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NAMES FOR LINEAR B WRITING AND FOR ITS SIGNS

If one of those who have worked with Mycenaean texts is asked what type of writing Mycenaean scribes used, he is likely to answer that "they wrote in a syllabic script with linear signs, most often with a stylus on moist clay tablets." When he is asked to speak of the types and varieties of signs, symbols, or marks they used, he is likely to mention such terms as *phonetic signs, syllabic signs, ideograms, numerals, metrical signs, commodity signs, word-dividers, adjuncts, check-marks,* or such other types as *determinatives, pictorial signs, linear signs, simple signs, ligatures,* and *monograms.* Equivalents of these in other languages, or in more formal English, are often found. It has also been suggested that some terms not now often used for Linear B signs, such as *logogram* for example (we scorn to mention the pejorative *chicken-scratching*), should be introduced and used by preference. But a systematic description of Linear B writing on typological grounds, including a satisfactory definitive set of names for the types of signs which it employs, is still to be supplied.

Any human society may employ, as we do, more than one system of writing, each in its own place and for its own purposes. Furthermore, any system of writing may embody, as most do, elements of more than one type of writing. In the texts written by Mycenaean scribes there are elements of the two principal types of writing which I would distinguish, in a composite system adapted to the purposes of the accounting texts we have on the clay tablets found in Mycenaean palaces and houses. Corresponding to the different types of writing in the Linear B texts there may be distinguished several different classes and sub-classes of signs, and it is my present purpose to define more precisely than has been done the terms which have been applied to the Linear B signs, and to suggest and define some new ones. As a preamble to this set of descriptions and definitions, the following sketchy typology of writing is set down.

Many systems of writing have been used in historical times, and extensive studies have been devoted to their genesis, filiation, and development. Naturally enough, little attention is paid to many things we call writing, such as numerals, algebraic or musical

notation, or to the many sets of signs and symbols which we use and freely invent for specialized purposes. Rather, the alphabet has most often been taken as the acme of the development of writing, and of the non-alphabetic systems most consideration has been given to the Near Eastern systems with the best chances of being direct ancestors of the Greek, Roman, and Cyrillic alphabets. The precise place of the Aegean scripts in the historical development of ancient writing, and the place of Linear B in its relation to antecedent and later systems, has not yet been securely established, but it is not to be discussed here.

Some studies of writing have also sought to assign the known writing systems to their functional classes and types rather than to their places in a particular historical development, while very few indeed have attempted to expound a theoretical basis for the classification of types and actual systems of writing. Sometimes the classification which is attempted has been conducted entirely on morphological and functional grounds; more often there has been described a hierarchy of types and systems ranging from *synthetic writing* or from *primitive pictography* through *ideographic* and *syllabic scripts* to the ultimate stage of *full writing*, the *fully developed alphabet*. In the better of these schemes of classification the particular forms of the signs (though they are helpful in tracing origins and influences) and the tools and materials used are given a place subordinate to the consideration of the type of information represented by the signs, and to the principles of their combination for complex communications. Among these better studies, I would give first place to that of I. J. Gelb, in his *Study of Writing* (London, 1952). It is from his theoretical work that much of what will follow is derived. But I have not followed him all the way in the classification of writing, though I imagine that I differ from him more in terminology than in substance, and he may wish to disown any responsibility for the scheme I suggest. To him particularly I address my discussion of what I call 'sematography', in which I intend rather to complement than to modify his theory, and my comments on the term 'ideogram', which he surely maintains is as misapplied in the description of Linear B as it has been in the accounts of other systems of writing.

General Definition of Writing

The term 'writing' may properly be applied to any system of human intercommunication by means of a set of visible marks with

