

STUDIES IN THE STRUCTURE OF SOME ANCIENT SCRIPTS

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I. THE WRITING SYSTEM OF THE PROTO-ELAMITE ACCOUNT TABLETS OF SUSAN

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THE Proto-Elamite script is known only from documents discovered in excavations at two sites in Iran, on the mound of Susa and at Sialk near Kashan. Of these, the latter site has yielded only nineteen tablets, or fragments thereof, in this script, and the overwhelming majority of the inscriptions, numbering more than 1,400, have been uncovered since the year 1901 in a sequence of campaigns on the acropolis of Susa.

In their general appearance, and in the manner in which they are drawn, the signs of the Proto-Elamite script resemble those of the archaic Sumerian, which was used earlier than the cuneiform writing system at Ur, Jemdet Nasr, Uruk, and other places in southern Mesopotamia. They consist of patterns of straight and curved lines, which in a few cases are clearly pictorial, but which for the most part must be regarded as abstract designs whose shapes convey no clue to their meaning.

The Proto-Elamite inscriptions of Susa separate themselves clearly into two classes, the monumental and the economic. The monumental inscriptions, sixteen in number, comprise ten on stone stelae or fragments thereof (A-I, including H2), three on clay cones (J-L), one on a piece of a lens-shaped clay object (M), and two on clay tablets (N, O). By comparison with those of the economic class, the signs on these documents are less numerous

and of simpler form. On some stelae, the Proto-Elamite inscription is accompanied by a cuneiform text in the Akkadian language. Although these are probably not bilingual documents, it may be taken as likely that the paired texts are contemporary and deal with kindred topics. At any rate, such assumptions have been made as a first step towards decipherment. The cuneiform texts of the stelae, and by inference the associated Proto-Elamite inscriptions, are attributable to Puzur-Šušinak, who is known to have been a local ruler immediately before and after the Akkadian conquest, about 2250 B.C.

Documents of the other class are dated on considerations of stratigraphy, and by the style of associated seal-impressions, to the earlier half of the third millennium B.C. These are the clay tablets which, from the abundance of numerical signs which they contain, appear to be some kind of statistical or mercantile records. They employ a repertory of signs about ten times larger than that of the monumental documents; moreover, relatively few of the monumental signs can be securely identified on the commercial tablets. In general, the signs on these tablets are both more elaborate in form, but more carelessly drawn, than those of the monuments.

It seems best, therefore, to treat quite distinctly the two classes of Proto-Elamite texts. Attempts have been made to interpret the inscriptions of the later or monumental type, on the assumptions that the signs on them are for the most part syllabic, and that certain proper names which are legible in the cuneiform can be identified in the adjacent Proto-Elamite texts.¹ Whatever the value of these conclusions, it has not proved possible to use them in order to understand the account tablets. Indeed, it will be seen that there are reasons for thinking that the script of these tablets is essentially ideographic, and, if this be the case, then any attempt to comprehend it by a general application of sound values to the signs would be invalid from the outset.

¹ C. Frank, *Zur Entzifferung der altelamischen Inschriften (Anhang zu den Abhandl. der K. Preuss. Akad. der Wiss., Berlin, 1912)*; *Altelamische Steininschriften* (1923). W. Hinz, "Zur Entzifferung der elamischen Strichinschrift" is promised in *Iranica Antiqua* ii, i, due to appear during 1962.

PUBLICATIONS

This essay is concerned only with the account tablets from Susa, which have been published in four of the volumes of the *Mémoires* of the French archaeological mission in Iran :

1. *Mémoires de la Délégation en Perse*, VI, *Textes élamites-sémitiques* (3^e Série) (Paris, 1905) by V. Scheil, includes a section (pp. 57 ff.) entitled *Documents archaïques en Écriture proto-élamite*. In this, Scheil lists three monumental inscriptions (A, B, and C) and 381 tablets in two series :

(a) 200, numbered 201-400, of which 181 are shown either by sketch or photograph.

(b) 181, numbered irregularly between 4752 and 5242, of which ten are illustrated by sketch only, seventeen by photograph only, and eight by both sketch and photograph.

It appears from volume xvii (Foreword, p. i) that these tablets published in 1905 were collected by J. de Morgan in 1901 in two main deposits : in trench 24, at a depth of 5 metres, lying along the sides of a room ; and in trench 7, at depths varying from 8 to 13 metres. But it is not stated which series came from which trench. In volume vii of the *Mémoires* (Paris, 1905, p. 16) G. Jéquier describes how the tablets had been jettisoned in disorderly heaps in the corners of rooms.

In addition to sketches and photographs, volume vi contains some preliminary remarks under the heading " *Considérations générales* " (pp. 59-62), a list of signs drawn up by J. de Morgan (pp. 83-114), and an " *Essai de déchiffrement* " (pp. 115-28), including an analysis of the numerical system and an attempt to interpret twenty-one selected tablets.

(2) *Mémoires de la Mission archéologique de Perse*, XVII, *Mission en Susiane* (Paris, 1923) by V. Scheil is entirely devoted to Proto-Elamite tablets under the general title *Textes de comptabilité proto-élamites* (*Nouvelle Série*). Four hundred and ninety tablets, numbered 1-490, are listed, and all are illustrated by sketches. According to the Foreword (p. i), this second batch was taken, from 1907 onwards, by R. de Mecquenem, partly from the same trench 7 which had yielded one of the first series, and which had subsequently been broadened and deepened to

17 metres below ground ; and partly from the north-west edge of the acropolis, excavated to a depth of 8 metres.

This volume incorporates a commentary on a wide selection of the tablets published therein, and a new sign-list which has no separate attribution but which, according to volume xxxi (p. 44), was compiled by Mlle M.-M. de Mecquenem.

Volume xvi (Paris, 1921) by L. Legrain is a full publication of sketches and descriptions of the seal-impressions on the tablets of volume xvii, under the title *Empreintes de Cachets élamites*.

(3) *Mémoires de la Mission archéologique de Perse, XXVI, Mission en Susiane* (Paris, 1935) by V. Scheil is again completely given over to Proto-Elamite tablets under the heading *Textes de comptabilité proto-élamites (3^e Série)*. This group of 485 tablets, numbered 1-485, had been recovered by R. de Mecquenem in his most recent excavations at the top of Level III of the acropolis of Susa, in the axis of and on the south side of the small hill. They are all sketched, and this volume also includes, in the form of a Supplement, sketches of 153 of the 165 items which were listed in the inventory of volume vi (pp. 63-66), but not illustrated there. Of the twelve pieces not illustrated, three are from series *a* and nine from series *b*. Volume xxvi also provides sketches of fifteen of the seventeen tablets from series *b* of the 1905 catalogue which were photographed but not sketched in volume vi. Unfortunately, one of the two tablets whose photograph is not clarified by a sketch is the large and important example no. 5242. It appears from volume xxxi (p. 44) that the sketches of the new series of 1935 were prepared by Mlle M.-G. de Mecquenem, and those of the Supplement by P. Toscanne.

In this 1935 volume, Scheil included the six monumental texts on clay objects (J-O), some general remarks on the contents of the new tablets, and a fresh analysis of the numerical system, with special reference to tablet 362 of the new series. With this exception, there are no commentaries on individual tablets, and no new sign list is proffered. Scheil died before the next series was published.

(4) *Mémoires de la Mission archéologique en Iran, XXXI, Mission en Susiane* (Paris, 1949). The first half of this volume, by R. de Mecquenem, is entitled *Épigraphie proto-élamite*. It

includes sketches of fifty new tablets, numbered 1-50, concerning the source of which no information is given, except that they come from the inventory of 1939. In this publication, de Mecquenem also takes the opportunity to collect and republish, with a concordance, the nine monumental lapidary inscriptions (A-I) already published in volumes vi (A, B), x (C-H), and xiv (I), together with one new text of this type (H2), making a total of ten. G. Contenau contributes an Introduction, and de Mecquenem in chapter iii gives a commentary on the fifty newly published tablets, and on selected examples from earlier sets—six from volume vi, five from volume xvii, and forty-two from volume xxvi. Chapter iv consists of a new sign-list, and chapter v of a comparative table of Proto-Elamite and cuneiform signs, based on suggestions by Scheil, Toscanne, Rutten, and Deimel.

The nineteen inscribed tablets from Period IV at Sialk, classed by the discoverer, R. Ghirshman, as Proto-Elamite, are published by him in his *Fouilles de Sialk*, I (Paris, 1938), pp. 65-68, Pls. XXXI, XCII, XCIII. They are, with one exception, small or fragmentary. Ghirshman also refers to these inscriptions in *RA* 31 (1934), pp. 115-19 ("Une tablette proto-élamite du plateau iranien"), and in his book *Iran* (London, Penguin Books, 1952), pp. 48-49, Fig. 18.

An encyclopaedia article by Frank¹ concerning the Proto-Elamite script, and short accounts by Diringier,² Gelb,³ Cohen,⁴ and Ghirshman⁵ are descriptive, but contribute nothing new to the understanding of the tablets. A review by S. Langdon of volume xvii of the *Mémoires de la Mission archéologique de Perse*⁶ offers some constructive criticism of Scheil's interpretation of the numerals. Comparisons have been made between the Proto-Elamite and the Proto-Indic scripts,⁷ and, with regard to one

¹ C. Frank, "Elam-Schrift" in Max Ebert (ed.), *Reallex. der Vorgesch.* iii (Berlin, 1925), 83-84.

² D. Diringier, *The Alphabet* (London, 1947), pp. 54-55.

³ I. J. Gelb, *A Study of Writing* (London, 1952), pp. 89-90.

⁴ M. Cohen, *La Grande Invention de l'Écriture et son Évolution* (Paris, 1958), pp. 79-80, 67, Pl. 26.

⁵ R. Ghirshman, *Iran* (London, Penguin Books, 1952), p. 45, Fig. 16.

⁶ *J. Roy. Asiatic Soc.*, 1925, pp. 169-73.

