

35. Pierre Amiet (1972), Vol. 2, p. 64.
36. Envelope on exhibition at the Oriental Institute, The University of Chicago.
37. Unpublished.
38. Alain Le Brun and François Vallat (1978) 32.
39. Pierre Amiet (1972), Vol. 2, p. 68: 539.
40. *Ibid.*, Vol. 1, p. 92: 555.
41. Susa: Sb. 1938; Sb. 1846; ACR 2130.4.
42. Chogha Mish, envelope on exhibit at the Oriental Institute, The University of Chicago.
43. Julius Jordan (1932) 29.
44. Vincent Scheil (1923) 4:20.
45. A. A. Vaiman (1974) 17.
46. Jöran Friberg (1978) 10, 20.
47. Denise Schmandt-Besserat (1980) 371.
48. Susa: Vincent Scheil (1923), p. II: 11; Pl. IX: 58, 70; François Vallat (1971) fig. 43: 9. Sialk: Roman Ghirshman, (1938) Pl. XCII: S 1621; Pl. XCIII: S 1632. Godin Tepe: 73-318.
49. A. A. Vaiman (1974) 21.
50. *Ibid.*, 20, fig. 3.
51. Jöran Friberg (1978) 10, 20.
52. A. A. Vaiman (1974) 19, fig. 2.
53. Jöran Friberg (1978-79) 46.
54. Alain Le Brun and François Vallat (1978) 32.
55. Pierre Amiet (1972) Vol. I, 92: 555.
56. Vaiman, A. A., "O svyazi protoelamskoj pis'mennosti s protošumerskoj," *Vestnik Drevnej Istorii* (1972/III) 124-133; Jöran Friberg (1978), 21.
57. Pierre Amiet (1972) Vol. 1, 91:539.
58. *Ibid.*, 92: 555.
59. Denise Schmandt-Besserat (1980) 374, fig. 11.
60. A. A. Vaiman (1972) 124-133.
61. Susa: SB 1940, Sb 6350, ACR 1999.1. In Sb 1927 and ACR 2067.2 the disks were associated with cones.
62. Alain Le Brun and François Vallat (1978) fig. 4: 2, 4.
63. Pierre Amiet Vol. II (1972) Pl. 79: 642.
64. Harvey Weiss and T. Cuyler Young, Jr. (1974) fig. 4: 6.
65. GD 73-61, unpublished.
66. Helene Kantor (1974-75) Pl. 17: 7.
67. S. E. van der Leeuw (1974) 82.
68. Eva Strommenger, "Ausgrabungen in Habuba Kabira und Mambagat," *Archiv für Orientforschung* 24 (1973) 171, fig. 17.

M. W. Green

## The Construction and Implementation of the Cuneiform Writing System

*Cuneiform was, from its inception, not merely a collection of individual symbols, but a coherent system of information manipulation for which written characters were the main, but not the only, component. This system did not evolve by itself, but was manufactured, developed, and implemented within the framework of a bureaucratic organization which controlled the distribution not only of goods and services but also of status and information. That institution produced the demand for a control technology for which the cuneiform writing system was the eventual realization. While the user institution imposed specific, characteristic constraints and demands, it also adjusted its own needs and goals to adapt to restrictions and functions of the technology itself. We look at the early development of the cuneiform writing system with special attention to the less well recognized peripheral components and to interactions between the technology and its user.*

### I Introduction

#### 1 The Archaic Cuneiform Script

This article focuses on the early "archaic" stages of the cuneiform writing system. According to the archaeologically-based chronology of Mesopotamia, this refers to the Late Uruk and Jemdet Nasr periods (ca. 3300-2900 BC) and corresponds to archaeological levels IV (Late Uruk) and III (Jemdet Nasr) at the site Uruk and to the single-period type-site Jemdet Nasr. The archaic tablets discovered at these two sites form the basis for our discussion—especially the Uruk tablets which we have been studying intensively for the past several years.<sup>1</sup>

The dating of the archaic cuneiform script has never been rigorously based on archaeological level because most of the tablets from Uruk were found in fill areas, rubble, and pits, not *in situ* in good archaeological context. Adam Falkenstein, who was epigrapher for the first Uruk seasons when archaic tablets were uncovered (1928-31), established a writing-stage terminology "Uruk IV" and "Uruk III" corresponding to archaeological level. But thereafter he assigned the tablets to one or another writing stage according to similarity of signform. We have followed this latter practice in determining writing stages for tablets found in subsequent excavations. The Jemdet Nasr tablets closely resemble the Uruk III tablets and are considered contemporary with them. The later "archaic" stages represented at Ur (Early Dynastic I period, ca. 2900 BC) and at Fara, Abu Salabikh, and elsewhere

("Fara" period = Early Dynastic II-III, ca. 2600 BC) will be mentioned here only in light of long-term trends and later evolution of the script system.

The Uruk and Jemdet Nasr tablets represent the earliest preserved stages of a well-developed, stable writing system. Although we can posit an earlier, formative stage of incomplete and inconsistent sign repertoires and writing standards, its traces have not yet been discovered. At this stage the writing system contained an extensive character set of approximately 1200 signs, as well as a coherent set of rules for writing texts. Later the character set was gradually reduced by various economizing principles, the pictorial content was gradually removed by various techniques of stylization, and the morphophonemic basis of the writing system was gradually transformed from chiefly logographic to chiefly syllabic.

The language(s) of the archaic period script have not yet been determined. Within the Uruk III lexical corpus, textual variants reveal the phonetic value of a few signs. While these do correspond to later known Sumerian sign values,<sup>2</sup> other languages which we cannot yet recognize might also be represented. No similar phonetic clues appear in the non-lexical corpus or in texts of the Uruk IV stage.

Many summaries are available of the development of cuneiform and other scripts from "realistic" pictographs to "abstract" linear characters.<sup>3</sup> In this article we view the script as a non-independent component of the cuneiform writing system and trace some parallel developments of script and meta-script components. Especially, we direct our attention to 1) the overall visual information system, and 2) the bureaucratic/clerical organization for which the visual system served as a tool.

## 2 Symbolic and Informational Aspects of Writing

There are many fruitful approaches to understanding the purpose and significance of writing, none of which should be exclusively taken as correct or definitive. Writing might be interpreted as 1) a symbol system, 2) a vehicle of communication, or 3) an information storage and retrieval system. We will utilize each of these interpretations in our discussion of the archaic cuneiform system. Important to us is their shared appreciation for the instrumental nature of writing, the conventional character of the encoded information, and the indispensability of transmitter and receiver.

Writing provides a set of visual images to represent language items. Depending on the complexity of the system, many linguistic levels can be simultaneously represented and many visual patterning techniques exploited. The early stages of most writing systems show only a loose correspondance between the spoken and written forms of the language. With recognition and application of linguistic principles—that is, with deliberate, analytic modification of the system—the correspondance between speech and writing increases. The phonetic principle is vital to this development, but not exclusively so.<sup>4</sup> The cuneiform writing system always remained a mixed system including elements representing phonetic, semantic, etymological, and elocutionary levels of various languages.

Any system of visual patterning can be chosen, however arbitrary. Pictorial correspondance between sign form and meaning ("pictographs") might assist the novice, but the fluent reader relies more on mentally-organized information patterns which he has constructed from his experience with the language, the writing system, and the textual context.

For the reader, processing the visual information is a task involving symbolic thinking, pattern recognition, and memory organization. Symbolic learning proceeds by mentally organizing separate information units into increasingly large and complex patterns. Eventually a complex array of information is translated into a more easily apprehensible system of a few patterns and symbols.<sup>5</sup> The process of learning to read involves both the assimilation of visual patterns and their integration with other, above all linguistic, knowledge. As with any perception, in understanding a written text the amount of visual information required depends on 1) the amount of information otherwise accessible, from memory or elsewhere, and 2) the information-processing capacities of the reader. With experience, the size, complexity, and speed of pattern recognition increases. Whereas the beginning reader struggles with each character, the experienced reader can comprehend entire sentences at a glance. Yet he, too, will stumble over a text in an unfamiliar handwriting or language.<sup>6</sup>

The written text itself contains visual images composed in such a way that a unit of information (a "record" or "message") is stored on the writing medium. The medium and symbol set are neutral instruments in this information system. Coding and decoding, storage and retrieval, are technological processes defined by the construction of the system. Message transmission, however, involves processes of analysis and interpretation by both transmitter and receiver—processes which are not inherent in the technology but are nevertheless intrinsic to the functioning of the system. We would stress that, besides the script itself, there are many components and many levels to a writing system, and that they function together simultaneously and interactively.

## 3 The Tool's User: Clerk and Bureaucrat

Writing was a powerful tool. Like any tool, its creation undoubtedly arose in response to the needs of its potential user, and its application was defined by user demands and directed toward user-defined goals. We therefore want to examine the nature of that user, its demands and goals, and its role in the invention and development of that tool, writing.

The cuneiform writing system functioned as a device to record transactions of the Sumerian administrative bureaucracy. It enabled that bureaucracy to expand vastly its basic resources and production processes—the control and distribution of information, labor, goods, and services.

Bureaucratic structures and their internal management vary. Accordingly, responses to technological innovation and utilizations of technology also vary. We might conjecture, based on studies of modern organizational structure, that the Sumerian administration had an "organic" style of management, with a diffuse allocation of responsibility, informal supervision, and a fair degree of local autonomy. This has been found to be a more successful management system for a highly professionalized organization using sophisticated, non-mechanized technology in its basic production process.<sup>7</sup> Nevertheless, that the historical development of the Mesopotamian public bureaucracy was toward ever-increasing centralization and formalization of controls has been amply demonstrated.<sup>8</sup>

We know little about the hierarchical structure of the organization which employed the scribe. We can probably assume that he himself was a low-to-

intermediate-level staff member, an accountant or clerk who performed procedural tasks but did not much participate in policy-making. The prominence of bookkeeping among the scribe's assignments is demonstrated by the extensive training in various forms of accounting, mathematics, surveying, etc., given by the scribal school.<sup>9</sup> Lacking, as yet, any trace of written creative literature from the early archaic periods, we must view the scribe of those times as neither scholar nor poet, but as, above all, a clerk. Nevertheless, in contact with the public he was probably highly regarded as an official, a "white-collar" worker, and a "professional." His familiarity with a sophisticated technology would alone have been a warranty of high status.<sup>10</sup>

In our investigation of the dynamic relationship between writing technology and the bureaucratic system within which it functioned, we assume that the Sumerian bureaucracy of the early archaic period already had a departmentalized, hierarchical structure. This seems likely from the large number and variety of official titles which occur in the archaic administrative texts and which, by Uruk IV, were already collected in lexical lists. Furthermore, we expect the operation of the usual internal bureaucratic constraints. These would include demands for documentation, specification, quantification, routinization, standardization, efficiency, and accountability, as well as a drive to maintain or tighten control of authority. It is important to remember that cuneiform writing is not an artistic style which might have had a "natural" evolution strongly affected by popular fancy and showing erratic variations or stages of "degeneracy" or "renaissance." Rather, it is a technology, designed and manipulated according to specific user needs. Therefore, as we trace its evolution within the bureaucratic framework, we will look for evidence of deliberate, systematic, and bureaucratic developments.<sup>11</sup>

Technology, in its turn, also has an impact upon the worker, the work process, and the organizational structure. Tools can have subtle, retroflexive effects upon their makers and users. Especially, they tend to restrict the user's outlook to the narrow avenue of approach provided by their specialized solution to a problem. Writing itself can affect the spoken language, as with the historical shift in English from inflection to word order as the main principle for representing grammatical syntax.<sup>12</sup> Printing technology has even been credited with the revolutionization of modern thought processes.<sup>13</sup> Keeping these notions in mind, we will also watch for evidence of such subversive reciprocal influences in the earliest evolution of writing technology.