a conventional reference. This is a variation, I think a justifiable variation, upon a definition made by Gelb (*Study of Writing*, 12). 'Writing' has sometimes been more narrowly defined. One important definition is that of M. Cohen, in his *'La grande invention de l'écriture et son évolution'* (Paris, 1958). In quoting it, however, I would point out that it is excellently applicable only to one of the two great divisions I would recognize in writing in general. Cohen says that "l'écriture [of what I would call the first type] consiste en une réprésentation visuelle et durable de langage, qui le rend transportable et conservable." Gelb, in quoting this definition (*Study of Writing*, 210), counts it as a definition of what he calls 'full writing' (which implies, as is the case, that he recognizes other writing than 'full writing'). But I would suggest that the term 'full', applied to the general type of writing so defined and as opposed to what Gelb terms 'semasiography', in which he includes 'forerunners of writing' and symbols or devices 'outside of our normal system of writing', inevitably introduces a judgment of value, detrimental to many stages in the progress of writing from its primitive origins, and overly favorable to our present state of perfection. This kind of judgment I find out of place, since I think that the invention of a system of notation for recording music, or of sets of symbols and devices for expressing algebraic or logical operations, is quite as significant an achievement as is the invention of writing to represent language, and since I think that such systems of writing are quite as worthy of serious study. Besides, Linear B is only in part writing of this first type, and the writing of the second type is of considerable importance in Linear B.

The two types of writing I would illustrate by this sentence, for the first, and by a bar of music, for the second. I would name them equally writing, and would assign to neither any degree of approximation to perfection nor of freedom from error. The first I would call 'lexigraphy', and the second 'sematography'. The term 'lexigraphy' has a respectable tradition (see Gelb, *Language* 38, 1962, 210—11), but I will give it a definition somewhat wider than it may have had before. 'Sematography' I consider a modification of, and improvement upon, Gelb's term 'semasiography'. I will discuss lexigraphy and its subdivisions first, paying attention to some types of lexigraphy not found in Linear B texts as well as to those which are. I will follow this discussion with a partial account of sematography, and a discussion of a few of its subdivisions, particularly those which are represented in Linear B texts.

Definition of Lexigraphy

A definition such as Cohen's for what he calls 'écriture', and for what Gelb calls 'full writing', I should find acceptable for what I would call 'lexigraphy'. This definition, however, implies at least one corollary, and I believe it is very important to note it. Let me then put down my definition and its corollary.

'Lexigraphy' is that class of writing (human intercommunication by means of a set of visible marks with a conventional reference) which represents speech by means of the conventionally ordered use of a set of conventional signs which refer to the larger or smaller segments of speech. Corollary: As speech is necessarily a serial sequence of vocal sounds, so lexigraphy necessarily involves signs written and read in an unambiguous serial order, such that the order of signs representing the segments of speech corresponds exactly to the order of those segments. It will be useful to add this observation: it is important to note that nothing in this definition of lexigraphy prescribes the number or extent of segments of speech to correspond to any one sign, nor is there any prescription of the number, nature, simplicity, or complexity of the signs corresponding to any one segment of speech. The definitions of various kinds of lexigraphy, however, will involve some of these matters.

The First Division of Lexigraphy — 'Logography'

Although other schemes are certainly possible, a two-fold division of lexigraphic writing is most economical, with the separation made on the basis of the 'value' of the signs compared. (I shall use the term 'value' to mean whatever segment of speech is represented by a lexigraphic sign.) The first class is 'logography' — in which the values of the signs are significant segments of speech, normally words, however they may be defined, but also phrases and morphemic fractions of words. Since in practice words are far more frequently written than phrases or morphemes, we need not set up the possible subdivisions for these particular segments. (Practically never will a system of lexigraphy employ signs only for segments consisting either of phrases or of morphemes; normally signs for such segments will be exceptional signs in lexigraphic systems, where they will be the equivalents of logograms.) In what follows we may mean by word, and refer to as the value of a logogram, either word or phrase or morpheme, i. e. any significant segment of speech.

A modern example of a sentence written logographically, with single signs corresponding to single words, is: '2 + 3 = 5', to be

read as 'two plus three equals five'. It is important to observe that the characteristic which sets off logographic writing from the other sub-class of lexigraphy, and which introduces the possibility of confusion with an entirely different class of writing in the analysis of some historical examples of logography, is that each sign not only represents and has the value of a significant segment of speech, that is, the actual or potential articulate sounds which constitute words, but also, by the First Axiom of Euclid, each sign may represent and signify the idea, thing, or whatever it may be that the spoken word signifies and represents. We shall use the term 'signification' to mean whatever idea, thing, notion, or the like is represented by speech, and therefore by any representation of a segment of speech large enough to have significance. Practiced readers will have the tendency to recognize the signification of logograms directly and without conscious or obtrusive vocalization, that is, without the practical realization of the values of logographic writing. Moreover, in some logographic systems it has been possible for those who did not or could not know the values of the logograms, that is, the spoken form of the words, or who did not even know the language the logograms represented, to understand more or less clearly the signification of a text in logographic writing, when the shapes of the logograms have a visible correspondence to the things signified by the words.