⁷ G. R. Hunter, *The Script of Harappa and Mohenjodaro and its Connection with Other Scripts* (London, 1934), p. 47. K. N. Sastri, *New Light on the Indus Civilization* (Delhi, 1957), p. 98, Pl. xv.

sign only, that of the double-axe, between the Proto-Elamite and Minoan scripts.¹

THE DOCUMENTS

According to the Foreword to volume xxvi of the *Mémoires* (p. i), the first three sets of tablets, published in volumes vi and xvii and the Supplement to volume xxvi, are in the Louvre, while the new set published in volume xxvi is in the Imperial Museum at Tehran. The whereabouts of the fifth set, published in volume xxxi, is not mentioned, but presumably this and the pieces from Sialk are stored in the Museum at Tehran. In the following account, tablets will be referred to by their index numbers in Arabic numerals, placed after the number of the volume of the *Mémoires*, in which they are illustrated, in Roman numerals.

The tablets are of unbaked dark brown or reddish-brown clay, moulded to an oblong shape, and inscribed on their carefully smoothed surfaces from right to left, beginning at the top, across the wider dimension. The ratio of thickness, height, and width is usually about 1 : 5 : 7, but the tablets vary considerably in size, between widths of approximately 3 and 25 cm., the average width being about 7 cm.² Their faces are slightly convex, but apparently in cases where both faces are inscribed the convexity is sometimes more pronounced on the obverse than on the reverse.³

The inscriptions consist of signs and numerals formed by a combination of incised lines and punctuations. Sometimes they are written on only one face of the tablet, but in other cases they overlap on to the bottom edge, and in still others the tablet is turned completely over on a horizontal axis, the inscription being continued on the reverse (e.g. xvii. 288). Further, the tablet may

¹ A. Deimel, "Ein unerklärtes Zeichen der Keilschrift, der proto-elamitischen und kretischen Schrift," *Archiv Orientalní*, xvii (1949, ded. F. Hrozný), i, 112-16.

² For a description of the condition of the tablets of 1901 as they were uncovered, see G. Jéquier's account in the *Mémoires de la Délégation en Perse*, vii, *Recherches archéologiques* (2^e Série) (Paris, 1905), pp. 16-17.

³ See the remark of Scheil quoted in the postscript note on p. viii of the Preface to S. Langdon, *Pictographic Inscriptions from Jemdet Nasr* (Oxford Editions of Cuneiform Texts, vii, 1928).

be turned upside down and a short inscription added on what began as the lower margin (e.g. xvii. 112). It appears on analysis that these inverted appendices incorporate totals of items detailed in the main body of the inscription. There are also many instances (e.g. xvii. 5, 139) of tablets being turned over on a vertical axis before being inscribed on the reverse ; in these cases the connecting edge is not inscribed. Sometimes the inscription is closed with a roughly drawn rectilinear pattern which is presumably a scribe's mark, and in many cases a seal-impression is added either under the inscription or on the otherwise plain reverse of the tablet.

According to Scheil (xvii, pp. ii-iii ; see also Jéquier in vii, p. 17) the tablets of the third set were usually found along with clay sealings carrying seal-impressions, as well as bearing imprints of the knots they had covered. Some of the tablets from Sialk were pierced, presumably for attachment.

Altogether 1,406 economic tablets or fragments thereof are listed from Susa, and of these 1,394 have been published. Together with the nineteen from Sialk, this makes a total of 1,413 available for study. But a high proportion of these are either very fragmentary or very briefly inscribed. The new tablets of volume xxvi are in general simple in form and comprise few totals, while those of volume xxxi are short and crudely drawn. Most of the inscriptions which are complex and rewarding to study are found in volumes vi and xvii and in the Supplement to volume xxvi.

THE DATE OF THE DOCUMENTS

Writing in 1905 (p. 61), Scheil was inclined to believe that both the Babylonian and Proto-Elamite writing systems stemmed from the same source, an early and so far undiscovered primitive "hieroglyphic" script. After they diverged, the Proto-Elamite system developed more slowly than the Babylonian towards a stylized form, and when eventually the two came into contact again, as on the stone monuments of Karibu ša Šušinak, they were in effect distinct scripts. These monuments he dates to about 3000 B.C., when Karibu ša Šušinak was governor of Elam and patesi of Susa under the Akkadian suzerainty. The

tablets he regards as contemporary with or earlier than the monuments.

In 1923, Scheil refers (Foreword, pp. i-ii), without giving examples, to three stages of writing on the tablets : the earliest, with carefully drawn pictographic signs ; the latest, with more cursive signs conveying more complex ideas ; and an intermediate stage. He regards the latest phase as contemporary with the lapidary texts of Puzur-Šušinak,¹ of the period of the Akkadian decline, about 2500 B.C., when the Sumero-Akkadian writing system was supplanting the Proto-Elamite. He would date the earliest tablets " quelques (?) siècles plus haut ".

In 1935, Scheil made no further remarks on the dating of the tablets, beyond noting that the set he was then publishing came from the top of Level III of the acropolis. In 1949, Contenau dated the tablets (Introduction, p. 1), by stylistic comparisons of the associated seal-impressions, as far back as the Uruk, or at least the Jemdet Nasr period. The lowest date for the script he took to be several years after the fall of the Akkadian dynasty, when Puzur-Šušinak, who had been governor of Elam and patesi of Susa under the Akkadians, became king of Awan. The total time-span of the surviving Proto-Elamite texts would therefore be more than 500 years.

In conclusion, there seems to be no warrant for making a chronological distinction, as did Scheil in 1923, between the simpler and the more complicated tablets, because close inspection shows no significant differences between the forms of their signs. It is more reasonable to regard all the tablets as roughly contemporary, though some convey more elaborate records than others. On the other hand, there appears to be a clear difference between the dates of the economic and the monumental inscriptions. In default of accurate stratigraphic evidence, the former may be dated by the attached seal-impressions within the period 2900-2600 B.C. ; the latter, on historical grounds, to about 2250 B.C. ²

¹ This is apparently a revised reading of the name Karibu ša Šušinak of volume vi (1905).

² For these suggested dates I am indebted to Professor W. Hinz of the Seminar für Iranistik in Göttingen.

INTERPRETATIONS OF THE TEXTS

Writing in 1905, Scheil considered that the Proto-Elamite inscriptions of the lapidary texts were neither translations nor transcriptions of the accompanying Babylonian texts. After describing the differences between the signs of the tablets and those of the stone monuments, he added, "Les uns et les autres sont, d'ailleurs, à mon sens, rigoureusement idéographiques" (p. 60). He reinforced this opinion with a note in parenthesis on page 61; after remarking that the Proto-Elamite script became stylized more slowly than the Babylonian, he added, "sans arriver, d'ailleurs, à se dégager, si peu que ce fût, de l'idéographie".

By 1923, however, he had modified this view; for, while regarding the signs of his earliest class of tablets as simple pictograms, he referred to the latest class as "des tablettes dont la rédaction se charge d'éléments nouveaux, complexes, objectifs ou phonétiques". He also said of the presumed contemporary lapidary texts of Puzur-Šušinak that they "comportent, pense-je, des éléments phonétiques" (Foreword, pp. i-ii). On the other hand, in the second footnote to p. iii, he made it clear that, except for the possible reading of Šušinak, he accepted nothing of Frank's rigorously phonetic interpretation of the lapidary texts in the Anzanite language.¹

In 1935, Scheil made no further important suggestion about the interpretation of the texts. As evidence for his view that the stone monuments A, C, and I were probably not bilinguals, he referred to a statue published in volume xi whose Anzanite and Akkadian inscriptions were not translations of each other (Introduction, pp. ix-x).

In 1949, Contenau in his Introduction to volume xxxi (p. 2) took the view that the writing system of the tablets is essentially ideographic:

"L'écriture est de même ordre que celle de la Mésopotamie, de même principe: la représentation des objets comme point de départ et, partant, d'objets qui peuvent n'être que voisins dans leur dessin et dans leur évolution pour rendre une même idée."

¹ C. Frank, *Zur Entzifferung der altelamischen Inschriften (Anhang zu den Abhandl. der K. Preuss. Akad. der Wiss., Berlin, 1912).*

De Mecquenem's interpretations in this volume are on these lines, as three examples will show :

xvii. 118 (Fig. 5): " Il s'agit de grains pour le poulailler : d'un tas, 5 mesures ; d'un champ 2 [*sic*] mesures, d'un individu ou d'un chariot, 2 mesures ; autre graine, par chariot (?), 2 mesures ; apportée sur une claie, 1 mesure ; au revers, pour les volailles, 14 mesures."

xxvi. 30 (Fig. 5): " Compte du jardin du canal, dans un carré irrigué, un champ, petit rectangle labouré avec 2 animaux, a donné 6 demi-charges d'épis, donnant 10 gours de grain."

vi. 220 (Fig. 4): " Le silo a reçu : du grand jardin, 390 gours ; d'un autre jardin, 400 gours ; du jardin près du canal, 633 gours ; fin de l'inventaire, ou le silo est rempli. Au revers, le total des gours récapitulé est bien exact, en supplant un des cercles de centaines."

Scheil's interpretation of 1905 of this last tablet is added for comparison. He was attempting then to comprehend the meaning of the ideograms by comparing them with particular cuneiform signs, and in this instance he read :

" Tablette : AK-GAL (denrée) 𒀭-ŠU + RIM . . .	Total 1090 (mesures)
AK- . . . (denrée) (id.) . . .	Total 1100
AK-ḪUM (denrée) (id.) . . .	Total 2033 de 𒀭
(Rev.) Total . . .	4223 "

It is only fair to add that by 1923 Scheil appears to have abandoned this line of approach, and in his preamble to chapter v of volume xxxi de Mecquenem makes it clear that such was the case.

In addition to the examples already quoted, Scheil and de Mecquenem make several further conjectures with regard to the ideographic significance of particular signs, either by inference from their pictorial shapes, or by applying the known meanings of kindred Sumero-Akkadian signs (no. 1 of Fig. 1, for example, may be compared with the Akkadian *duppu* and interpreted as " tablet " or " account "), or, in one case (Fig. 1, no. 2—see Scheil's commentary to xvii. 5), by considering the context of the sign in the designs on seal-impressions. But such methods may lead to different conclusions in the case of the same sign.

For instance, the inverted triangle of punctuations, no. 32 on Fig. 1, was read by Scheil in 1905 as GIN, with the meaning "contribution" (see, for example, his commentary to vi. 237); but in 1923 he interpreted it variously as "son of . . ." (xvii. 18), "young slave" (xvii. 45), and "small" (xvii. 120). De Mecquenem, observing that this sign on vi. 388 stands alone before a measure, favours Scheil's last-quoted view, regarding it as a diminutive (xxxii, p. 34). Such opinions are manifestly speculative, and de Mecquenem's comment of 1949 (xxxii, p. 43) is certainly right: "L'interprétation des signes autres que les chiffres est tout à fait incertaine."