## II Meta-Script Information Inherent in a Written Text

We have already mentioned, with respect to pattern recognition in general, the importance of the accessory information used in conjunction with the featural information present in the pattern. This is the background knowledge which the reader brings to the task of reading—above all, his linguistic and lexical proficiency, but also familiarity with the visual configurations of a written text.

Besides the graphic shape of individual characters, visual information is provided by the arrangement of signs into larger units, the patterning of units on the writing material, individual handwritings or embellishments, etc. Although they vary with time, place, and script form, some such categories of information are

always incorporated into a writing system as writing conventions. They may be deliberately designed as features of the writing system or they may arise incidentally. An important supplementary information source for the reader, they are essential to the writing system, although peripheral to its main visual component the grapheme.

Examples of common writing conventions in modern script systems are: consistent linear direction of script, word-separation, punctuation, capitalization, and paragraphing. These provide higher-level information concerning the language and the written text, and thereby facilitate the close reading of individual words and characters. Other conventions are specific to text genres and serve to differentiate one genre or text subunit from another. For example: left-margin justification in poetry, column-justification in accountancy records, speaker-designation in play or movie scenarios, heading and signature formats in letters.

Analogous writing conventions were also incorporated into the cuneiform writing system. Eventually the direction of script became firmly established left-to-right; columns were customarily read left-to-right on the obverse of a tablet but right-to-left on the reverse; the tablet was rotated from obverse to reverse around a horizontal axis (as for a modern steno notebook, in contrast with the vertical axis for turning pages in a modern book). Even word-separation was frequently practiced in literary texts; mathematical and lexical texts were ruled into appropriately-spaced columns for various types of entries; interlinear bilingual translations were left-justified to indented margins. For a proficient reader of cuneiform, either ancient scribe or modern scholar, different text genres such as omens, rituals, lexical lists, mathematical tables, ration lists, etc., often could be distinguished at a glance.

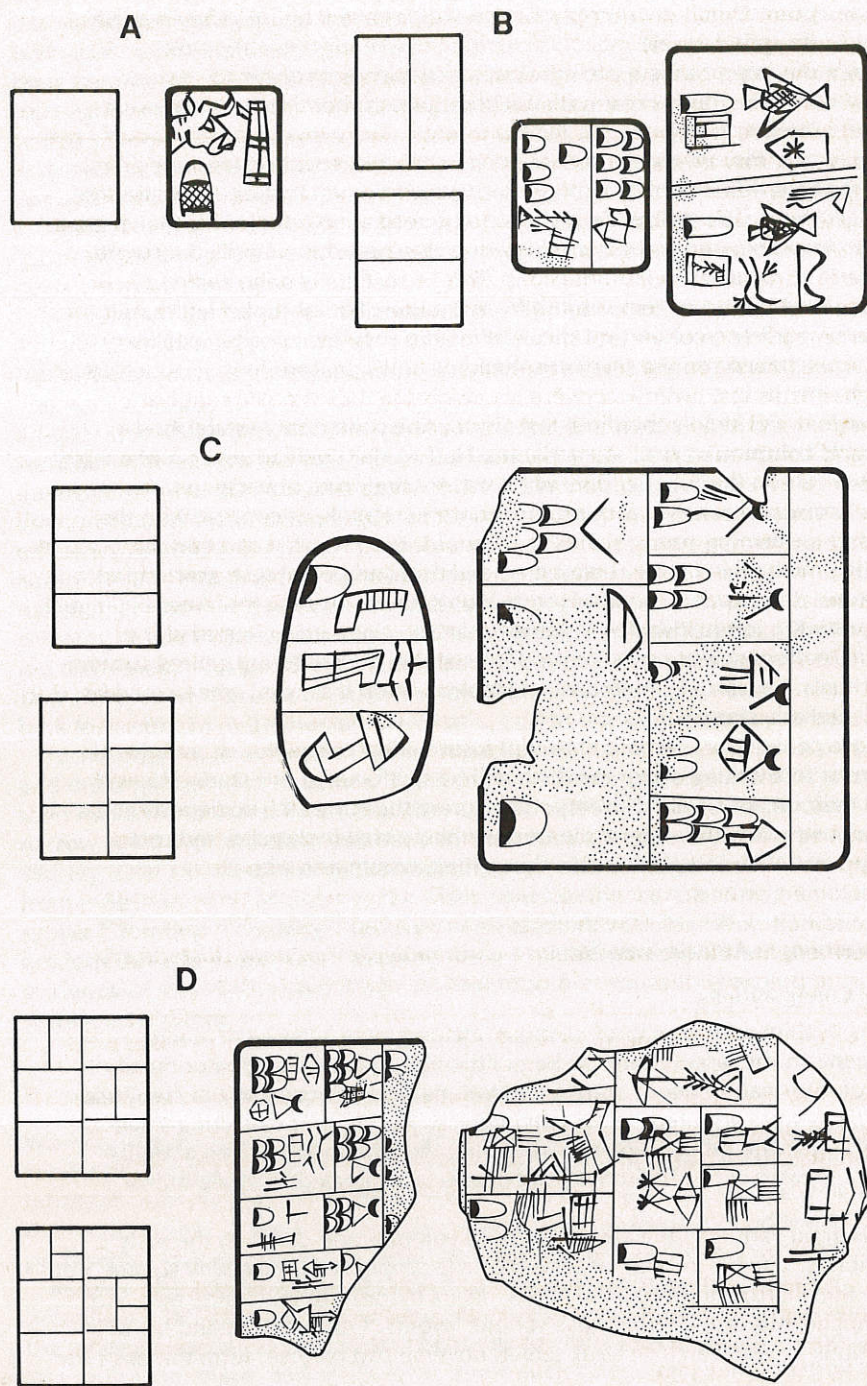
It is these conventions—the meta-script information components, peripheral but essential to a writing system—which will be the focus of our study. We will describe their inception and development during the early archaic periods and thereafter, with particular interest in trends, their possible direct or indirect influences, and their integration into the writing system as a whole.

## III Conventions in Archaic Cuneiform

### 1 Visual Configurations

As long as a tablet records a brief memo containing only a few signs, their arrangement on the tablet seems to be of little importance. But greater detail or quantity of information needs some coherent method of organization. Two practical solutions were adopted by the Sumerians. One involved clustering small groups of signs; the other involved structuring the tablet surface into a regular series of compartments—"columns" and "cases"—separated by straight dividing lines.

There is great variety in the arrangement of columns and cases on the early archaic tablets. Usually in Uruk IV texts the case proportions are nearly square, but gradually they narrow to horizontal "lines" like a modern ruled writing pad. We have compiled and categorized these various layouts. Our typology and list of classifications for each archaic Uruk tablet, obverse and reverse, form the basis for



this presentation. Detailed descriptions and diagrams will be included in the first volume of text publications.

Although the exact column and case pattern depends on the data of the individual text, consistent organizational principles can be deduced. These are illustrated in Figure 1. At one extreme is the single-entry text with no dividing lines. A two-entry text may be divided either horizontally or vertically; multiple entries are arranged top-to-bottom in a column. A text with many entries would require several columns, each divided into cases, to be read sequentially like the columns in a modern newspaper. Individual cases may also be subdivided by a secondary sequence of vertical and horizontal lines. This procedure is described in detail below. The tablet reverse seems to follow the same general organization, but the direction of reading columns and the relationship between obverse and reverse depend more heavily on the text's content.

The other organizational principle, sign clustering, has the same goal of separating integral segments of the text from one another for more efficient reading and comprehension. But it is more likely to be misread and is limited by space restrictions. It is most commonly used in large cases or wide columns without subdivisions, and rarely with more than three sign clusters per surface unit.

Chronologically, clustering seems to have preceded column and case division, or cluster patterns tended to be replaced by dividing-line patterns. A gradual replacement process may be observed in the comparison of three layouts illustrated in Figure 2. Example (A) shows clustering of signs arranged at the top-left, bottom-left, and center-right of the tablet; (B) has an equivalent column and case arrangement with one wide column on the left divided into cases and one narrow, undivided column on the right; (C) has a combination pattern with only a horizontally-ruled case dividing line on the left side of the tablet, no column dividing line, and a single sign group centered on the right. These three layouts are common among the Uruk IV tablets and we may guess that the combination type is transitional between the other two. Of these three types, only the two-column layout appears in Uruk III texts, although other layouts with sign clusters or partially divided cases do occur (e.g., Figure 4 D, column i, first case). There are also a few Uruk IV tablets with irregular and jagged dividing lines, as if drawn as an afterthought. If there was indeed a chronological shift from clustering to case-division practices, these would represent an intermediate stage.

We would interpret the invention of columns and cases as an attempt to devise a system of text organization which could encompass more, detailed information within a single tablet record. Mere spatial separation was found to be insufficient, but the addition of linear separators became a satisfactory solution. Still, the clustering technique was never entirely abandoned. It underlies word-separation, for example, which may often be seen in cuneiform literary texts,

Figure 1. Diagrams and examples of tablet layouts. A: Single-entry tablet (W. 15658) B: Two-entry tablet with horizontal or vertical case-divider (W. 19592E, W. 10632). C: Columnar arrangement of cases (W. 19948.1, W. 21418.2). D: Case subdivision (W. 22100.3 obv., W. 20274.125).

