third millennium, in which provisions, known as sâ-sâli, rations, for deities or revered sites were reserved. These included, in a striking parallel, bread and beer, sheep, fish, dairy products and fruits, often in this order.

6.3.3. 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, III. 49) surrounding documented settlements. Few texts combine notations both from the grain capacity and from the area measures systems, but 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 Ur III period account W 19726, a in figure 81. The ‘obverse’ face of this tablet preserves one numerical notation representing, in later Sumerian tradition, 40 bar, or about 640 acres.491 To the left of this notation are two divided signs, one of which is certainly the pictogram GAN. The ‘reverse’ contains a grain notation, indeed one which represents for and away the largest capacity measure in the archaic text corpus, corresponding to ca. 350 tons of emmer.492

491 The sign presumably represents irrigated fields defined on a long axis by two parallel canals, with leader cones running between them; compare the hypothetical plate calculated in the text M 72, 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 ilu, represented in archaic texts with the sign N. However, the only likely candidate for such a division is the sign N, found in several texts from Jemdet Nasr and probably representing 1/15 ilu (see here fig. 83 and my remarks in N.A.S.U. 1995, 38); these all refer to divisions of a field. The ideogram SAB, as precursor of the later šar, representing one 1/15th or 1/15th ilu, seems in all notations of surface measures to qualify, if anything, the type of productive area or field concerned, and in no case can we discernily count SAB, as confidently interpreted to represent surface measures and thus measures of gardens or vacant or developed lots, as was the case in later periods.

492 See above, fig. 41, for further diagrams representing these systems.

493 As is the case with many such text fragments, it is difficult to recognize a difference between obverse and reverse. Assuming that W 19726, b represents a harvest account, let us account the recording first of field measures and including on the reverse the grain measures representing the harvest.

494 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 ‘insa’), and the surface measure ‘garden’ (pl. Sumerian ‘sarr’), 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 measuring and harvest.

495 The notation in fact represents the amount five times as large as the next largest measure, that recorded in WV 17729, a (unpubl.). Note that assuming our interpretation of this text is correct (see ATU 2, 140), the

Figure 81: WV 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 (40 bar, 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 350 tons of emmer.

Based on the Ur III named yield of 30 gur (9000 liters) per bar, 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 Ur.

496 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 relation to an area measure on its reverse face of 15N, grain per 1/15N (bar). 497 Using our hypothetical absolute values of GAR = Ngur × 1/15 liter, sign NGur would have been in the derived capacity system S' to represent both a measure 10 as large as that represented by NGur and a measure 18000 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 NGur to represent a multiple of 10Nur would find a good analogy in the use of NGur to represent a multiple of 10Nur in the basic grain system, both based on the sequence N = Ngur > N15Nur = N60Nur in the sexagesimal system. This connection with the larger grain measures in later grain capacity systems as well. It may be noted that this large measure of emmer wheat would provide only an average of 25 tons of grain on the obverse. Relative to the area, this would equal 25 quintals per bar.
Figure 83. MSWO 1, 2 (reconstructed). This account is of a group of fields recording the division of land among high officials in period II. The wide differences in size and location of the fields are recorded together with the calculations of surface area for the balance. The hypothetical plans depicted on page 207 are an attempt to understand how the calculated fields might have been situated along a roadway. Note that the removal of agricultural land held by the ruling EN and his retainers with 34.1% of all the fields reported in these documents.

Length measures:
- 1 kenti (ca. 6 m) = 60 kenti

Surface measures:
- 1/9 du (90) = ca. 0.9 acre
- 1 bēn = 6 du = ca. 5.2 acres
- 1 bi = 3 ē = ca. 1.5 acres
- 1 bi = 10 ē = ca. 15.0 acres
- 1 ē = ca. 93.6 acres

Calculation of the first field:
- Length: 290 kenti (ca. 1740 m)
- Width: 100 kenti (ca. 600 m)
- Field area: 16 bu = 2 bu + 2 ē + 2 ē + 2 ē = ca. 300
  instead of 200: calculation error?
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 GAN, EN=, '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 (fig. 84) and by the sign AB, indeed, the sign combination AB, EN=, BU which qualifies the grand total of land divided among the EN and his high officials — apparently including his own wife (EN, SA), who was assigned the largest plot of those recorded on the account's obverse — can be reasonably interpreted to mean 'household of NIRU', whereby NIRU might represent Jemdet Nasr itself. Based on the hypothetical yield of 30:1 and a seeding rate of 15N, per buṣu (see above, fig. 82), the parcels of the high officials registered in this account would, on average, support a working household of ca. 500-700 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 Urk offers evidence of the same type of field accounts in the much larger urban center of the Late Urk period (fig. 84). Nonetheless, other texts prove the existence of comparably large agricultural populations, and the greater antiquity of field surveying there. The oldest evidence known of the field calculation of areas is found in a group of texts from the Urk IV period, of which WV 1967.27 (fig. 85), unearthed by P. Damrower in the Urk collection of the German Archaeological Institute in Heidelberg, is certainly the most important. The fragmented Urk 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 notes 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 unilaterally large field of 105000, or 600 buṣu (the largest otherwise attested field notation is of a little more than 324 buṣu; see below, fig. 87). Since, moreover, no further ideograms qualify the purpose of this account, it is certain that the text represents another school exercise, the oldest accounting exercise known to us, containing 'difficult' exercises on surface calculation.

Another field account from Urk (fig. 86) bears some resemblance to the texts MSVO 1, 2-6 discussed above. Parcels ranging from 45 down to just 6 buṣu 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 buṣu, 141 are at least partially
preserved in the individually registered parcels — and qualified in two following cases with ideographic notations. The sign combination SILA₅ + DUG₂ 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.

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 br of land qualified as LAGAB, GAN, RI, KI, NI, KU, AB, APIN, total of measured arable land, (from) the plowing office of the household of NITU. This land is comprised of three types of parcels: those qualified as SE₃ + SE₅ BA, or GURUS, SAL, and as GAN, KI, A, and in each of the first five cases of the reverse face the parcels so qualified are assigned to the same five officials, including the wife of the EN, or 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) br per official. This would accord rather well with the average of ca. 22 br per official of SE₃ + SE₅ fields in MSVO 1, 1, and suggest that these parcels were really distributed as grain-growing plots (SE₃ + SE₅ BA). We might further imagine that groups of workmen were assigned to each plot and at the same time themselves, given subsistence

Conclusions

fields, ranging from 2 bus (abv. I I-2, ii 2) to 4 (abv. 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 (GURUS, SAI), 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 GAN.A.l, which literally translated according to later sign meanings would result in 'arable land, wetland'.

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 postulated 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 if 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 Ur during the period Ur IV-Va was intensive, monumental building apparently came to an abrupt halt in the succeeding Ur IVb–Jemdet Nasr period, precisely when administrative documentation became most intensive, both in numbers of documents and in the quantities of goods and services recorded in the accounts. Assuming that we do not have a roughly representative group of accounts from both periods, the size of economic activity reflected in Ur IVb 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 commonality and breadth of lexical compendia, to methods of timekeeping and complexity and fields of application of numerical sign systems, derives ultimately from the Ur IV period; whether these elements of writing were also in use during the Ur 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 desired 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 on 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 stylus 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 stylus 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 stylus 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-ideographic 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 concomitant development of lexical lists, of which only the professions list was canonized. Multivocality 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 time-keeping 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. Multivocality 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 concomitant with a native system of writing in Persia called proto-Elamite.

8. Period of late proto-cuneiform
   Ca. 2600-2700 B.C. (Early Dynastic I), this period is characterized by the earliest apparently multivocant 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.
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