THE TRANSCRIPTIONS

In order to clarify the structure of these accounts, the inscriptions, which are drawn on the tablets as continuous texts, are re-arranged as lists, with the headings, items, numerals, totals, and colophons disposed separately. Scheil attempted an analysis into constituent items in dealing with tablets 81, 85, 112, 414 and 490 of volume xvii, and he remarked on the separate significance of the heading in the case of tablet 6 and elsewhere. But neither he nor de Mecquenem adopted this analytic system generally. It must be made clear that, as here applied, it involves some degree of interpretation. In general, the single signs or sign-groups which comprise the items of the accounts can be separated without difficulty with the help of the numerals which accompany them. But it is not so easy to place the limits of the headings, as there is no indication on the tablets of where the heading ends and the first item begins. Decisions on where to make separations of this sort can often only be taken after an entire tablet has been analysed, and with the help of comparisons with other inscriptions which are similarly composed.

In the transcriptions, the headings are underlined for emphasis, and the breaks of lines on the original tablets are indicated by writing a small numeral over the first sign of each line after the first. These numerals should not be confused with the larger numbers in the left margin which list the items of some of the longer inscriptions. The letter *R* indicates the start of the reverse face, and the letter *I* that part of the text, always comprising the

final totals, which was written with the tablet inverted. For convenient comprehension, the transcriptions are arranged from left to right, although the tablets were inscribed from right to left. The system is illustrated by juxtaposing the drawing and the transcription of xvii. 46 on Fig. 4.

THE NUMERALS

The main unit, indicated by sign 5 (Fig. 1), is counted by a series of signs representing units, multiples, and aliquot fractions. By Sumero-Akkadian analogy, this unit is usually known as the *gur*, and the fractions are referred to as quantities of *qa* or *sila*, on the basis of 300 *qa* to one *gur*. The evidence for assigning values to these numerical signs is found largely in the totals, above all in the remarkable computational tablet, xxvi. 362, the so-called scholar's copy. The differences between de Mecquenem's values in volume xxxi and those of Scheil in volume xxvi are due to the former's improved interpretation of this tablet, which dispenses with the need to assume scribal errors. The various suggestions about the values of the numerical signs in the different volumes of the *Mémoires* and in Langdon's review¹ are indicated in the table on Figure 2. Those of volume xxxi may be accepted as the most probable, and to these may be added the sign for $\frac{1}{2}$ and the second of the two signs for 100, which were interpreted in the earlier volumes but not noticed in the collections published later.

As de Mecquenem remarked, xxvi. 166 (Fig. 4) is an apparently unique example of a record of a subtraction rather than an addition. xxvi. 220 (Fig. 4) illustrates on the same tablet the use of both the signs for 100. In this tablet too it must be significant that the first and second numerals in each column stand to each other very nearly in the ratio 2 : 1 ; and that the three pairs of corresponding numerals in the left and right columns are either exactly or approximately in the ratio 6 : 5. In the cases of xvii. 153 and 414 (Fig. 6) the final entry does not correspond with the sum of the itemized quantities, and may represent some amount other than their total.

¹ *J. Roy. Asiatic Soc.*, 1925, pp. 169-73.

THE SIGNARY

Sign-lists were prepared in three of the volumes of the *Mémoires*, as follows :

vi. 989 signs, of which the first sixty-three belong to the monumental texts.

xvii. 1,582 signs, from the tablets published in this volume.

xxxi. 5,529 signs, from all the inscriptions, both monumental and economic, published to date.

Unfortunately, there is no accord between the numbering of these three signaries, though the last gives a very complete set of references. By listing separately scribal variants and ligatured signs, all three inventories give a very exaggerated impression of the size of the Proto-Elamite signary. For instance, volume xxxi enumerates seventy-five variant and ligatured forms of the *gur* sign (Fig. 1, no. 5), and 118 of the open cross (no. 3). Lists of this kind which insist on meticulous distinctions of form are valuable for purposes of reference. But it would also be useful to have a much less extensive signary which would bring together all variant forms of the same sign. As a first step towards this, a rough attempt is made in Fig. 1 to assess the real range of the repertory of signs. There are set out 100 selected basic signs, including all the most common, and a good many which are only infrequently used. The complete list would be longer than this, but probably not much longer, and certainly not twice as long. Some variants of these basic signs, when they are modified by gunification or by the addition of inserts, may qualify as separate signs. But, in the great majority of cases, the adjoined or inserted symbols are signs or numerals which are included separately in the lists, and the resulting ligature or monogram adds nothing new to the signary. By way of illustration, at the foot of Fig. 1 are set out some of the modified and ligatured forms of signs 14 and 35. In the second case the ligatures are for the most part with numerals ; in the first, with other signs.

The following characteristics of the signs and of the ways in which they are used may be noted :

(1) Certain signs show a preference for particular positions. The common signs 1, 2 and 3, for example, are generally found

near the beginning of inscriptions, as a quick perusal of Figs. 2-6 will demonstrate. The *gur* sign, no. 5, is placed almost invariably at the end of inscriptions or sign-groups. No. 7 may preface an inscription (xvii. 25, Fig. 3), but usually stands alone at the end, in a position similar to that of the last sign of xvii. 7 (Fig. 6). Examples are to be seen on vi. 223, xvii. 431, and xxvi. 338.

(2) Signs are often reduplicated, as in the cases of a variant of sign 91 on vi. 355 (Fig. 3), of sign 26 on xvii. 249, and of a variant of sign 16 on xvii. 167. Two instances are to be seen on xvii. 7 (Fig. 6). Sign 38 seems to be particularly liable to reduplication; examples occur on xvii. 45 and xxvi. 30 and 43 (Fig. 5).

(3) Akin to duplication is the frequent habit of placing a sign next to a ligature in which it is included; for instance, in the case of sign 2 at the opening of xvii. 81 (Fig. 2), and of sign 5 in the second item of vi. 358 (Fig. 3). This last example can be matched in item 18 of xvii. 490 (Fig. 6), and again on xvii. 60 and 448. Cases involving sign 1 can be seen on vi. 211 and 305, and xvii. 1 and 3; and with reference to sign 13 on vi. 358 (Fig. 3) and xvii. 343, and to sign 23 on xvii. 390.

(4) Sometimes signs are arranged in the form of a palindromic triplet of the form A-B-A, as in item 2 of xvii. 490 (Fig. 6). Two instances may be remarked on xvii. 43, in lines 1 and 4/5. A common group of this kind consists of signs 30-19-30, as, for example, on xvii. 18 and 426, xxvi. 173, and xxxi. 29. A unique case of five signs arranged as a palindrome occurs in the heading of xvii. 46 (Fig. 4).

(5) Some pairs of signs which frequently stand adjacent may be found in either order. For instance, many tablets, like xvii. 414 (Fig. 6), begin with the two signs 3 and 1. vi. 233, 235, 257 and 290 may be compared. But the same two signs in the reverse order open vi. 209, 228, 241, 274 and 5054. The pair 34-35 of xvii. 36 is seen in the inverse order on xvii. 133, and variants of signs 15 and 31 can be seen in one order on xvii. 81 and 94 and in the inverse order on xvii. 91 and 240. A particularly clear case is illustrated on Fig. 4, with xxvi. 346 and 348. Another illuminating example may be studied on the same figure

by comparing xvii. 16 and 32. Except for the infixing of a variant of sign 16 in the first case, and the qualification of the leading sign in the second, the inscriptions are manifestly akin. But tablet 32 inverts the final two signs of tablet 16, and intrudes the numeral between them instead of placing it at the end.

(6) Comparable with this last feature is the custom of writing kindred groups with slight variations in the concomitant signs. If vi. 263 and 387 are compared (Fig. 4), it will be seen that each consists of eight signs, a numeral, a colophon, and a scribe's mark, all of which are identical in form and order except for the sixth and seventh signs. As another example, general similarities but slight differences can be observed throughout the group of tablets xxvi. 29-45, of which two (30 and 43) are shown on Fig. 5. Again, the first group of seven signs on vi. 358 recurs exactly on vi. 377 except for the fourth signs and the inserts in the second (Fig. 3).

THE FORMULAE OF THE TABLETS

After the tablets have been analysed into their component parts, they may be classified, according to their arrangement, into categories, of which the following is proposed as a provisional list :

(1) Simplest of all are the tablets containing only a row or rows of numerals, such as xvii. 70 (Fig. 3) and xvii. 58.

(2a) A good many tablets contain only one sign and a numeral. An example, shown on Fig. 3, is xxvi. 429. Among many others may be quoted xvii. 63, 65 and 429, and xxxi. 5 and 6.

(b) Sometimes a list of single signs with numerals is closed with a simple total. With xxxi. 19 on Fig. 3 may be compared xvii. 83, with headings but no totals.

(c) A special category may be made for tablets with the *gur* sign (no. 5) only, and numerals. A simple case is xvii. 65 (Fig. 3). xvii. 328 and xxvi. 362, the "scholar's copy", are more complex cases of sequences of numerals accompanied only by the *gur* sign.

(3a) Two signs and a numeral, as xxvi. 140 (Fig. 3). xvii. 66 shows two examples of this formula.

(b) A special case is the "tablet" and *gur* signs (nos. 1 and 5) with a numeral. With xxvi. 7 (Fig. 3) may be compared xxvi. 7 and 321, and xvii. 30, where this formula is closed with a scribe's ornamental mark.

(4a) An elaboration of the last formula is the same two signs (nos. 1 and 5) with one or more signs between them, followed again by a numeral. xvii. 15 (Fig. 3) is a simple case. With it should be matched two examples on Fig. 4, xvii. 16 and 32, xvii. 7 (Fig. 6), and the more lengthy inscriptions vi. 263 and 387 (Fig. 4). vi. 227 and xxvi. 306 may also be quoted.

(b) In lists of several items, the tablet may open with sign 1 and each item end with sign 5, which is also set in front of the total. vi. 358 (Fig. 3) and vi. 220 (Fig. 4) will repay close comparison. xxvi. 302 is arranged similarly.

(c) In some more lengthy inscriptions, sign 5 is appended to all or almost all the items, though the form of the heading may vary. xvii. 153, 414 and 490 on Fig. 6 may be compared. Sign 3 opens all three, as it does also the long inscription xvii. 112. The unusual feature observable in xvii. 490, of inserting a group after the total or totals, possibly as a kind of colophon, occurs also on xvii. 112.