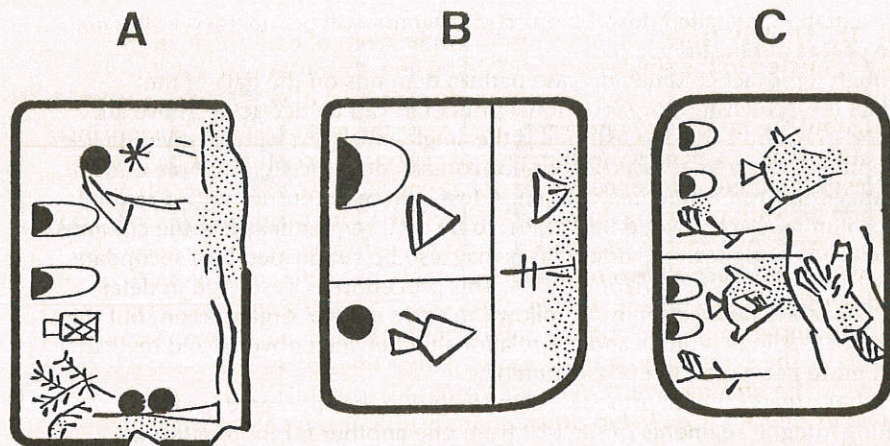


Figure 2. Alternative arrangements of three entries. A: Sign clusters (A. Falkenstein, *ATU* [1936] no. 65). B: Columns and cases (W. 20044.8). C: Combined pattern (*ATU* no. 63).

and columnar spacing (without column dividers) used in various administrative and numerical lists.

Column and case patterns show a chronological increase in complexity associated with an increase in the total number of entries. Most Uruk IV tablets are written on only one side (75%)<sup>14</sup> and 40% of those are single-transaction records with no compartmentalization of the tablet surface. Half the Uruk III or Jemdet Nasr tablets are written on both sides and fewer than 5% are single-entry texts. By the time of the archaic Ur tablets, single-entry texts are extremely rare.

Multiple-column texts are common throughout the Uruk corpus; use of that format seems to depend mainly on the quantity of data to be recorded. As the average total number of entries increases, there is also, not surprisingly, a noticeable increase in the number of columns required to contain the data. Twenty percent of the multiple-entry Uruk IV texts use only one column (data given only for obverse); 30% need three or more columns. In Uruk III one column is sufficient for fewer than 10% of the texts, and 60% need three or more columns. Among the Jemdet Nasr tablets, 12% use one column but only 30% use three or more.

Moreover, the Uruk III scribes were able to pack far more into a column than the Uruk IV scribes. This they accomplished by the principle of case subdivision which, although occasionally used in Uruk IV, became prevalent and was elaborated in Uruk III (see Figure 1 D). The first subdivision is made by drawing a vertical line, usually somewhat off-center, through a case to divide it into a pair of adjacent subcases. Such subcases appear only rarely among the Uruk IV tablets (7% of the multi-entry texts) but more frequently in Uruk III (20%) and at Jemdet Nasr (23%). The Uruk III and Jemdet Nasr texts carry the subdivision procedure a step further by drawing horizontal dividing line(s) through the right-hand subcase (15% of multi-entry Uruk III texts, 9% at Jemdet Nasr). The procedure can continue algorithmically.

The Uruk IV tablets do not show multiple levels of case subdivision; they are restricted to the single vertical dividing line. Complex case subdivision patterns can therefore serve as a diagnostic identification of writing stage III.

Throughout the history of cuneiform, even from the earliest stages, underlying all text-organization schemes was the principle of one conceptual unit per spatial unit. Obviously, there can be many interpretations of the size and content of a "unit," and the various archaic formats do allow for a variety of possible units and subunits. Case subdivision is one data-organizing technique which functions to confine within one case all the information considered pertinent to a single record. In an administrative document, a single entry concerning distribution of beer rations, for example, might include the number of jugs, the type of beer, the name and/or title of the supervisor, and the names and/or titles of the lower-level individuals who are the final recipients. A typical Uruk III layout of such a record is illustrated in Figure 3. General information (total quantity, type of goods, supervisor) is given in the left subcase and specific information (individual names and disbursements) in a miniature column of subcases on the right. Uruk III "ration lists"<sup>15</sup> contain lengthy series of such entries arranged in separate cases. The visual pattern permits immediate recognition as a ration list and localization of the individual units. In later periods the same data categories are organized in a simple, linear sequence of cases. Ration lists have not yet been recognized among the Uruk IV texts. Very likely composite lists were not written then, but rather individual distributions were recorded on separate tablets.

According to another basic format convention, information pertaining to the entire tablet as one unit is spatially segregated in a "subscript." Such information might include a total, transaction classification (e.g., payment, income, votive gift, worker assignment), supervisor, city or state involved, etc. Often this subscript is written in a single, undivided column placed at the far left or right side of the tablet surface (Figure 4 A, B); or sometimes the whole reverse is used for the subscript. A predecessor to this text layout is the sign cluster set apart at center-right (Figure 2 A, described above), which occurs in Uruk IV tablets; an extension of it is the "intercolumnar," narrow, undivided band inserted between other normal columns (Figure 4 D), which is an innovation of the Uruk III writing stage. In a subdivided case with many specific items or names recorded on the right side (Figure 3 col. iii bottom), the left subcase takes on the appearance of such a subscript column, as, indeed, it contains an analogous data set. The visual effect of these patterns is to stretch the unifying subscript across a surface parallel to the area encompassed by the individual entries. The Uruk IV cluster pattern often actually rotates the sign (group) on the right 90° and draws it larger.

Spatial separation of different text sections can also employ a double dividing line or a fancily ornamented one (Figure 4 B, G); this technique is more typical of Uruk IV texts. Case proportions can be given special significance. For example, a subscript can be isolated at the bottom of an exceptionally tall final case in a column. Sometimes several adjacent columns bear such individual subscripts (Figure 4 C).

Certain tablet layouts are specific for particular text genres. Lexical lists are an outstanding example. Beginning with writing stage Uruk III, their standard format of regular, narrow cases with a single wedge or numeral "1" at the left edge of each

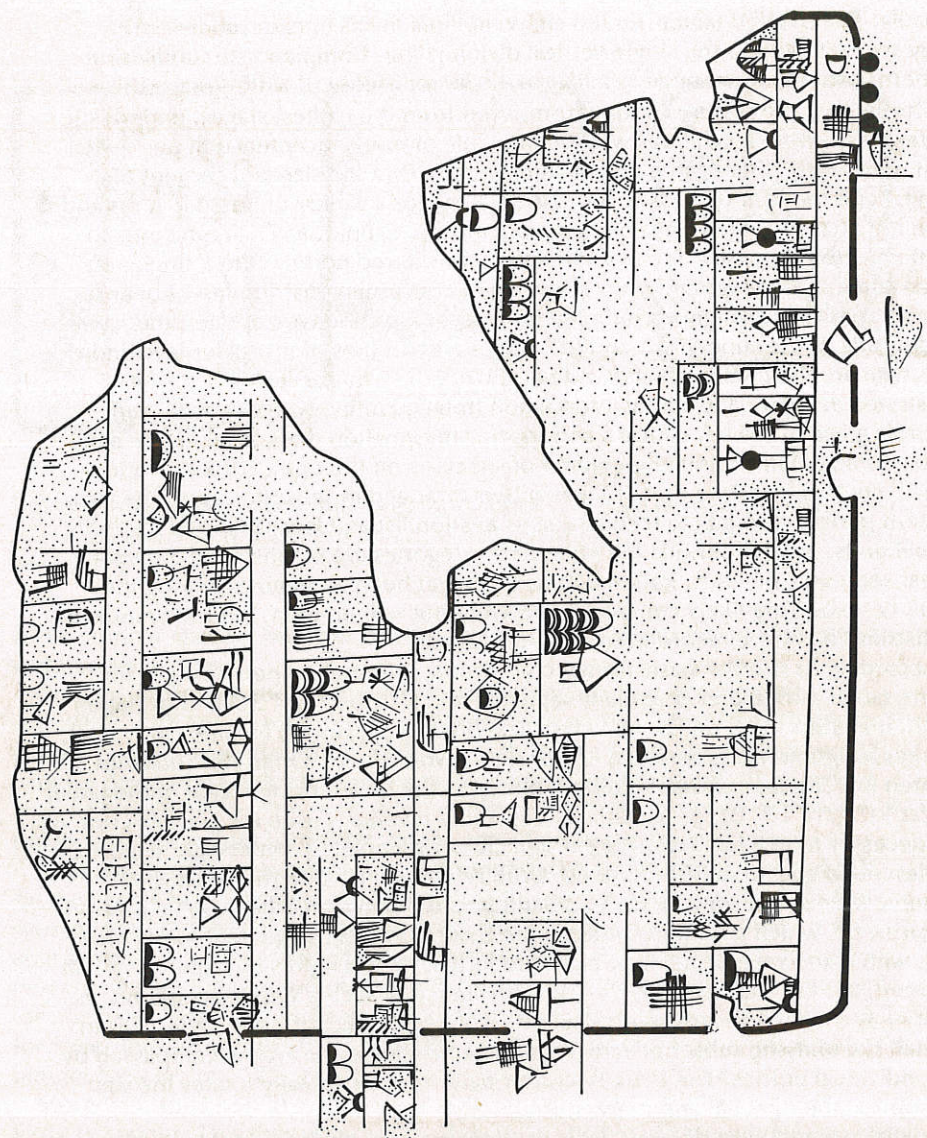
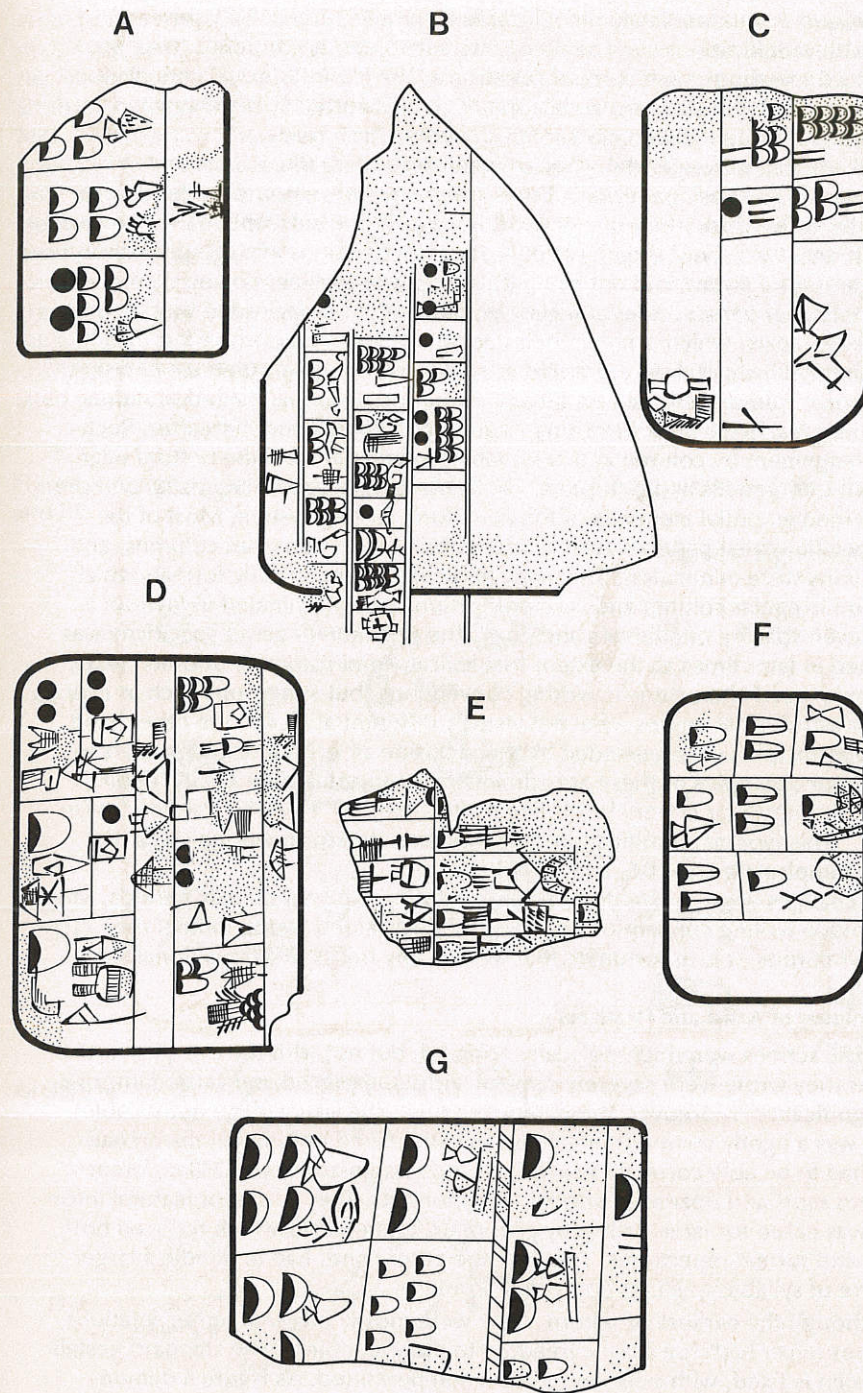