(5a) After sign-groups, factors indicated by single signs may be listed along with numerals, without these being totalled. vi. 355 is shown on Fig. 3. vi. 399 is another instance.

(b) After a heading, variant forms of the same factor, distinguished by differing inserts, may be listed, sometimes along with quite distinct factors. There are attendant numerals, but no totals. With xvii. 5 and 125 (Fig. 3) compare xvii. 90.

(c) After various items in a list, particular factors are given with numerals, which are totalled at the end. xvii. 25 (Fig. 3) is a simple case. xvii. 81 (Fig. 2) is more complex; in it, the successive items are apparently distinguished only by alternating variants of sign 31. The sign 34 after the first occurrence of sign 31 apparently belongs to the general heading. vi. 353 and xvii. 3 and 112 may be remarked among other instances. Although the factors are usually added separately, sometimes two are totalled together, as on xvii. 17 and 43.

(6) Here the common factor, to which the numerals refer, is not listed after each item, but indicated either before (xvii. 12, Fig. 4) or after (xvii. 118, Fig. 5) the first item, and is repeated before the total. For comparison see vi. 214, 217 and 219.

(7) A special elaboration of this formula is used on xvii. 45 (Fig. 5), in which the factor illustrated by sign 32 is totalled on the reverse, and is also indicated twice after the first item, at the beginning and end of a group of five signs. No other example of this formula has been noticed, but the tablet should be compared with vi. 4997 (Fig. 5) which is described below under § 8b.

(8a) A sign or sign-group with a numeral is followed by the *gur* sign (no. 5) with another numeral. xxvi. 116 (Fig. 5) is a simple case. xxvi. 30 and 43 (Fig. 5) are two instances from a series of seventeen, xxvi. 29-45. xxvi. 220 (Fig. 4) and 161 and vi. 236 may be compared.

(b) The same formula, but with the quantities associated with the first signs or sign-groups and with the *gur* signs separately totalled. On vi. 221 the *gur* sign is accompanied usually by the "plough" sign (no. 54). The example illustrated here, vi. 4997 (Fig. 5) includes two distinct accounts, and in each of these the main total is accurate if the defective numerals be taken in every instance as 11. The numeral associated with the first *gur* entry in the second account is read, from the photograph, as 22, instead of 15 as transcribed by Scheil, thus making the *gur* total there correct. In each account, the first item, which may be understood as making or receiving a contribution (perhaps of a token kind) of one unit, is repeated in the total with the addition of signs 36 and 32. The resulting group, after sign 38, both opens and closes with sign 32, and has sign 36 in the penultimate position, as in the case of the key group after the first item on xvii. 45 (Fig. 5 and § 7, above). It seems clear that sign 32 is the common factor throughout the lists of sign-groups and in the associated totals on vi. 4997; but in one item in each list (no. 11 in the first, no. 4 in the second), it is absent. In the first instance, however, an animal silhouette occurs, and in the second the outline of an animal's head, each perhaps representing a donkey. The tentative proposal may therefore be made, that sign 32 (concerning which several conjectures are mentioned above in the discussion

of attempts to interpret the texts, on p. 25) represents an animal, or that an animal is here a specific instance of a general idea which is conveyed by sign 32.

THE NATURE OF THE SCRIPT

The conclusions of Scheil, de Mecquenem, and Contenau, that the script of the Proto-Elamite account tablets is largely, and possibly entirely, ideographic, are confirmed by much of what has been observed above. The prevalence of signs standing in isolation, the extensive use of ligatures, the preference of certain signs for particular positions in the formulae, the types of prefix, infix, and suffix in the sign-groups, and the variable order of the signs in kindred groups, are all considerations which converge on this same conclusion. As a final instance, it may be remarked that an opening formula of two signs, nos. 3 and 1, which, it is only reasonable to assume, must always convey the same meaning, may occur in either order (§ 5 of the discussion of the Signary, p. 28); and another such formula, comprising signs 2 and 1, may be written in the order 2 plus 1 (xvii. 5, 49, 95), or as a ligature with 2 inside 1 (xvii. 26, 48, 98, 109, 335, 336), or in the form 2 plus the ligature just described (xvii. 81). Such variations can only be possible in writing which is basically ideographic.

It is, of course, possible that this script includes some phonetic elements; but the general impression from a scrutiny of the documents will probably be that this is unlikely. The task of comprehending an ideographic script must, even in the most favourable circumstances, be both difficult and hazardous. Such an obvious combination as "horse plus plough" on xxvi. 120 (Fig. 4) may be interpreted in a number of different ways, for example as plough-horse, or horse-plough, or as a unit of land defined by horse ploughing, or the produce therefrom, or again as a rebus or canting device.

At present the only reasonable objective can be to appreciate, through rigorous internal analysis, how the script functioned. The manner of thinking involved in such writing, which is so alien to that to which we are now accustomed, is not easy to appreciate. But some clues may be found in the symbolism of heraldry, astronomy, chemistry, engineering, and, above all, of

mathematics. Some forms of ideographic writing may be loose and fluid ; the Indian dhobi, for example, has a variable repertory of signs with which to inscribe the clothes of customers to his laundry. But in the Proto-Elamite script it is noticeable that not only the individual signs but also certain characteristic associations of signs recur among the several sets, although they were discovered in different trenches and at different levels. This was a highly conventionalized and formulaic script, not a collection of *ad hoc* jottings. It leaves the impression of official or even ritual documentation of a set of notions covering a comparatively limited range of experience.

1		21		41		61		81	
2		22		42		62		82	
3		23		43		63		83	
4		24		44		64		84	
5		25		45		65		85	
6		26		46		66		86	
7		27		47		67		87	
8		28		48		68		88	
9		29		49		69		89	
10		30		50		70		90	
11		31		51		71		91	
12		32		52		72		92	
13		33		53		73		93	
14		34		54		74		94	
15		35		55		75		95	
16		36		56		76		96	
17		37		57		77		97	
18		38		58		78		98	
19		39		59		79		99	
20		40		60		80		100	

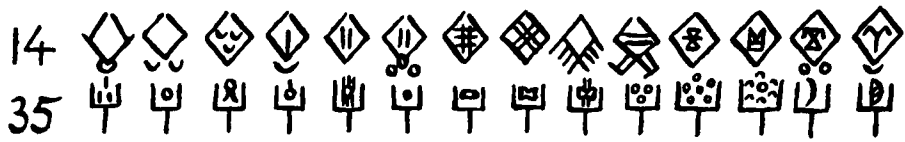


FIG. 1. 100 of the more common signs of the Proto-Elamite signary, and selections of variant forms of two examples.

Sign	VI	XVII	Langdon	XXVI	XXXI
	—	—	—	100,000	10,000
	10,000	600 (6,000?)	10,000?	10,000	1,000
	1,000	60 (600?)	1,000 (cf. 6)	1,000	300
	100/—	100/100	100/100	100/—	100/—
	10	10	—	10	10
	1	1	—	1	1
	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	—	—
	$\frac{1}{6}$	$\frac{1}{3}$	—	$\frac{1}{5}$ (60 qa)	$\frac{1}{3}$
	$\frac{1}{12}$	—	—	$\frac{1}{10}$ (30 qa)	$\frac{1}{10}$
	$\frac{1}{30}$	—	—	$\frac{1}{30}$ (10 qa)	$\frac{1}{30}$
	$\frac{1}{60}$	—	—	$\frac{1}{60}$ (5 qa)	$\frac{1}{60}$
	—	—	—	—	$\frac{1}{120}$ (2½ qa)

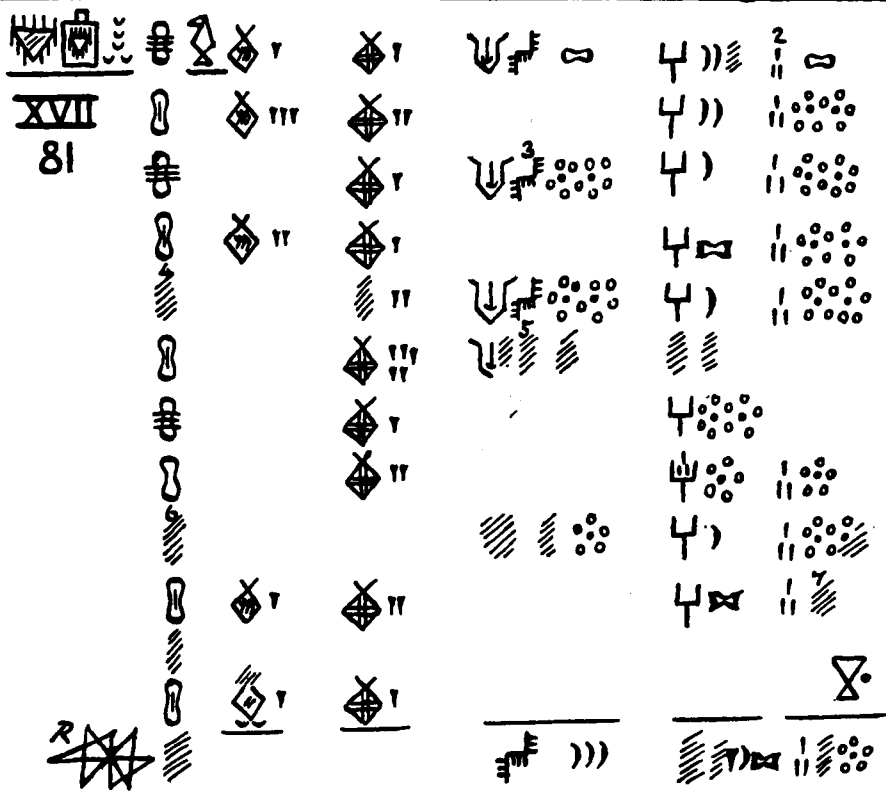


FIG. 2. Various interpretations of the numerical signs : Analysis of one tablet.

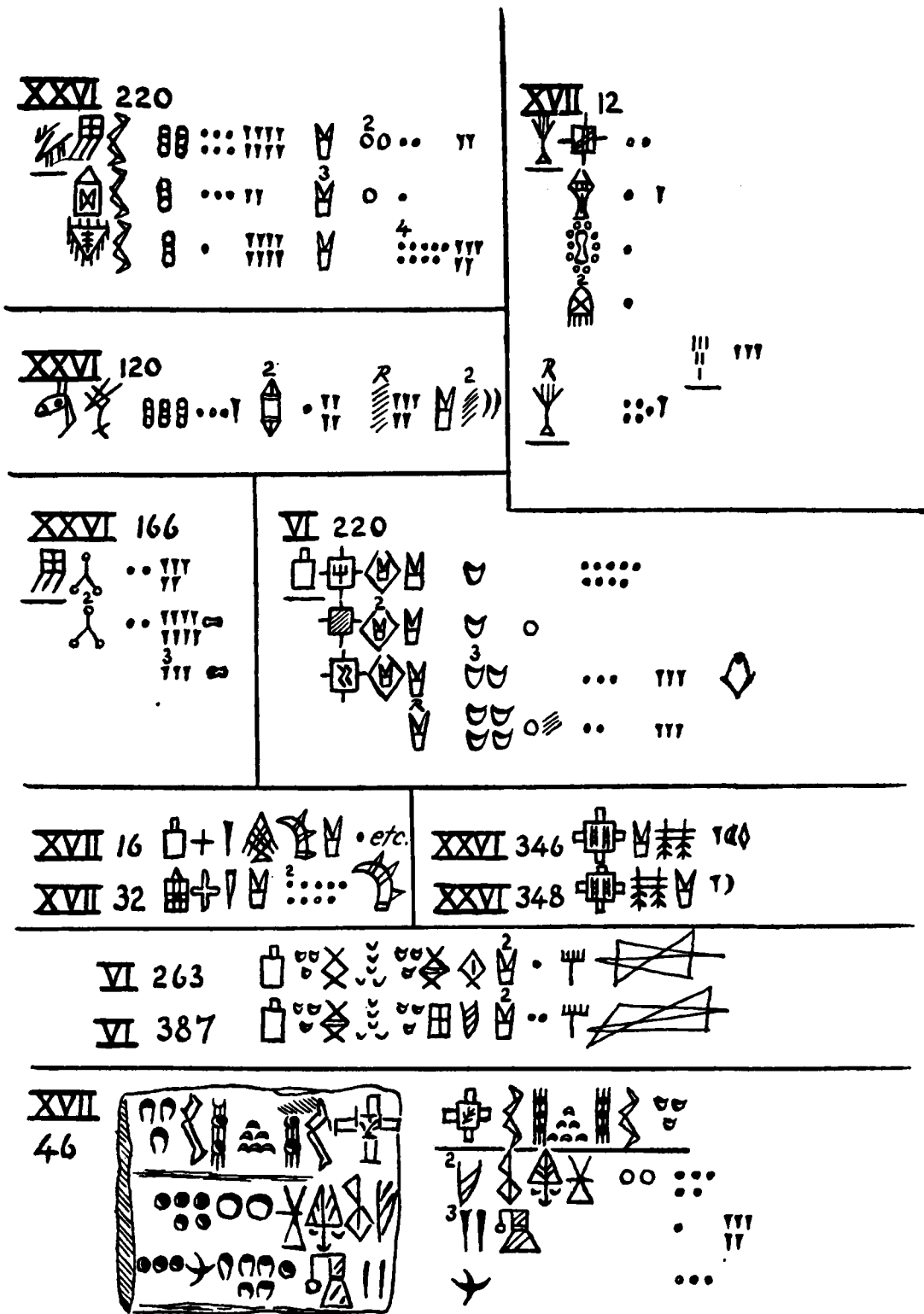


FIG. 4. Analyses of selected tablets.

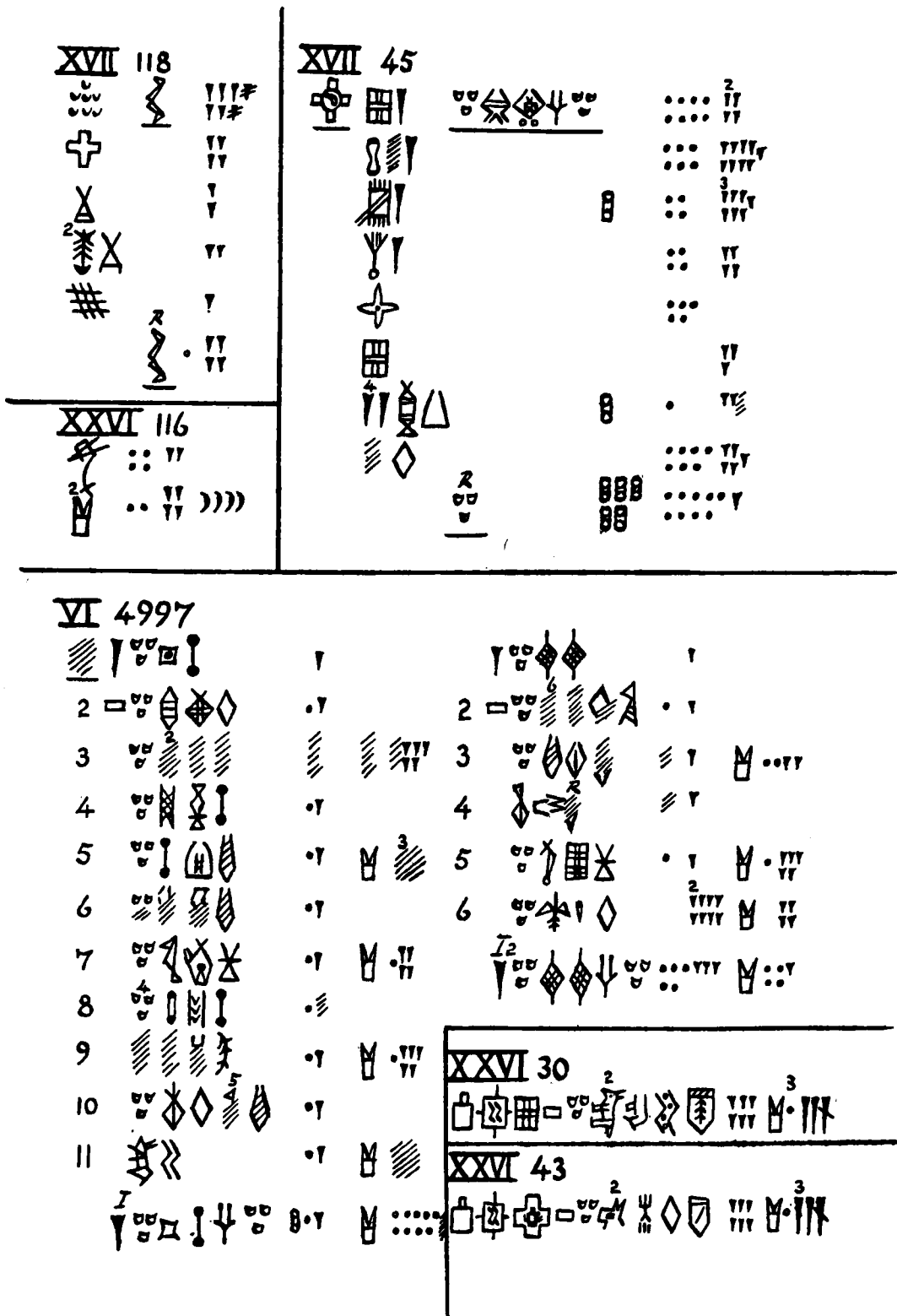


FIG. 5. Analyses of selected tablets.

XVII 414		XVII 490	
	1		.
2	1	2	.
3	1	3	.
4	11	4	...
5	1	5	.
6	1	6	1
7	1	7	111
8	1	8	111
9	1	9	. 1
10	1	10	.
11	1	11	111
12	1	12	111
	111	13	111
<hr/>		14	111
XVII 153		15	.
2	1	16	3 111
3	11	17	11
4	11	18	11
5	11		0... 11
6	3 11		
7	11	<hr/>	
8	4 11	XVII 7	

		+	..

FIG. 6. Analyses of selected tablets.

II. THE QUESTION OF LIGATURED SIGNS IN THE CRETAN LINEAR SCRIPTS¹

By ERNST GRUMACH

PERMIT me first to explain in a few words why I have taken the question of ligatures as the subject of this study. The inscribed evidence that we possess for the Cretan linear systems A and B consists, both in Crete and on the mainland, with few exceptions, of clay tablets which show a peculiar structure. Introductory formulae, which usually consist only of a few sign-groups, are generally followed by single signs, which themselves are often introduced by one or more groups. These single signs are often distinguished by their size from the signs constituting the introductory sign-groups. In addition, they are accompanied in most cases by signs indicating numbers and measurements. Hence there can be no doubt, and indeed no one does doubt, that, in the case of these signs, we are dealing with ideographic representations for definite substances or objects. This conclusion is the more certain because in many of these signs we can recognize straight away the objects represented, either by their pictorial form, as with *cattle, horses, pigs, figs, cereals* and so on, or, as in the case of the sign for *wine*, by comparison with parallel signs in Egyptian or Hittite. Today people are accustomed, depending on their different views of the tablets, to describe these signs as "commodity-signs", as "object-signs", or simply as "ideograms". I would suppose "object-signs" to be the best term, because it posits pictographic representations of the objects with which the calculations in the tablets are concerned and because it therefore constitutes a neutral designation which does not prejudice the interpretation of the tablets. The frequent use of these signs—and their frequent arrangement in lists to form whole series of objects—evidently represents a peculiarity of the Cretan tablets. We know of nothing similar, even

¹ This paper was read on 17 April 1962 as the Charles Gordon Mackay Lecture for 1962 at the University of Edinburgh. For the translation of the text from the German I am indebted to Professor A. J. Beattie.

in the range of Egyptian and Hittite hieroglyphic texts, which in other respects offer so many parallels and from many points of view facilitate the understanding of the Cretan script. As W.C. Brice has shown, we must go back to the Proto-Elamite inscriptions, to find even an approximately comparable structure of texts, although so far we are unable to say whether in fact a historical connection exists here or only an accidental relationship is involved.