Figure 3. Uruk III "ration list" (W. 20327.3 obv.).

Figure 4. Special formats and format elements. A: Subscript column at right (W. 21049). B: Subscript at left; double dividing line (W. 22102.0). C: Multiple subscripts in elongated cases (W. 21195.1 obv.). D: Intercolumnars; partially subdivided case (W. 20274.5 obv.). E: Lexical text (W. 15958B+D, Lu-List). F: Vertical "columns" (W. 21300.6). G: Ornamental dividing line (W. 21403).



case is unique and immediately recognizable (Figure 4 E). Essentially the same format, with modifications such as ruling into subcolumns, continues to earmark lexical lists throughout the history of cuneiform. The Uruk IV lexical compilations are not organized into standardized lists and are not written in any characteristic case pattern, although most have a "1" at the left of each case.

Several administrative genres are also signaled among the archaic texts by unique column and case patterns.<sup>16</sup> These genre-specific patterns are found predominantly in the Uruk III corpus. In writing stage IV the correspondance between layout and text type is not directly one-to-one, as it becomes in stage III. Rather, certain genres are always laid out in a particular pattern which, however, may also be used for other genres. A Jemdet Nasr example might be provided by certain "field survey" texts, which arrange their data in rows instead of columns.<sup>17</sup>

In tracing the historical development of spatial tablet organization we find that the basic principles established in the archaic period were maintained, but their multiformity reached a peak in writing stage III and diminished thereafter. Rectilinear arrangement by column and case, tablet rotation around the bottom edge,<sup>18</sup> placement of numerals at the (top)-left, and one conceptual (or linguistic) unit per line remained essential elements of the cuneiform writing system. Most of the highly specific spatial patterns such as case subdivisions, subscript columns, and intercolumns were eliminated. The many particular genre-specific formats which depend on irregular column and case proportions were eliminated in favor of a regular, even spacing of columns and lines. The principle of genre specificity was maintained in later times to the extent that lexical, administrative, or omen texts, for example, used characteristic writing conventions, but subgroups such as liver omens or astrological omens were not visually differentiated. On the other hand, the visual principle was superseded by the inclusion of written text identifiers in the subscript. Examples of these are administrative formulas like ZI-GA "debit," MU-IR<sub>10</sub> "delivery"; or literary labels like *nishu* "extract," EŠ<sub>2</sub>-GAR<sub>3</sub> "series," *pirsu* "section." This type of identification came into use already in writing stage III; archaic examples are GU<sub>7</sub>, BA, and GI-(GI).

These changes were substantially achieved during the later archaic periods. Most of the unique writing conventions of Uruk III disappeared by the time of the archaic Ur corpus. It is unfortunate that we lack any traces of a transitional stage.

## 2 Techniques of Artist and Draftsman

The archaic scribes were highly visually oriented, but not with the eye of an artist. The signs they wrote were severely stylized and standardized and carried informational significance. Moreover, the writing medium, the visual plane of the tablet surface, was a tightly compartmentalized and structured unit. In all, the archaic scribes had to be able correctly to produce and recognize nearly 1200 different cuneiform signs and dozens of special tablet formats. The burden of featural information was eased for later scribes by economizing measures which reduced both the sign and format repertoires. They, on the other hand, had to handle a larger repertoire of syllabic spellings and verbal formulas.

Even though the earliest cuneiform signs were mostly pictorial representations, the scribes never had true artistic freedom to draw an object. The standard gestalt of each sign is fixed, with only limited variation permitted. As Figure 5 demon-

strates, the sign SAG, "head," may be realistically drawn with clearly delineated eye, nose, and chin, but it has to be a right side-view and include both head and neck but not hair, mouth, or ears. GUD, "bull," has to be a front-on view of the animal's head only; MUŠEN "bird," a right side-view of the whole body but without legs. DU, "to go," "to stand," a picture of a human leg and foot, may include the knee but not the toes. The directional orientation<sup>19</sup> of the sign is also fixed, with only occasional, sign-dependent variation. The signs BU or ŠU may be rotated 90° clockwise; SANGA 180°; but EN only through a horizontal axis outside of the plane, producing an upside-down mirror image (Figure 6). Graphic variability, of either form or orientation, occurs most frequently in Uruk IV; inverted or rotated signs are almost never to be found thereafter unless they have acquired a special meaning and distinctive phonetic value.

The size and arrangement of signs within a case also seems to have been regulated to some extent. As a rule Uruk III signs are drawn to fill the case, with neat,

Figure 5. Range of variation for selected archaic signs (examples taken from Uruk IV and III).

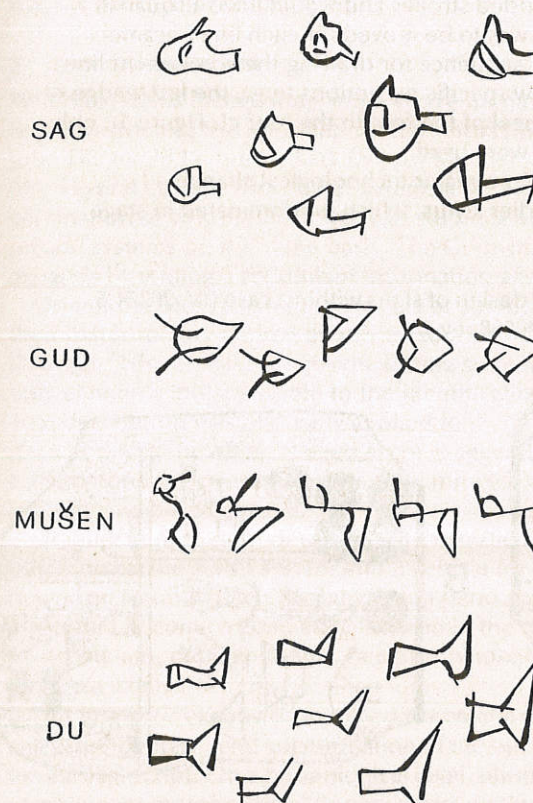
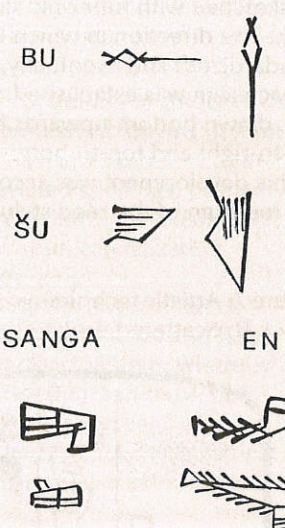


Figure 6. Sign rotations.



artistically designed packing of wedges around numerals and within the negative space of neighboring signs. Uruk IV signs are somewhat more scattered, individually drawn, with less apparent regard for overall design. There seem to be several distinctive writing styles among the archaic Uruk tablets, however. One of these is characterized by tiny, isolated signs surrounded by large, blank spaces. Because the signs tend to look more archaic than the typical Uruk III shapes but less clumsily drawn than in Uruk IV, we have postulated that this style represents an intermediate writing stage between IV and III. It is nevertheless possible that these and other "artistic" differences, which are always difficult to assess objectively, could characterize different scribal schools or teachers, or a range of individual handwritings.<sup>20</sup> Examples of the Uruk III "unit design" and the "scattered" styles are shown in Figure 7. Compare also Figures 1 D left vs 1 D right.

Between writing stages IV and III the technique of sign production developed from drawing to writing, as the signs themselves began to change from pictures to script characters—a process that would continue for many more centuries. The "archaic" stages witnessed the breaking of long, curved lines into a series of shorter, straighter, quick strokes, as well as general reduction of curvature and detail. Whereas in stage IV a circle—a basic outline form appearing in dozens of archaic signs—might be drawn with a single, continuous stylus motion, in stage III it would be sketched with four only slightly rounded strokes and would have a squarish look. The direction in which the stylus was to be moved for each line became standardized, and eventually, a correct sequence for drawing the component lines of each sign was established. With a few specific exceptions (e.g., the last wedge of DU, drawn bottom-upwards from the heel of the foot to the toe; cf. Figure 5), only left-to-right and top-to-bottom strokes were used.

This development was accompanied by a major technological change—the redesign of the reed stylus. The earlier stylus, which predominated in stage

IV, was sharpened to a (blunt) point like a pencil. The later stylus, also used frequently in stage IV but later exclusively, was sharpened along the length of one side like a knife edge.<sup>21</sup> With the new stylus new manipulation techniques were also developed.

The pointed stylus can be manipulated much like a modern pen or pencil, its tip drawn or pushed across the clay surface to produce a line of fairly even thickness. Undulating lines, closed loops, and continuous outlines, typical of stage IV signs, are especially readily drawn with the pointed stylus.

The edge-sharpened stylus is pressed into the clay by a slight rotation of the hand, producing the characteristic, triangular-looking wedge "head." The "tail" of the wedge is automatically produced by the sharpened edge, or can be lengthened by a slight sweeping wrist motion. The handsome trailing-off and flowing lines of the Uruk III script are probably attributable to this technological change.