Only this much can be said, that we have to do here with a phenomenon which in Crete itself can be traced to the very beginnings of the script. For already on the hieroglyphic clay bars from Knossos, which were published by Evans in *Scripta Minoa I* (1909, P. 100 ff.), and which we can in a sense treat as precursors of the Cretan clay tablets, we find similar sequences of ideograms for plants and other things, together with signs for numbers and measurements. We find such sequences already on the so-called "Phaestos hieroglyphic tablet" (P. 121 in *Scripta Minoa I*) and on the clay tablets and clay bars found by Doro Levi in the oldest strata of the Palace at Phaestos and now published by Pugliese Carratelli.¹ Since these texts can be dated with confidence, in terms of pottery finds, to the Kamares period, it is certain that an original and specific form of tabulation is involved, which is continuous from the hieroglyphic and proto-linear texts through the Linear A tablets to the Linear B tablets from Knossos and also the mainland tablets from Pylos and Mycenae: that is to say, over a period of about 700 years. If, as is often done today, one reads these Linear B tablets as "Mycenaean", and if one adduces as proof that the language of the tablets is Greek, that it is a question of administrative texts "and that one would expect the language of the ruling class above all in documents and directives in the sphere of administration",² then it may be objected that the Mycenaean lords, or their Cretan servant-scribes, used here in any case a method of tabulation and of writing that is a very ancient Cretan tradition. But it remains still an unresolved question whether we are really concerned here with purely administrative or mercantile texts.

¹ *Annuario della Scuola Archeologica di Atene*, xix/xx (1957-58), pp. 363 ff.

² A. Heubeck, *Gymnasium*, lxvi (1959), 497.

One of the most striking peculiarities of the object-signs is that they often appear not alone but combined in ligatures with one or more other signs. Anyone who compares the instructive table of ligatures published recently by Brice in his brilliant edition of the Linear A texts¹ will recognize that here too we have a phenomenon which goes back to the older kind of linear writing; and similar connections can be observed in the proto-linear texts. Evans, discussing the frequent appearance of compound signs in Linear A, observes, amongst other things, that "this practice was, in fact, of very old inheritance in Crete, and is illustrated by the conjunctions of masons' marks on the Early Palace blocks"—that is to say, it is a phenomenon which evidently goes right back to the time of the foundation of the older palaces.

According as the additional signs are merely set alongside the ideograms or are combined with them, people talk today of "adjuncts" and "compounds". It is necessary to add that the delimitation between "adjuncts" and "compounds" cannot be clearly drawn. Quite often we can trace how adjuncts become fused with the principal signs and so form compounds, and equally we can observe the opposite process; the signs combined in a ligature are capable of dissolving their union and being set alongside each other, like normal signs used in writing. Two examples, to which I shall return later, are apparent in Fig. 1, where in both series the combined and separate writing of the same signs alternate with each other. In this case it is particularly important to note that all these examples come from the same archive, namely from the clay tablets of Hagia Triada; that is to say, *both* forms of writing, ligature and juxtaposition, appear alongside each other in the same archive. A third example, to which I shall also return later, can be seen in Figs. 3 and 4; here we are concerned with a combination of signs which is read by Ventris as *me-ri*, "honey". It is apparent that the signs written separately as a sign-group alternate with the ligature, although, in terms of context, connection with amphorae, etc., it is to be assumed that the meaning, namely *content of amphorae*, remained the same; so that, in view of our own habits, we should expect a constant form of writing. We therefore

¹ *Inscriptions in the Minoan Linear Script of Class A* (Oxford, 1961), Table 3,

reach this conclusion: in the observed cases (which can be multiplied), ligature and juxtaposition apparently alternate irregularly, without the sense of the combinations being affected by this alternation. This is a very strange phenomenon for which we know no parallels in the contemporary systems of writing in the Eastern Mediterranean and Near East. So in all three phenomena, in the regular use of ideographic object-signs, in the combination of such signs with other signs to form "adjuncts" or "compounds", and in the striking alternation of ligature and juxtaposition, we have evidently before us peculiarities which are specially characteristic of the Cretan script and which, therefore, can tell us something about its nature. We may, therefore, hope to divest it to some extent of its secret character if we investigate the question of ligatures more closely.

No satisfactory explanation of ligatures has yet been established. Evans was content to note the frequent occurrence of "compound" signs in Linear A and to trace these back, as I have already remarked, to an older Cretan tradition. Myres supposes (*Scripta Minoa* II, 1. 41) that the ligatures in the Linear A script might have served the purpose of saving space, an explanation already rejected by Brice (op. cit. p. 5). It simply does not meet the case to say that ligatures are only used where there is shortage of space or, vice versa, juxtaposition where there is abundant space. A glance at our examples is sufficient to refute this explanation. Even Sundwall, to whom we are indebted for the most powerful observations on the question of "compounds", did not develop a proper theory of his own. In all his writings, however, he does regard it as self-evident that, in the case of both "adjuncts" and "compounds", we have to do not with phonetic signs but with combinations of ideograms.

Ventris and Chadwick were the first to propose a proper theory of "adjuncts"; they, however, go in the opposite direction. They explain them thus (*Documents in Mycenaean Greek*, p. 53): "They (the 'adjuncts') probably all stand for the initial syllables of Greek adjectives or nouns, intended to differentiate the meaning of the ideograms", and they themselves and their followers have tried to interpret a series of the commonest "adjuncts" in this way. On this view, "adjuncts" were

abbreviations for names or for attributes of the objects represented ideographically, and were intended to help to qualify these objects or to define them more closely. I should like to say at once that this theory threatens one of the pre-suppositions on which the Ventris-Chadwick decipherment rests—namely, the assumption of different languages in Linear A and B. We can indeed say that some Linear B ligatures were taken over from Linear A.¹ It is therefore obvious that, in these cases at least, the “adjuncts” concerned cannot be initial syllables of *Greek* adjectives or nouns. Ventris-Chadwick (*Documents*, p. 36) themselves state: “Since these Mycenaean ideograms were evidently taken over from Linear A as they stood, it is useless to look for a Greek word to round out the component syllables”. If the phonetic explanation of “adjuncts” is right at all, only Minoan designations could be involved in these instances; and the reader of the tablets might thus have understood the “adjuncts” sometimes as Greek abbreviations, but on other occasions he would not have been able to understand them at all, because they had been taken over from the substrate language. Schachermeyr² states that Greek readers in these instances “inferred, or tried to infer, the meaning of such ideograms with the help of (Greek) parallels written in phonetic script”. Something of this sort is not inconceivable. Even the uneducated reader understands the letters “etc.” in a text without knowing that it means *et cetera*. But it would be very strange if such “adjuncts”, which were incomprehensible to the Greek reader, should have served the purpose of identifying or qualifying ideograms, particularly in a script which is supposed to have been created for the needs of a new population. Moreover, if the Linear B system of “adjuncts” evidently presents a continuation of the Linear A system, and if individual “adjuncts” were taken directly from Linear A, we must ask (with some degree of astonishment) how the Mycenaean scribes came to create, on the basis of this incomprehensible pattern, a system of *new* “adjuncts” which nevertheless appear, strangely enough, to be the initials of *Greek* words. There is something

¹ Cf. J. Sundwall, *Etudes mycéniennes*, p. 121 and *Minos* IV, i. 45, as well as Grumach in *Orientalistische Literaturzeitung*, 52 (1957), 319.

² *Anzeiger für die Altertumswissenschaft*, xi (1958), 211.

amiss here. Either the theory that Linear A and Linear B represent different languages is wrong or the theory that the "adjuncts" are to be explained phonetically is wrong.

A second point arises; what is the sense of such phonetic "adjuncts" to be? On tablet KN 704, which is reproduced in Fig. 4, there is seen beside the amphora not only the ligature for *me-li* but also a double-axe inscribed inside the vessel itself. For this, too, there is a precedent in Linear A, not indeed in the form of an amphora but in the form of a pot-like vessel, above which there is a double-axe.¹ It is precisely the fact that the sacral symbol is combined with various vessels that prompts the thought that we have to do here with vessels standing in a relationship to the cult of the double-axe. Ventris and Chadwick think otherwise; since the double-axe is read as vowel *a*, because it is the most frequent initial sign, they interpret it here too as *a*, as an abbreviation for *amphora*, of course. I must confess that the meaning of this kind of writing escapes me. The aim of the ideograms is, as we have seen, to indicate the objects which they depict; and the Minoan or Mycenaean reader who saw an amphora drawn so neatly and clearly no doubt understood without any auxiliary sign that the scribe means an *amphora* here, and not a *jug* or a *vat*. That he in fact understood this is proved by the amphoras on KN 705 (Fig. 3); for they have no double-axe. The additional double-axe on KN 704 (Fig. 4) must, therefore, have a special significance—that is to say, this amphora is distinguished from others as standing in a special relationship to the double-axe, and is indeed a *double-axe amphora*, whatever we are to understand by that.

The function of the ideograms seems to me to have been misunderstood in these cases. The path travelled by the art of writing leads, if I may recall a famous title of Paul Sethe, "from picture to letters"; and the ideograms are, if you will, a surviving remnant of the original pictographic script, in which the object drawn stands for a definite concept. It would be paradoxical, and moreover incomprehensible, in terms of the history of scripts, if the pictorial signs which stand for a concept were

¹ HT 39, 4, and thereon J. Sundwall, *Acta Acad. Aboensis. Humaniora* XV, ii, 1944, 15.

to be explained by phonetic signs, which themselves grew out of pictographic signs through a long process of development.

These arguments would be even more valid if the Minoan ideograms, as supposed by J. A. Davison,¹ F. Schachermeyr² and others, were *determinatives* in character and function. Determinatives, as everyone knows, serve to establish the categories of meaning to which words written phonetically belong, and so to eliminate ambiguities. It would thus be essentially inexplicable and incomprehensible if these signs, which are supposed to determine and fix words written phonetically, were themselves to be determined by phonetic signs, or even to be qualified by initials of adjectives, since these are irrelevant to a determinative of *general* meaning. In any case this theory contradicts the other that these signs served to convince "the illiterate nobleman that the accounts were in order",³ for it is hard to see how phonetic auxiliary signs could help the *illiterate* person who tried to use them. But we can only feel sorry for the *literate* user of the tablets as well, if he had to distinguish between (a) incomprehensible *Minoan* abbreviations, which were preserved only by custom, (b) abbreviations of *Greek nouns*, which designate the objects, and (c) abbreviations of *Greek adjectives*, which qualify the object in one respect or another—an extremely inconsequential system, which doubtless gave the Mycenaean reader many hard nuts to crack and also provides the modern reader of the tablets with fascinating puzzles to solve.