Familiarity with wedge characteristics and sign edges and fragments contributes to reading proficiency, especially when the writing is imperfect or abnormal. A modern comparison is the offhand knowledge of which letters in cursive script hang below the line or which degenerate into a series of cusps when rapidly written. Admittedly, such skill in recognition is probably more vital for the modern scholar, who is regularly confronted with tablet fragments and broken signs, than it was for his ancient counterpart.

### 3 Information Content

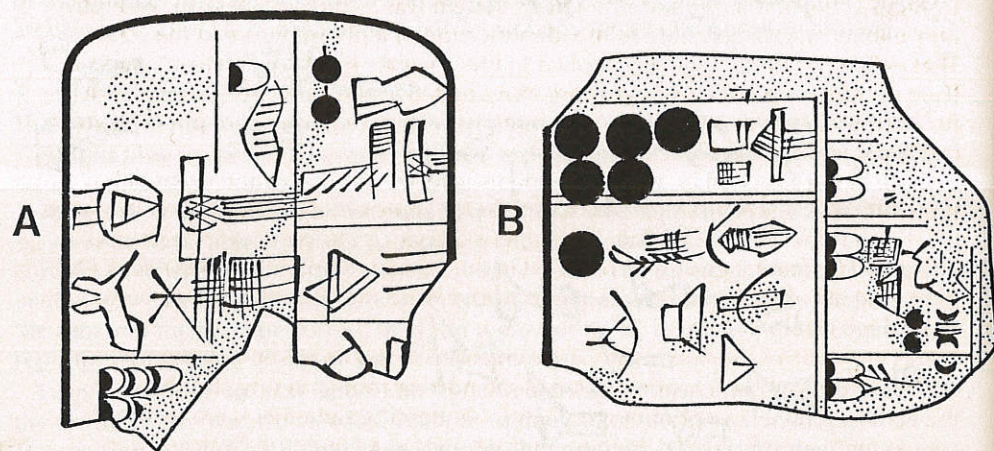
Writing systems incorporate some conventional tricks for expanding or (more often) abbreviating the information transmitted in the written text. Acronyms (JFK for John Fitzgerald Kennedy, KaDeWe for Kaufhaus des Westens) are a modern example. Several current shorthand systems also rely on abbreviated spellings, primarily elimination of vowels; many college students invent less efficient, but satisfactory, private systems on the same basis. The German system of noun capitalization expands by adding a redundant information element to the script.

One of the most frustrating aspects of attempting to study the archaic texts is their extraordinary degree of abbreviation. As described by Miguel Civil and Robert D. Biggs,<sup>22</sup> the archaic cuneiform writing system was a "nuclear" system, whereby only elements indispensable to the identification of a phrase figure in the script. That description was originally applied to literary texts of a later "archaic" stage (Fara period). The effect is even more exaggerated in the early archaic texts which, furthermore, are economic texts (i.e., memos) where the niceties of phrasing are irrelevant and disregarded.

Gradual introduction of additional linguistic levels of information eventually transformed the script system into a vehicle for approximating the spoken language in written form. By the Old Babylonian period about a thousand years later, this effect had become a goal, encapsulated in the Sumerian proverb *dub-sar šu ka-ta sa<sub>2</sub>-a e-ne-am<sub>3</sub> dub-sar-ra-am<sub>3</sub>*, "a scribe whose hand matches the mouth, he is indeed a scribe."<sup>23</sup>

This linguistic expansion involved the creation of new linguistic-graphemic correspondences<sup>24</sup> and augmentation of the nuclear root-structure shorthand of the earliest script. On a phonological level, phonemic graphemes were used to complement morpholexical (logographic) writings by phonetic indicators, or to

Figure 7. Artistic techniques. A: Spatial design of signs within a case (W. 20274.5 obv.). B: Scattered, isolated signs (W. 20568 rev.).



replace them by "syllabic" spellings. On a morphological level, previously omitted grammatical elements were expressed in the writing. Semantic level information was added by means of semantic indicators. In short, information which once belonged to the sphere of the scribe's personal familiarity with the language and writing system, information which was used by him to supplement the featural information of grapheme and text, became systematically incorporated into the visual writing system itself.

The initial stages of these developments are observable in the texts of writing stage III. The lexical lists make use of phonetic indicators and complements like <sup>U2</sup>UGA<sup>MUSEN</sup> (bird list) and <sup>GIS</sup>ALIM-MA (tree list). Syllabic spellings also appear in the lexical lists, as in BALA-ZA<sup>MUSEN</sup> for later BIL-ZA-ZA<sup>MUSEN</sup> (practical vocabulary), and possibly among administrative texts in the personal names.<sup>25</sup> Semantic indicators are used regularly in the lexical lists and sporadically in the administrative texts. The determinatives GIŠ, KU<sub>6</sub>, and MUŠEN accompany every entry in the archaic tree, fish, and bird lists, respectively. DUG, "jar," in both lexical and administrative texts, functions as a determinative but is written enclosing an inscribed sign. KI and DINGIR, indicators of geographical and divine names respectively, occur in administrative texts. There are also some uncertain examples of grammatical elements (dative-ra and genitive-ka).

Information content in a bureaucratic sense is also systematically regulated—which details of the transaction are pertinent and how they are to be recorded. As described above, tablet format plays a vital role in data organization, and certain format elements are designed for particular information categories. The subscript column is one example; sometimes several subscripts serving different functions are included, or portions of the information are repeated in separate subscripts. Another major data category is the total, required by many types of documents and sometimes organized into a series of subtotals and totals arranged in adjacent columns on the reverse.

In comparison with Uruk IV texts, those of Uruk III contain more bureaucratic detail. As mentioned above, the multiple-transaction document becomes widespread, in contrast to the prevalence of single-entry texts in Uruk IV. This could mean that many individual transactions belonging to a single office are tabulated together in a collective record, or that sublevels of a single transaction are accounted in more detail. In Uruk III the individuals involved in a transaction are more often personally identified by name and /or title; totals and subtotals are more often registered; the type of transaction, or text genre, is more often specified. These data categories, which pertain directly to the bureaucratic, administrative levels of the distribution process, appear more often in individual entries. And beyond that, they constitute the main elements of the subscript, which is also more often included as a vital, integral part of the document, either to serve as a resume or to designate a higher supervisory level of authority.

#### IV Interpretation: Implementation of a Technology

##### 1 Intentional Visual Modifications

The script and text characteristics which we have described as writing "conventions" are, in many cases, purposefully designed features of the writing system. Their development represents an effort to refine or improve the already powerful and successful technology of writing. In other cases, however, some features might have arisen coincidentally, without deliberate design. We will consider these unintentional developments later, but first, we look at what more probably are intentional measures.

The fundamental system and its basic conventions were established at the outset of, or during, writing stage IV. These include representation of words or other linguistic message units by pictographic signs; impression of characters with a stylus into a flattened clay surface; specification of a conventional, limited character set; fixed sign orientation; relative patterning of numerical and pictographic signs; rectilinear subdivision of the tablet surface into columns and cases; and sequence and direction of reading cases for transmission of an extended, multi-component message or record. What preliminary stages might have preceded the mature Uruk IV writing system we cannot yet establish precisely. Surely the calculi system described by Denise Schmandt-Besserat<sup>26</sup> was an important predecessor. Another stage is probably represented by the tablets found at Susa, Habuba Kabira, and elsewhere including Uruk,<sup>27</sup> which bear impressed numerals dissimilar to those of the archaic cuneiform texts and often seal impressions but no written characters.

The Uruk III writing stage amplified the system and added many specific innovations, but in subsequent stages the range and variety of elaborations were curtailed. The repertoire of column and case patterns introduced in stage III was discarded thereafter in favor of a regular sequence of vertically ordered cases and horizontally ordered columns. Specific examples of eliminated patterns are extra-wide columns, extra-tall cases, narrow-band intercolumns, case subdivisions, and horizontally arranged rows of cases. This standardization reduced the informational significance of layout patterns. Survival of the principle of visual format, in a restricted form, has already been mentioned above.

Clustering of signs, a convention maintained in stage III, was also discarded later. Information units which previously had been clustered were written in separate cases instead. The design units which clusters sometimes form, with wedges of one sign overlapping or intruding into the negative space of its neighbors, continued to be a feature of squarish case proportions. But with narrow lines, which became common in late Early Dynastic times, cuneiform script acquired a new linearity, soon thereafter accompanied by a new convention of graph sequence and spoken morpheme sequence concord. Survival of the cluster principle is apparent, however, in word-separation and sign ligatures. It might also have contributed to the sign construction technique of inscribing one sign within another.

The visual expansion of the writing system undertaken in stage III may be understood as an attempt to discover its limits and to exploit the maximum information potential of its components. Information incorporated into the system at one level need not be reiterated at another level. Thus, what the case patterns convey need not be redundantly conveyed by signs; the unique format of a ration list precludes

the need for a label declaring "this is a ration list"; scribal knowledge of the Sumerian language counter-balances highly selective morpheme representation.

Memory capacity usually fixes the limits of a writing system,<sup>28</sup> especially the size of the visual character repertoire and, here, also the case pattern repertoire. The cuneiform character repertoire probably reached its limit early, for we can observe contraction and standardization already in writing stage III. Some of the modifications were primarily visually or aesthetically oriented, such as the general reduction of pictorial content and the standardization of sign form by reduction of the permissible range of variation. Other changes, like elimination of some infrequently used signs and coalescence of graphically similar signs, were more direct manipulations of the information content and the grapho-linguistic relationship.

We would view the case pattern innovations of Uruk III as recognition and exploitation of the informational potential of that component. Later contraction indicates that, like the logogram, its capacities were restricted and its limits were quickly reached.

Analogous situations arose at other stages in the evolution of cuneiform. One was the Late Uruk period expansion of the calculi system, when there was a great proliferation of incised or otherwise marked types and unique shapes. That attempt to infuse more information into the system overburdened its capacity and gave way to the more powerful recording technology of incising pictographs on a flat clay surface.<sup>29</sup> A second example is the Old Babylonian period experimentation with the principle of phonetization. An attempt to apply it to Sumerian, evident from the large number of "syllabic Sumerian" texts, was abandoned except as a pedagogical tool, although it had long been effectively used for the Akkadian language.

## 2. Intentional Bureaucratic Modifications

Bureaucratic changes are primarily localized in the information content of the texts. More information was recorded in stage III, more detail, and new categories of information. The data volume increase per text—seen in the far greater proportion of multi-entry tablets and, among these, the greater average number of entries—signifies to us an extension of the bureaucratic reach. A single-entry tablet deals with a transaction at an individual level. A collective report serves organizational efficiency by consolidating related data, and also by treating the individual client or event as a member of a larger classification.

The creation of special formats, reminiscent of modern form sheets which require data to be entered in the appropriate columns and boxes, is an example of bureaucratic routinization and standardization. The underlying demand, the development of text genres which would be repeatedly transcribed, implies general task routinization.