The matter becomes still more complicated, because the meaning of the "adjuncts" is supposed to vary with the ideograms with which they are connected. The double-axe, as I have said, is supposed to mean *amphora* when it accompanies an amphora but to mean *almonds* (*amygdala*) when it accompanies *oil*—that is to say, a particular kind of *almond-oil*⁴—and yet another word beginning with *a* when it accompanies *olives*.⁵ The theory wrecks itself at this point, since no one can discern the value of "adjuncts" which should fix or qualify a generic ideo-

¹ *Phoenix*, xiv (1960), 20.

² *Saeculum*, x (1959), 61 n. 26.

³ Davison, *op. cit.*

⁴ L. R. Palmer, *Gnomon*, xxxii (1960), 194.

⁵ Ventris-Chadwick, *Docs.*, pp. 218 f.

gram but which change their meaning with the ideogram which they are presumed to determine.

A final point, and one that is of fundamental importance for our present subject, is that the entire theory seems to me to be derived from the instances in which one "adjunct" sign is combined with one ideogram only. For this reason it fails in instances in which two or more "adjuncts" are combined in different ways with a single ideogram. An interesting example of this is shown in Fig. 2. This is Knossos tablet 616, in the first line of which are seen two ideograms for *woman*, each of which is combined with two "adjuncts". It is to be noticed that the "adjuncts" alternate not only in the order in which they are written but also in the level at which they are written. The sign which in the first case is placed higher up and in second position, in the second case is placed lower down and in first position.

The volume entitled *The Knossos Tablets*, edited by Bennett, Chadwick and Ventris,¹ transcribes the signs in the following way: *pe. di. WOMAN 2 di. za. WOMAN 2*. Regarding this interpretation, the following comment may be made. To begin with, Evans assumed that the various forms of the Linear B sign B 102, which he collected in *The Palace of Minos IV*, Fig. 684, are to be explained as ideograms for *women* and, accordingly, the sign-groups which frequently accompany them, 70-42 and 70-54, must be understood to mean *children*. His interpretation appeared to be so plausible and so self-evident that A. E. Cowley, in his well-known *Note on Minoan Writing*,² proposed *kouros*, *kourē*, and this proposal was subsequently taken up by Ventris as *ko(r)wo(s)*, *ko(r)wa*, and played a decisive role in his *Work-note 20* in the application of the sign *ko* and the readings *ko-no-so* etc.³ I believe that the basis for this interpretation is not so sure as people since Evans's day have assumed, for the simple reason that, on our tablets, there are clearly to be recognized two different signs for *woman*. In the first sign the breasts are

¹ *Bull. Inst. Class. Stud.* (Univ. of London), *Suppl.* 2 (1957), Ak. Nr. 52.

² *Essays in Aegaeon Archaeology pres. to Sir Arthur Evans* (Oxford, 1927), pp. 5 ff.

³ Cf., on this point, Grumach in *Gnomon*, xxxii (1960), 684 f.

visible, in the second they are not, and the distinction is, both here and elsewhere, marked so clearly that the Cretan scribes obviously attributed significance to it. At least, we should have to distinguish here two ideograms, *woman I* and *woman II*, which must naturally have had distinct meanings. But that is not all; Evans (op. cit. p. 709) already recognized that the "characteristic elongated triangular outline" of the lower part of these signs is evidently intended to show that both women are wearing the Cretan dress or crinoline. If, in addition, the breasts are shown in the case of the first woman, we can without difficulty recognize another element of the Cretan costume, the short jacket with deep décolleté, leaving the breasts exposed, which is to be observed on the Snake Goddess from Knossos and other artistic representations. In addition, Chapouthier, in an important article,¹ correctly traced this form of the Linear B sign for *woman* to the representation of a woman on a cylinder seal from Mallia, in which the costume with crinoline and exposed breasts is clearly recognized. If this is correct, the least we can say is that the left-hand sign is not simply an ideogram for *woman*. Archaeologists and historians of religion are nowadays at one in believing that the costume under discussion is not for everyday wear and is no sophisticated court costume, as was long supposed, but a *cult* garment, which probably was worn only for certain ceremonial occasions.² A well-known Minoan seal shows a clothed woman who has a double-axe in her right hand and a crinoline in her left, apparently with the intention of putting on the latter; another seal represents a woman between two of these dresses. According to Matz's convincing interpretation,³ the sacred garments qualify these women to appear in the costume and in the role of goddess at the cult-ceremonies. Through the costume the women became personifications of the goddess; and Lehmann-Haupt⁴ has convincingly brought the Cretan cult-garment into connection with a Babylonian garment which is

¹ "L'Orient et la Crète à propos d'un cylindre crétois", *Archaiologikē Ephemeris*, i (1937), 321, fig. 3.

² The question has been thoroughly reviewed recently in H. Reusch, *Die zeichnerische Rekonstruktion des Frauenfrieses im böotischen Theben* (Berlin, 1956), pp. 52ff.

³ F. Matz, *Kreta, Mykene, Troja* (Stuttgart, 1956), p. 85.

⁴ *Klio*, 4 (1904), 387.

“ the characteristic sign of the *divinities* (not priests) concerned, who lead the suppliant into the presence of the seated supreme deity ”.

In view of these facts, it is, as I have said, hard to believe that the left-hand woman, (or, indeed, either ideogram) should mean nothing other than *woman*. One could hardly suppose that the Cretan scribes used so special a sign to record a general concept, particularly since our tablet shows that the two women are to be distinguished by their garments. So one may doubt whether both signs are rightly interpreted as *woman*, and hence whether the sign-groups accompanying them are to be understood simply as *boys* and *girls*. I make this observation only to show how hypothetical these interpretations are, although at first sight they seem to be very plausible.

If, now, we return to the question of the “ adjuncts ”, we may notice a second mistake in the transcription, namely that in it the “ adjuncts ” are simply placed alongside each other. The reason for this is doubtless incorrect copying of the tablet ; for the scribe—apparently on purpose—arranged the adjuncts on different levels. I apprehend in any case that such a method of writing is hard to explain on phonetic grounds ; indeed I would go so far as to assert that this method by itself renders the phonetic hypothesis impossible. If the external “ adjuncts ” here belong respectively to the internal ones, in both cases the initials of adjectives or nouns would have to be defined or qualified by other initials—an evident impossibility. If, however, both “ adjuncts ” in both instances refer to the generic ideogram, it can hardly be explained on phonetic grounds why they not only stand in varying relationship to the generic ideograms (and stand further from or nearer to these) but also on different levels. Evidently the scribe wished to express by this means that the “ adjuncts ” in the two cases have a different order of importance. In other words, the concepts, or words for which the adjuncts stand, are here in varying relationship to the generic sign to which they belong, and in a different way in each case. Accordingly, we have to do with a complicated method of writing concepts which are related to each other in different ways, and from these we can learn two things : (1) that the

“ adjuncts ” must be signs for concepts—that is to say, ideograms, and (2) that the Cretan script is capable of combining such conceptual signs in very different ways, so that in combination they form new concepts. Our example in Fig. 4, despite the fact that at first glance it appears so simple, is in fact a complicated grouping of ideograms. For here we have *four* signs which are combined to form a new concept: the generic ideogram which stands for “ amphora ”, the internal sign which places this amphora in relationship with the double-axe, and finally the signs *me + li* (so-called), which together give the content of the amphora.

Let us now see whether this explanation of ligatures which we have reached by considering the “ adjuncts ” remains valid in the case of “ compounds ” too. Since it is impossible to give even a general conspectus of compounds in the Cretan scripts within the space of one article, I have collected in Fig. 1 and in Figs. 3 and 4 examples for Linear A and B, which have already been touched upon. It has been remarked above that the examples in Fig. 1 come from the Hagia Triada tablets, that is to say, from a relatively small archive, covering a limited period of time. It is thus all the more remarkable that in both series the “ combined ” and “ separate ” forms of writing alternate with each other; that is to say, ligature and juxtaposition of the same signs appear next to each other. Ventris and Chadwick (*Documents*, p. 35) regard ligatures as “ the telescoping of two or more phonetic signs into a monogram ” and in fact, from the point of view of our own modern writing, the notion of monograms is congenial. Nevertheless, the monogram is a highly developed artistic form, very often only a trick of writing, which we usually employ on coats of arms, signet rings and things of that sort—that is to say, on limited writing-surfaces—and we have already seen that ligatures in Linear A and B are not used simply because space is short. Moreover, it is unusual for monograms and separate forms of writing to alternate with each other within the same texts, but this in fact is just what we observe in Linear A and, as Figs. 3 and 4 show, in Linear B. Accordingly, it is difficult even on general grounds to understand the Linear A and B compound signs simply as monograms or phonetic signs.

Moreover, a nice question arises if it is a matter of phonetic signs. In what order were the signs read? I give a simple example of this. The ligature standing at the head of the second column in Fig. 1 belongs to the ligatures that were taken over by Linear B, in which they are usually understood nowadays as ideograms for *wool*.¹ It is amusing to see that Goold-Pope² read the Linear A-ligature as *ruma*, while Ventris and Chadwick read it in Linear B as *maru* with equal confidence. Minoan readers of the texts must have been in exactly the same difficulty, and repeatedly so, since compounds are strikingly frequent in Linear A. Indeed, one would have to assume that the scribes of the Hagia Triada tablets constantly created ambiguous signs because they were so fond of ligatures.

Now it might be thought that the explanation of the "compounds" was given through the context. If *we* read in a text the compound for "and" it does not occur to us to read this as *te*; we know through habitude and from the context that this is to be read as *et*. But in the Hagia Triada tablets there is no context in the strict sense of the term. The texts consist only of single sign-groups and ligatures, or of ideograms with the signs for figures and measurements belonging to them. Another explanation might be that the understanding of ligatures was determined by strict rules; and such a rule may in fact have been effective in series I (Fig. 1), for the double-axe in Linear A almost always stands at the beginning of sign-groups, and in Linear B it does so most of the time. One might thus understand that the double-axe ligature in series I was always resolved on the basis that the double-axe comes at the beginning. Series II, however, shows us that in this case both forms of resolution were possible. The reading A-B was, in this and in parallel cases, just as possible as the order B-A. Since, moreover, juxtaposition accompanies ligature here too, both possibilities must have been inherent in the ligature. It follows that the ligatures must consist of signs which can be transposed; or, in other words, whose arrangement is not relevant to the

¹ Ventris-Chadwick, *Docs.*, pp. 52, 313 ff.; Bennett, *MT*, ii, 99, and J. Killen, "The Wool Ideogram in Linear B", *MLS*, 8. iii (1961), 235 ff.