Transactions became larger and more complicated, involving more hierarchical levels of personnel and more departmental or distributional levels. The texts which we believe to be ration lists, which first appear in Uruk III, record as a single entry unit (subdivided case) a quantity of goods and the responsible official and, moreover, a further subdivision of that quantity among other named persons. Another type of Uruk III text lists on the obverse single allocations of goods to named persons, on the reverse a series of subtotals for each individual recipient and a total naming a different official, presumably the supervisor of the entire transaction.

While these might be receipts rather than allocations, and administrative units rather than persons, nevertheless, the point holds that several levels along a distributive chain are documented by such texts. A third type, which might reveal a network of intercoordinated departments, are annual herders' reports. These give an account of the condition of the herd but also mention cultic allocations of animals for particular temples, gods, or festivals.<sup>30</sup>

This is not to say that such details are absent from Uruk IV texts, but that they are more often included in Uruk III, and clerical procedures were adjusted to implement them. While the hierarchical structure might not have altered, its documentation increased; and we think that is indicative of tighter centralized supervisory control within the administration. The Uruk III texts' more frequent identification of persons by name and title, at all personnel levels, from supervisor to client or slave, might also show more direct or more authoritarian internal controls.

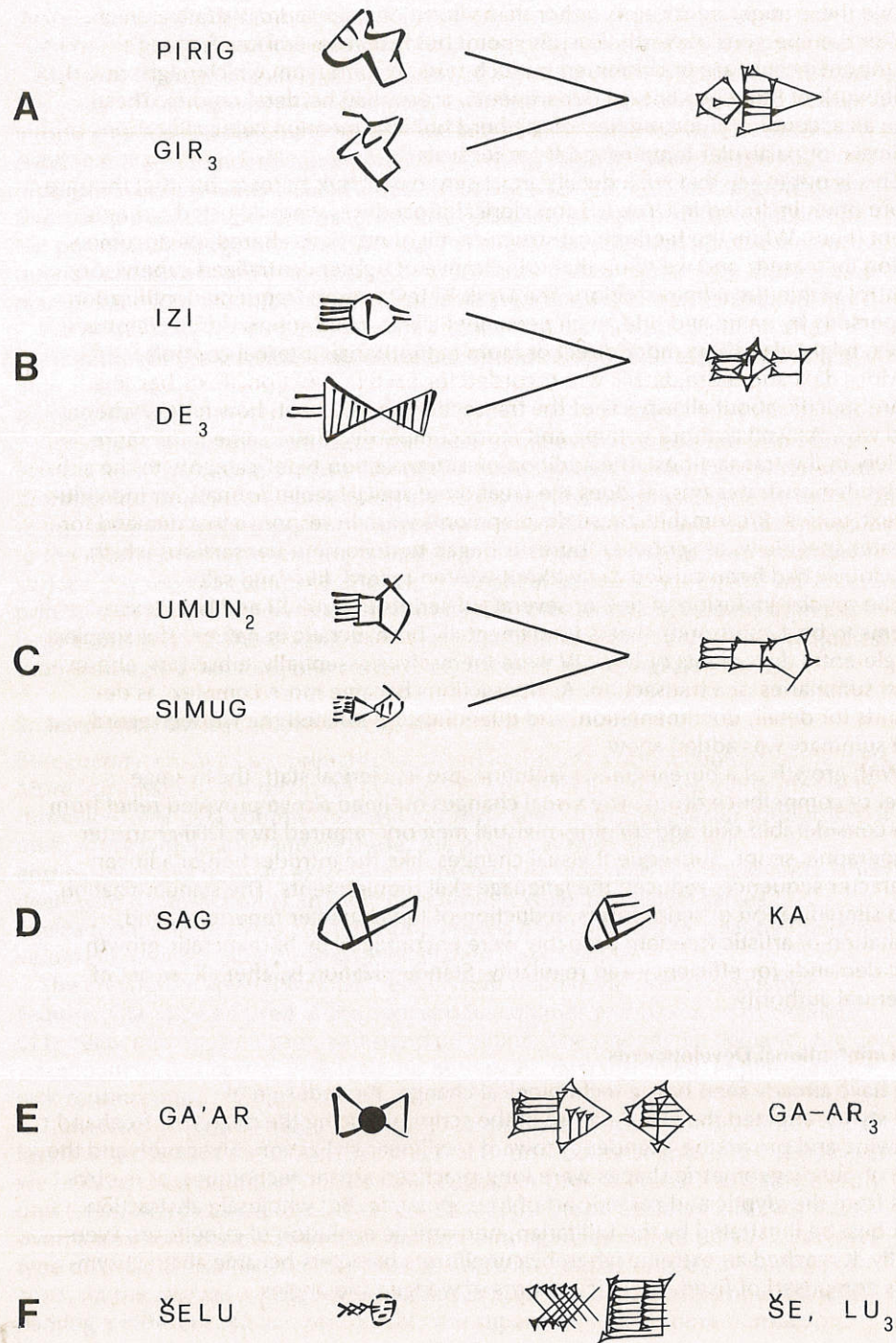
More data and more details were recorded for each transaction. Texts became more specific about all aspects of the transaction— who, what, how much, where, and why. As well as more volume and more complexity, there came to be more variety in the transactions. The addition of a "transaction type" category to the subscript demonstrates this, as does the creation of special tablet formats for individual text genres. Presumably, these developments were in response to a demand for greater specificity, as scribes or bureaus began to document transactions which previously had been carried out without written record, like land sales.

The regular inclusion of one or several subscripts in Uruk III and later texts seems to be a conformity that is fundamentally bureaucratic in nature. The simpler single-entry documents of Uruk IV were themselves essentially subscripts, abbreviated summaries of a transaction. As transactions became more complex, as demands for detail, documentation, and quantification inflated the written record, the summary was added anew.

With growth of a bureaucratic institution and its clerical staff, the average level of competence drops. The visual changes outlined above provided relief from the considerable skill and training in visual memory required by a 1200-character logographic script. Subsequent visual changes, like the introduction of a linear character sequence, reduced the language skill requirements. The standardization and simplification of script forms, reduction of the character repertoire, and limitation of artistic freedom probably were encouraged by bureaucratic growth and demands for efficiency and regularity. Standardization is, after all, an act of a central authority.

## 3. Unintentional Developments

We have already seen how a technological change, the redesign of the stylus, affected the visual nature of the script, reducing the degree of freehand drawing and provoking a tendency toward rectilinear stylization. Stylization and the use of purely geometric shapes were long-practiced artistic techniques, as is obvious from the glyptic and ceramic art of Mesopotamia. But wholesale abstraction can best be illustrated by the utilitarian, non-artistic evolution of cuneiform. Eventually, it reached an extreme whereby cuneiform characters became abstract symbols composed of fixed, specific patterns of wedges and angles.



Stylization and simplification gradually remove the differentiating features of visually similar graphemes, eventually leading to their coalescence. While the original objective might have been faster writing, at some point in the evolution of cuneiform this process became recognized and adopted as an organizational principle. We would suggest that true coalescence of signs, even if gradually approached, cannot be entirely accidental. Either it is recognized and affirmed or measures are taken to prevent it. An example of the latter is the addition of differentiating features for KA, "mouth," vs. SAG, "head."

Examples of sign coalescence are shown in Figure 8. In these examples coalescence occurs after the Uruk III stage. We can guess at examples dating to stage III but cannot prove them because no phonetic identifications can be made for stage IV signs. In this stage the signs involved are usually both visually and semantically related. The signs GIR<sub>3</sub> (basic meaning of pictograph unknown) and PIRIG, "lion," originally represented by different animal heads, are visually similar signs belonging to the same wider semantic field. IZI, "fire," and DE<sub>3</sub>, "torch," are a similar case. The original forms of SIMUG, "smith," and UMUN<sub>2</sub>, "forge," carried only slight differentiating marks which were eventually eliminated.

Stylization produces an overall modulation of the sign system. Sign coalescence and differentiation have the more profound effect of altering the graphemic relationships between signs. The introduction of the phonetic principle, however, transforms the morphophonemic foundation of the system.

Reduction of one spectrum of information reduces the communication capacity of the system unless it is compensated for by amplification at another informational level. While sign simplification and coalescence might promote writing efficiency, the loss of visual featural information interferes with reading efficiency.<sup>31</sup> For cuneiform a solution was found in the introduction of new linguistic features into the script, most notably phonetic values. By this means, the decrease in visual correspondence between graph and meaning was compensated for by a closer phonetic correspondence. This probably worked retroactively to accelerate the divorce between visual and semantic significance and the further abstraction of sign forms. Once the requirement of the sign system to maintain a minimal level of information content was recognized, and a mode of implementation by substitution of information levels was invented, the technique was adopted as a principle for further development of the system.

Specific results (see Figure 8) include replacement of logographic signs by syllabic spellings, such as GA-AR<sub>3</sub> for earlier GA'AR, "cheese"; reinterpretation of logograms as composed of syllabic elements, such as the ligature of ŠE and "LU<sub>3</sub>" in ŠELU (a type of metal); and polyphony (multiple phonetic values for a single sign). The addition of redundant phonetic "indicators" and purely semantic "determinatives" functions as compensation for polyphony.<sup>32</sup>

The substitution of syllabic writing for logographic both trims and transforms the sign system. Whereas the conceptual unit of a logographic script is the sememe,

Figure 8. Methods of script systemization. A, B, C: Coalescence. D: Differentiation. E: Phonetic replacement. F: Grapho-phonetic composition of grapheme.

that of a phonetic script is the morphophoneme, a smaller, specifically linguistic unit. Although the total number of signs is reduced, the number required to write a message is increased. Thus one factor in efficiency is counteracted by another; maintenance of cuneiform as a combined logographic-syllabic system might represent a compromise between them.

Another subtle consequence of the adoption of the phonetic principle is to make the script language-bound. A logographic script can be "read" in any language. Although we doubt that any "full" script (non-rebus, more than numerical) is ever totally logographic, phonetization fixes the sign "value." As a logogram the sign NUN can be read "nun" in Sumerian, "rubû" in Akkadian, or "prince" in English; as a character of a phonetic script, however, the reading is "nun," while "rubû" or "prince" can only be translations.

At other levels of the archaic writing system, uniqueness was replaced by consistency. Specialized tablet formats were replaced by regularly-spaced lines and columns. And, whereas each individual format had been associated with a particular column and case reading sequence, the regular lines were also consistently ordered. Within broad limits, and with many exceptions, there was also a trend toward consistent spelling. This is most noticeably true for Sumerian; but for Akkadian, too, in each later period and region a small, select set of basic syllabograms was preferred. With standardization, the reader lost the informationally-rich visual gestalt of Uruk III, to be confronted instead with segmented elements which he had to piece together into a coherent message. Consistency, as an ordering principle, benefitted the reader by adding featural information back to the visual form.

We have described the informational enrichment of layout patterns as a bureaucratically-guided attempt to maximize the information storage capacity of the text. The fact that this was visually oriented and reached its culmination in writing stage III gives us a clue to the relative chronology of these trends. For it contrasts with the linguistically-oriented innovations which did not develop fully until after stage III. Indeed, most of the information incorporated visually into tablet formats was later replaced by verbal formulas and labels. The total, for example, was deprived of a special spatial position, to be identified instead by a label NIGIN<sub>2</sub> or ŠU-NIGIN<sub>2</sub>, "total," an important term which is exceptionally rare in the archaic documents. Predecessors to many important formulaic phrases, such as DI-TIL-LA, "completed court case," or LU<sub>2</sub>KI-INIM-MA, "witness," are probably likewise to be found in the archaic tablet formats. This strong shift from visual to verbal dependence was a step toward the transformation of writing from an independent symbol system to a tool for transferring speech to a more permanent storage medium.<sup>34</sup>

#### 4 After Effects

We have seen how the archaic cuneiform script system was constructed and refined according to the needs of the user, and how manipulation of some features of the system produced imbalances and ambiguities which were either incorporated into the system design or counteracted by other adjustments and manipulations.

We close now with a look at some of the subtler effects of writing technology on the administrative bureaucracy and its literate clerical personnel.

One of the earliest recognizable objectives is the exploitation of the maximum data storage capacity of the texts. This is apparent, first, in the sudden sign explosion with the invention of writing, which does not seem to have been a gradual growth process; and second, in the data accretion and the cooptation of format as a system component in writing stage III. Another contrivance to enable denser packing of data was a miniaturization of the script, which seems to belong to an intermediate IV/III stage. Yet another was production of larger tablets. Such improvisation never went so far as either computer-on-a-chip size script or book-binding, although the "tablet basket" archives and libraries of later times should perhaps be viewed as system components. Nonetheless, a maximum information capacity was quickly reached and alternative solutions had to be sought. Outstanding among these was the shift to a phonetic script basis.

The existence of a technology which can reliably preserve information facilitates the control and management of information, which is a primary task of a public administration. The socio-economic basis—a stratified society, a redistribution system, and voluminous transactions—preexisted in ancient Mesopotamia. So, too, did the demand for accountability and record-keeping, attested by the widespread use of tokens (calculi) and seals. The emergence of a large-scale, centralized, bureaucratic institution, however, might itself have been a consequence of the creation of the tools which empowered its functioning. Certainly, writing enabled the administration to grow and, through written liability, to maintain direct authority over even the lowest levels of personnel and clientele.

It is also clear from the standardization and complexity of the script system that scribal training was the province of a central, coordinating authority. With the lexical texts of writing stage III the establishment of the scribal school is confirmed. This implies the existence of a professional class of scribes removed from productive labor. We do not know from what socio-economic class archaic scribes were drawn. Since the professional title DUB-SAR, "scribe," is not attested, we may guess that the scribes of Uruk, like those of Fara and Abu Salabikh later were members of the SANGA-college of temple priest-administrators (perhaps specifically the DUB-SANGA included in the archaic list of professions: Lu List 47, 67a). In that case, they were selected from an already hierarchically ordered, exclusive class.

Mastery of any secret or esoteric wisdom confers a high status if it is viewed positively and its practitioners are integrated into the culture. The opposite, negative attitude leads to accusations of witchcraft and to social ostracism. In the case of Mesopotamia, the scribal art became the exclusive prerogative of an elite, specialist group. Moreover, the written record itself may be viewed superstitiously as a powerful object possessing a higher authority and wisdom.<sup>35</sup> That such seems to have been the case in ancient Mesopotamia is apparent from the Sumerian epic "Enmerkar and the Lord of Aratta," which portrays the awe inspired by Enmerkar's use of the written word in international diplomacy. Further evidence is the rapid expansion of cuneiform writing into the fields of religion and creative literature. The professional scribal college, which we have characterized in ancient times as essentially a clerical staff, developed into a literati and added to its ranks scholars, sages, and pedagogues.

Visual fixation of language patterns also influences the spoken form. Modulations of acoustic elements such as pitch or accentuation, pronunciation changes, archaizations and retardations of language evolution are attested in the history of writing.<sup>36</sup> While some such effects may be imagined for archaic Sumerian, such as damping of phonetic distinctions, the difficulties in reconstructing spoken Sumerian from written sources prevent serious speculation. Moreover, at that stage such effects could scarcely have infiltrated from the small, specialized literati into the wider culture. The same considerations hamper evaluation of McLuhan's theses on separation and specialization of senses, the dominance of visual experience, or the evolution of categorical and analytical modes of thought in light of ancient scripts.<sup>37</sup>

Acoustic ambiguities in language are not readily represented in writing, yet they formed an essential component of Sumerian creative literature.<sup>38</sup> Fondness for riddles, word play, rhetorical wit, and equivocation is a well-known Sumerian character trait.<sup>39</sup> Writing provided a new medium and opened a whole new range of opportunities for linguistic divertissement, which the ancient scribes did not overlook. Ambiguities inherent in the polyphonic graphic system, which could be avoided by various redundancy techniques, were sometimes left standing, or were even exaggerated by syllabic spellings.<sup>40</sup> The boredom of multiple repetitions of a phrase could be relieved by writing MIN, "ditto," instead, as was the practice of Babylonian hymn copyists—or more cleverly by inventing fancy, uncommon spellings, like the Ugaritic scribe who managed to use four different spellings in five occurrences of one phrase within eighteen consecutive lexical entries.<sup>41</sup> Finally, entirely new, esoteric language games based on a visual system were developed, like acrostics,<sup>42</sup> visual puns, and parodies of written literary genres.<sup>43</sup>

1. Study of the Uruk tablets is sponsored by the Deutsche Forschungsgemeinschaft under the grant title "Archaische Texte aus Uruk," directed by Hans J. Nissen, Berlin. I thank Marvin A. Powell, Jr., for reading and commenting on preliminary drafts of this article. Photographs courtesy of the Deutsches Archäologisches Institut.

2. Examples are KAŠ/KIŠ, LU/LU<sub>3</sub>, SUHUR/SAHAR.

3. Samuel Noah Kramer, *The Sumerians: Their History, Culture, and Character* (1963) Appendix A; David Diringer, *The Alphabet: A Key to the History of Mankind* (1948); I. J. Gelb, *A Study of Writing* (1963); George L. Trager, "Writing and Writing Systems," in Thomas A. Sebeok, ed., *Current Trends in Linguistics*, vol. 12: *Linguistics and Adjacent Arts and Sciences* (1974).

4. Gelb, *Study of Writing*, 10ff. Frank Smith, in "Alphabetic Writing—A Language Compromise?," *Psycholinguistics and Reading* (1973) 117 ff., points out that the phonetic principle, particularly alphabetic script, benefits the writer more than the reader. "The fact of there being any relationship at all between the written form of language and its sound may be one of the major concessions made by readers to writers" (117).

5. George A. Miller, *The Psychology of Communication: Seven Essays* (1967) 6ff., 37ff.

6. H. J. Chaytor, *From Script to Print: An Introduction to Medieval Vernacular Literature* (1945) 9f.; Frank Smith, *Understanding Reading: A Psycholinguistic Analysis of Reading and Learning to Read* (1971) 76f.

7. Kenneth C. Laudon, *Computers and Bureaucratic Reform: The Political Functions of Urban Information Systems* (1974) 25; James D. Thompson and Frederick L. Bates, "Technology, Organization, and Administration," *Administrative Science Quarterly* 2/3 (Dec. 1957) 340.

8. I. M. Diakonoff, "The Rise of the Despotism in Ancient Mesopotamia," *Ancient Mesopotamia, Socio-Economic History: A Collection of Studies by Soviet Scholars* (1969) 173ff.; Horst Klengel, "Einige Bemerkungen zur sozial-ökonomischen Entwicklung in der altbabylonischen Zeit," *Acta Antiqua Academiae Scientiarum Hungaricae* 22 (1974) 249ff.; Thorkild Jacobsen, "Early Political Development in Mesopotamia," *Toward the Image of Tammuz and Other Essays on Mesopotamian History and Culture* (1970) 132ff.

9. Åke W. Sjöberg, "The Old Babylonian Edubba," in Stephen J. Lieberman (ed.), *Sumerological Studies in Honor of Thorkild Jacobsen on his Seventieth Birthday, June 7, 1974* (1975) 168f.

10. Laudon, *Computers and Bureaucratic Reform*, 30.

11. Systematic revisions of the writing system and other bureaucratic tools are well known in later Mesopotamian history; for example, Šulgi's revision of the calendrical and metrological systems (Ur III period) or the creation of the purely literary Standard Babylonian dialect (Kassite period). For these see E. Sollberger, "Sur la chronologie des rois d'Ur et quelques problèmes connexes," *Archiv für Orientforschung* 17 (1954-6) 17ff.; W. G. Lambert, *Babylonian Wisdom Literature* (1960) 14.

12. Marshall McLuhan, "The Effect of the Printed Book on Language in the 16th Century," in Edmund Carpenter and Marshall McLuhan (eds.), *Explorations in Communication: An Anthology* (1960) 131. See also McLuhan, *The Gutenberg Galaxy: The Making of Typographic Man* (1965) 229ff.; Chaytor, *Script to Print*, 53; Gelb, *Study of Writing*, 223ff.

13. McLuhan, "Effect of the Printed Book"; *idem*, *Gutenberg Galaxy*. But now, against this thesis, see Elizabeth L. Einstein, *The Printing Press as an Agent of Change* (Cambridge, 1979).

14. These statistics are approximations based on those texts which are well enough preserved for an accurate estimation of column and case layout and for which a photo is also available. This includes approximately 400 of the published Uruk IV tablets in A. Falkenstein, *Archaische Texte aus Uruk* (1936) plus 500 unpublished Uruk IV tablets and 200 unpublished Uruk III tablets. A possible bias in the sample might be overrepresentation of smaller tablets, since these tend to survive intact and to permit pattern recognition even from a broken fragment. The relatively large number of Uruk IV texts, and especially single-entry texts, is a sign that this bias is indeed present.

Very generally stated, the published and unpublished Uruk IV tablets are equivalent samples. The published corpus does have a larger number of tablets with a single entry (44% vs 23% of the unpublished) and tablets with one entry on each

obverse and reverse (26% of those inscribed on both sides vs 6% of the unpublished). One hundred twenty tablets from Jemdet Nasr, published by Stephen Langdon in *Pictographic inscriptions from Jemdet Nasr* (Oxford Editions of Cuneiform Texts VII, 1928), without accompanying photos, have been used for comparison. But because these texts show unique characteristics which are as likely to represent local scribal practices as chronological changes, the Jemdet Nasr data are given only parenthetically.