² *Preliminary Investigations into the Cretan Linear A Script*, p. viii.

understanding of the combination. If this is correct, the ligatures cannot be phonetic signs, the arrangement of which cannot be changed without simultaneously changing the sense of the sign-group. The only solution that I can see is, therefore, that in this matter too the component parts of the ligatures are ideograms, which together form a single concept. Only because this is the case—that is to say, because both signs are understood together as a unity from the outset, is it possible to explain the fact that the scribes can express this concept by the order A-B as well as by the order B-A, or—more obviously and impressively—through merging the two signs in a ligature. The inclination to form ligatures, which is so characteristic of Linear A, might then be explained very simply in terms of effort to form *conceptual units* of this kind. The proof of the theory that Linear A-ligatures in fact consist of ideograms can now be presented in simple fashion (for I cannot in any event adduce all the arguments in detail):

(1) Every sign, or nearly every sign, that occurs in ligatures also occurs independently as an ideogram.

(2) A proportion of these signs are isolated by punctuation, even in combinations of words. This naturally means that the signs are to be read in isolation at this point.

(3) The signs, apart from the double-axe, constantly change their position. In this connection I refer to my article "Positionswechsel in den kretischen Schriftsystemen H und A",¹ and to the article by Brice which is complementary to it, "Some Observations on the Linear A Inscriptions".²

An example from Linear B may now be given. I have deliberately chosen the tablet in Fig. 3, because it has achieved a certain fame through the Ventris-Chadwick decipherment. This is tablet KN 705, the first line of which is supposed to signify

a-mi-ni-so e-re-u-ti-ja ME + RI AMPHORA 1. "Amnisos: one jar of honey to Eleuthia."

This means, as I said earlier, that the ligature B13 + 53, which stands just to the left of the amphora, is to signify *ME + RI*,

¹ *Forschungen und Fortschritte*, 36 (1962), 115 ff.

² *Kadmos*, 1 (1962), 42 ff.

“honey”. I should like first to put forward two objections to this interpretation :

(1) Minoan scribes, as early as the period of the hieroglyphic script, created ideograms for the commonest stuffs, such as *grain, figs, wine*, etc., and these, as we saw, were inherited in Linear B. It is hardly to be assumed that, for a substance so much used in cults and in daily life as *honey*, no ideogram should have existed. (Possibly, however, this ideogram is still concealed amongst the ideograms which we have not been able to identify as yet.)

(2) If there were really no ideogram for honey and the word had to be written syllabically, why did the scribes not keep to the written form *me-ri* but, instead, put the two signs together to form a ligature, which, in Fig. 3, is put *beside* an amphora or, in other instances, *upon* the amphora ?

Ventris-Chadwick (*Documents*, p. 52 f.) develop a complicated hypothesis to explain this type of writing. On their view, the ligatures must have arisen through “the process of forming such abbreviations from Greek words . . . and this variability suggests that most of the ‘monograms’ are only optional abbreviations, which may be used at the scribe’s discretion where time or space is short. . . . After being used for over 200 years one might have expected such abbreviations to be self-explanatory”. This theory appears to me just as unsatisfactory as the theory of adjuncts, for the simple reason that (1) it does not explain what it sets out to explain, namely the alternation between the combined and separate forms of writing. If these abbreviations had become self-evident in the course of centuries, it is impossible to understand why they were not used on all occasions (2) it remains incomprehensible how time is to be saved if the same signs are written out again in a different arrangement. We have already said that ligatures are not used simply to save space, and we can see the truth of this in Fig. 3. Besides, in one tablet (Pylos Un 718) we find the word *tu-ro₂* and after it the ligature *TU + RO₂*, both word and ligature combined in the same group and separated from each other only by a simple vertical stroke. Ventris and Chadwick (*Documents*, p. 52) say : the ligature “is introduced by the full spelling of the word, as

if to say $TU + RO_2$ is to be taken as an abbreviation for $tu - ro_2$ ". But a ligature which has to be introduced by the full spelling of the same word cannot be an abbreviation. Whatever the sense of this strange combination may be, it must be clear that it cannot be a combination of phonetic signs. If these signs were phonetic, this kind of writing would be merely a piece of frivolity.

To return to our previous example, $ME + RI$, it can easily be shown in this case too that the components ME and RI cannot be syllabic signs but are in fact ideograms. I refer in this connection to the two tablets from Pylos which I have set beside each other in Figs. 5 and 6. In the first of them (Un 02), the sign ME is seen in a series of *animals*, *figs* and other ideograms which are combined with signs for figures and measurements. Since the ME sign is in the same situation there can be no doubt that it is here a sign for a commodity or an object which can be measured and counted. Even Ventris and Chadwick observe (*Documents*, p. 220) that here ME is probably a commodity, "the abbreviation ME , being a liquid, is probably *meli*, 'honey' ". From this we learn, to our astonishment, that there was a still shorter abbreviation for "honey", and so we can hardly understand why the person who wrote Fig. 3 took the trouble, in order to save time and space, to combine these signs in an artfully contrived ligature.

On the second tablet (Ma 124), and equally in the other tablets of the Ma class, we even see both signs ME and RI , separated only by a few spaces, combined with numeral signs—a form of tabulation which is repeated in both lines of the tablet. It cannot be doubted that both signs here must stand for substances which can be counted and measured. Ventris and Chadwick refrain from any interpretation at this point and that is doubtless wise, since it would be difficult to explain RI , in addition to ME , as an abbreviation for "honey". They therefore suggest that the signs in the Ma class might have a meaning different from that which they have in other places.¹ But this is an unsatisfactory explanation. An interpretation is only confirmed

¹ *Docs.* p. 290: "There is no guarantee that they have the same meaning as similar syllables used as abbreviations in other contexts."

when it is proved valid in all positions. If *ME* and *RI* cannot be interpreted as "honey" in the Ma class of tablets, this is proof that the interpretation is false. To summarize, we can, therefore, say that it is unlikely that a commodity so common as honey was written not in ideographic but in syllabic form. Moreover, tablet Un 02 and the tablets of the Ma class show that *ME* and *RI* are not syllabic signs but ideograms for commodities which can be counted and measured. If we find these two signs beside amphorae at Knossos, whether combined with each other or separate, the simplest explanation is that these amphorae contain a substance which is a mixture of the substances *ME* and *RI*. If so, the ligature is simply a means of expressing a combination of the substances *ME* and *RI*; and in this sense a ligature is only too easily comprehended. If this combination is kept in amphorae, or in open bowls, as another class of tablets from Knossos indicates, this speaks in favour of a *liquid* or *soft* substance. If, moreover, some of the amphorae bear a double-axe, this indicates that the substance was used in the double-axe cult. We can, therefore, assume with a high degree of probability that *ME + RI* is a mixed drink, perhaps of an intoxicating nature, which played a part in the double-axe cult.

However, I do not want to put forward now my own interpretation of the Knossian tablets, but simply to show, in the case of certain examples, that the ligatures of both systems of the linear script cannot be phonetic combinations of phonetic signs but must be *combinations of ideograms*. These combinations, as we have seen in our last example, can evidently, in certain cases, signify quite simply the actual combination of two things or substances. They may also, however, as is at least probable in the double-axe ligature in Fig. 1, express a conceptual combination of signs which are symbolic and which by this means are put together to form larger conceptual units.

This seems to me to be a very notable conclusion, for the very reason that through it we learn something about the nature of the Minoan script. We learn: (1) that all signs which appear in ligatures must be ideograms—and, in both categories of script, that is a considerable number; (2) that such signs can be simply juxtaposed without being ligatured. This means, therefore,

that so-called word-groups may also consist of ideographic signs. Accordingly one cannot proceed blindly on the naïve supposition, on which all our decipherments are based, that the signs which occur in groups must be phonetic or syllabic signs. If we refer once again to Fig. 1, we see that such ideographic combinations can be extended by other individual signs, and we must therefore reckon with the possibility that larger groups can be composed of signs which are ideographic.

If this is correct, and all analyses have constantly led me to this conclusion, we have here to do with a script of a peculiar kind, which does not correspond in its structure to the type of the neighbouring pictographic scripts of the Eastern Mediterranean area. This presents us with a serious problem, since we can imagine only with difficulty how such a script worked. It is equally difficult to understand how it could succeed with a relatively small number of signs. In any case, it should be clear *a priori* that such a script cannot be disentangled by the normal methods of phonetic decipherment, and least of all by decoding. For this reason I am conscious that, by the explanations I have given, I am bringing out more questions than answers; but that need not discourage us. Science does not make progress if one contents oneself with quick answers but only if one endeavours to make it clear what the problems are. Anyone who can see the problem correctly has thereby taken the first step to solving it.

Series I	Series II
Lc 40	Lc 46
HT 2	HT 64
86a	117a
b	99b
II 2	115b
	118
	90

Fig. 1



Fig. 3

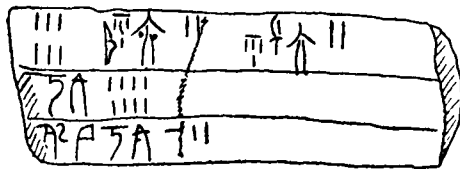


Fig. 2



Fig. 4

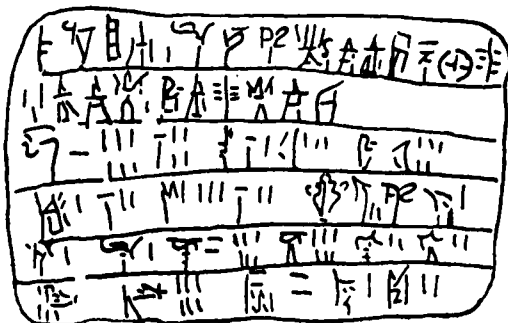


Fig. 5

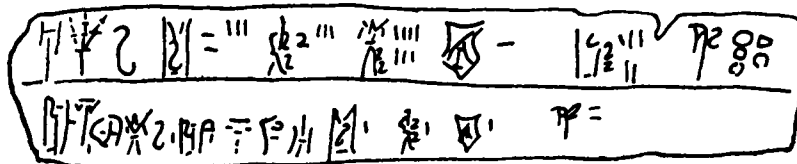


Fig. 6