15. We conjecture, but are not able to prove, that these are "ration lists."

16. See M. W. Green, "Animal Husbandry at Uruk in the Archaic Period," *Journal of Near Eastern Studies* 39 (1980) 1ff.

17. Langdon, *Pictographic Inscriptions*, nos. 67, 83, 99, 100.

18. Bottom-edge rotation is the rule in the archaic texts, but there are exceptions. While some of these seem due to simple misjudgement by the scribe of how much space was required, others do appear to be significant; rotation might function as a specific writing convention. See A. A. Vaiman, "The Formal Characteristics of Proto-Sumerian Texts," *Vestnik Drevni Istorii* 119 (1972/1) 127ff.

19. Cuneiform signs were standardly written 90° counterclockwise from what would be the normal viewing position of the object depicted. However, at what writing stage this practice began remains an unanswered question. Although archaic signs are usually copied in the rotated position (for better comparison with later graphic shapes), most scholars believe that throughout the early archaic periods the signs were written upright (or perhaps written at an angle but read upright). Falkenstein proposed a date shortly after the time of the Fara texts for the change, but Anton Deimel considered it to have predated the Fara texts. See Falkenstein, *Archaische Texte aus Uruk* p. 11; Deimel, *Liste der archaischen Keilschriftzeichen* (1922) 13. Sergio Angelo Picchioni presents a fresh review of this problem, bringing in new evidence from Ebla and offering convincing arguments for an even later date, in "La direzione della scrittura cuneiforme e gli archivi di Tell Mardikh-Ebla," *Orientalia* n. s. 49 (1980) 225ff. In our work we have maintained the assumption that the Uruk IV tablets are already written in the standard, rotated position. We have suspected, further, that a pre-rotated stage could be represented by a few tablets assigned to Uruk IV. These include Falkenstein, *Archaische Texte aus Uruk*, nos. 1-6, for which Falkenstein (p. 11 n. 2) already noted this possibility, Figure 1A here, and about ten other unpublished tablets of similar appearance.

20. We are trying to establish graphic and chronological criteria for differentiating these writing styles. Our results will be published in detail elsewhere.

21. L. Messerschmidt, "Zur Technik des Tontafel-Schreibens," *Orientalische Literatur-Zeitung* 9 (1906) 185ff., 304ff., 372ff.; Deimel, *Liste der archaischen Keilschriftzeichen*, pp. 9ff. For a different idea about the stylus see Falkenstein, *Archaische Texte aus Uruk*, pp. 5ff.

22. "Notes sur des textes sumériens archaïques," *Revue d'Assyriologie* 60 (1966): 12ff.

23. Sjöberg, "Old Babylonian Edubba," p. 170. The Sumerian text does not distinguish between speed and accuracy.

24. See the graphemic typology outlined by Miguel Civil, "The Sumerian Writing System: Some Problems," *Orientalia* n.s. 42 (1973) 21ff. As yet, no P(hono-logical)-level graphemes have been identified in the Uruk IV script.

25. AD-DA, Langdon, *Pictographic Inscriptions*, no. 51 ii 2.

26. See the contribution by Schmandt-Besserat in this volume and "The Earliest Precursor of Writing," *Scientific American* 238 (June 1978) 50ff.; "An Archaic Recording System and the Origin of Writing," *Syro-Mesopotamian Studies* 1/2 (1977) 31ff.; "An Archaic Recording System in the Uruk-Jemdet Nasr Period," *American Journal of Archaeology* 83 (1979) 19ff.

27. Alain Le Brun and François Vallat, "L'origine de l'écriture à Suse," *Cahiers de la Délégation Archéologique Française en Iran* 8 (1978) 18ff., pl. 4; Harvey Weiss and T. Cuyler Young, "The Merchants of Susa: Godin V and Plateau-Lowlands Relations in the Late Fourth Millennium B. C.," *Iran* 13 (1975) 8ff.; A. Nöldeke, *Vorläufiger Bericht über die von der Notgemeinschaft der Deutschen Wissenschaft in Uruk unternommenen Ausgrabungen* 5 (1934), pl. 14 b, d; D. Sürenhagen and E. Töpferwein, "Habuba Kabira (Hububa Kabira) Herbstkampagnen 1971 und 1972 sowie Testgrabung Frühjahr 1973: Kleinfunde," *Mitteilungen der Deutschen Oriental-Gesellschaft zu Berlin* 105 (1973) 21, nn. 19f.

28. Albert Upton, "On the 'Matter' of Freshman English," in Lee Thayer (ed.), *Communication: General Semantics Perspectives* (1970) 333. This fact underlies the "principle of economy" enunciated by Gelb, *Study of Writing*, p. 251.

29. Schmandt-Besserat, "An Archaic Recording System in the Uruk-Jemdet Nasr Period," pp. 22ff.

30. Green, "Animal Husbandry," p. 8.

31. In written, as in spoken language, ease of production varies inversely with ease of discrimination; Smith, "Alphabetic Writing," pp. 117f.

32. Gelb, *Study of Writing*, pp. 103ff.

33. Smith, "Alphabetic Writing," p. 120. Smith's valuable notion of proficient reading and writing as fundamentally logographic processes (p. 124) seems to be contradicted by evidence from recent neurological studies. See S. Toulmin, "The Mozart of Psychology," *New York Review of Books*, Sept. 28, 1978, pp. 51ff. (review of L. S. Vygotsky, *Mind in Society: The Development of Higher Psychological Processes* and M. Cole [ed.], *Soviet Developmental Psychology: An Anthology*).

34. Gelb, *Study of Writing*, p. 12.

35. Even in a basically non-literature culture: Albert B. Lord, *The Singer of Tales* (1965) 109, 137f.; McLuhan, *Gutenberg Galaxy*, p. 144.

36. Gelb, *Study of Writing*, pp. 223ff.; Chaytor, *From Script to Print*, p. 3; McLuhan, *Gutenberg Galaxy*, p. 231.

37. Several aspects of McLuhan's powerful insights into the nature and significance of writing seem applicable to cuneiform, although that itself contradicts his basic tenet as to the uniqueness of alphabet and print. Visual fixation, linguistic analysis resulting in segmentation of language flow, translation of sound into sight, and compartmentalization are all present in the earliest decipherable pre-alphabetic script systems. Moreover, the ideolectic construction of larger logographic symbol systems for reading, and integrated movement sequences for writing, as proposed

by Frank Smith and others, diminishes the intellectual importance of alphabetic or typographic characters.

38. Note especially the story of the Babel of Tongues in "Enmerkar and the Lord of Aratta," Inanna's enigmatic message in "Lugalbanda," and the repartee of the debates and dialogues.

39. Bendt Alster, "Paradoxical Proverbs and Satire in Sumerian Literature," *Journal of Cuneiform Studies* 27 (1975) 201ff.; *idem*, "A Sumerian Riddle Collection," *Journal of Near Eastern Studies* 35 (1976) 263ff.; Robert D. Biggs, "Pre-Sargonic Riddles from Lagash," *Journal of Near Eastern Studies* 32 (1973) 26ff.; Miguel Civil, "The Anzu-Bird and Scribal Whimsies," *Journal of the American Oriental Society* 92 (1972) 271; *idem*, "From Enki's Headaches to Phonology," *Journal of Near Eastern Studies* 32 (1973) 57ff.; Benjamin R. Foster, "Humor and Cuneiform Literature," *Journal of the Ancient Near Eastern Society of Columbia University* 6 (1974) 69ff.; Edmund I. Gordon, *Sumerian Proverbs: Glimpses of Everyday Life in Ancient Mesopotamia* (1968).

40. Examples are given by Civil, "Anzu-Bird."

41. Ras Shamra Recension A of Har-ra = *hubullu* XX-XXII (B. Landsberger, et al., *Materials for the Sumerian Lexicon* 11 [1974] 42ff.): *bir*<sub>x</sub> (BUR<sub>5</sub>)-*ti* (ii 61', iii 8), *ša bi-ir-ti* (iii 2), *ša bir<sub>5</sub>-ti* (iii 4), *ša be-ri-ti* (iii 6).

42. "The Babylonian Theodicy," Lambert, *Babylonian Wisdom Literature*, pp. 63ff. The textual organization of Sumerian proverb collections is according to the initial sign, even though the phonetic value varies.

43. E. Sollberger, "The Rulers of Lagaš," *Journal of Cuneiform Studies* 21 (1967) 279ff.; cf. the "Monkey Letter," interpreted by M. Powell as a parody of a formal business letter: "Ukubi to Mother . . . The Situation is Desperate," *Zeitschrift für Assyriologie* 68 (1978) 173.

Carol F. Justus

## Visible Sentences in Cuneiform Hittite

*On the premise that horizontal Hittite scribal rulings be taken seriously as punctuation, this study investigated their content and found that in fact they punctuate a structure similar to the periodic sentence in older Greek and Latin. As such they are to be compared with the oldest (alphabetic) Greek mark of punctuation, the paragraphos, which begins to be replaced in Alexandrian Greek by marks which segment the language on the basis of prosodic features, as in English. Hittite "visible sentences," moreover, signal in visual form underlying differences in language structure and cohesive basis which can be correlated with differences in word order type and changes which the genetically related Indo-European (IE) languages have undergone over a period of c. 4000 years of written attestation.*

### 0.0 Introduction

Written English demands today for interpretation conventions of punctuation which were not imposed on Englishmen as late as Chaucer, Shakespeare, or even Noah Webster. Use of comma, period, and quotation mark, question mark, or exclamation point makes visible in writing the intonations of voice pattern which distinguish a completed assertion from a question, command, or half-finished sentence. As the linguist Charles Hockett (1958:33ff.) noted, a simple sentence like "I'm going home" has many interpretations depending on the speaker's intent. While the words, when segmented into separate units, retain their original semantic values, nonsegmental voice inflection or prosodic features create important distinctions of their own.

Most work on the Hittite writing system focuses on phonetic interpretation of the script or dating of its form. Hittite phonetic forms, however, clearly underlie both syllabic and logographic spellings. This study, then, concerns itself not so much with the signs of the script as with the auxiliary scribal marks which visually represent speaker intent and sentence structure in the language. Analysis of the structural content in units formed by horizontal scribal rulings, by contrast with that of English sentences, leads to the conclusion that the bases of cohesion marked by English periods differ from those marked by scribal rulings. The differences, moreover, correlate with systematic differences in word order patterns and rhetorical construction already noted by linguists (Greenberg 1966; Lehmann 1973, 1974; and others) and classicists (Weil, discussed by Justus 1981a).

The perspective here, while historical, is not in any sense evolutionary. Although punctuation using comma, period, and capital letters did undergo evolutionary development from its beginnings with the third century BC Alexandrian scholar, Aristophanes of Byzantium, up through recent codification in manuals of style (see below), scribal rulings on cuneiform tablets were already punctuating written