I am uncertain what to call the repertory of signs in a logographic system — a code-book? or dictionary? or glossary? However, we may term the sign appropriate to logographic writing a 'logogram'. In accordance with our observation on the definition of lexigraphy we note that the value of the logogram is not restricted in extent, that is, a single logogram may vary from the smallest significant segment of speech (morpheme) to an element larger than the word (phrase). Similarly we note that the word (or morpheme or phrase) may be represented by a single and simple sign, or by a compound or complex sign composed of other signs in a conventional arrangement. I shall indicate these (and similar -grams to be mentioned later) by 'logogram (s.)' and 'logogram (c.)'. When either simple or complex logogram may be understood, logogram may stand by itself, or for explicitness we may write 'logogram (s. or c.)'.

The Second Division of Lexigraphy — 'Phonography'

The second division of lexigraphy we may call 'phonography' — in which the values of the signs are non-significant segments of

speech, segments which, uttered in sequence, form the significant segments of speech. These segments may be of any possible extent, from a consonant to a string of syllables. There will be two divisions of phonography to be considered.

The signs, like those of logography, may be simple or complex, 'phonograms (s.)' or 'phonograms (c.)'. By a corollary of this definition phonograms have values, but no significations. There will, however, be instances in which a sign in a phonographic system may appear to coincide with a logogram, as 'I' has the value of the spoken word 'I' and the signification of the first person singular, while the same sign in 'Isis' is only a phonogram, and is without signification, though it has the same value as in 'I'. The rebus is a special case of this phenomenon. In 'B 4' (i. e. 'before'), B and 4 are phonograms; in '4 B's' (i. e. 'four [letter] B's') they are logograms. The explanation of this is simply that certain combinations, that is strings, of phonograms, whose corresponding segments of speech compose a word, thus become in effect logograms (c.), and in some instances the segment corresponding to a single phonogram may be itself a word. In the case of the rebus, one simply abstracts its phonographic value from the sign, which in origin is a logogram, discarding its signification.

The Two Divisions of Phonography, 'Syllabography' and 'Grammatography'

The principle of division reflects differences in the extent and kind of value ascribed to the phonograms. The first class is 'syllabography', in which the values of the signs are certain separately utterable, but non-significant segments of speech. The sign is a 'syllabogram (s. or c.)' or better simply 'syllable'. The repertory is a 'syllabary' (when in a reasoned array) or an 'iroha' (when in an arbitrary or poetic order). We may occasionally extend the meaning of 'syllable' to cover such non-significant segments as 'fortitu' represented by the ordinary complex logogram '42' when it is used as a rebus in '42de'.

The second class, for which the simple name 'alphabetic writing' is much to be preferred to the pretentious 'grammatography', is 'alphabetic writing', in which the values of single signs include elements of speech not all separately utterable but discovered by analysis, elements which in strings form syllables and words. The signs are 'letters' (which are the only phonograms requiring names different from their values; hence 'B' in the rebus 'B 4' is a syllable

(originally a logogram: value, 'be'; signification, the name of the letter 'B') and not a letter. Letters may be simple (e. g. *f*, *c*) or complex (*ph* or ç) and the compounding elements may be letters or diacritic marks. The repertory is an 'alphabet', and almost always has an arbitrary order for its letters.

If alphabet makers were as linguistically sophisticated as some suppose them to be, and if historical orthography did not regularly develop and survive while phonemes change, one could call the type 'phonematography', and the sign a 'phoneme'. Beyond this molecular stage there is an atomic stage, the International Phonetic Alphabet, and beyond that are the particles detected by spectrography.

Auxiliary Marks, Signs, and Devices

To the types of lexigraphy there must be added a number of auxiliary classes of marks and devices, which, though they may be essential parts of lexigraphic writing, do not themselves constitute types of writing coordinate with lexigraphy, logography, or phonography. These are: I. Prosodic marks and devices, auxiliary to lexigraphy in general, II. Indicative signs and devices, especially orthography, auxiliary to logography, and III. Diacritic signs and devices, especially spelling rules, auxiliary to phonography. I shall not discuss them in this order, but in an order of complexity.

The class of 'prosodic' marks and devices, applied rather to larger segments of lexigraphic texts than to individual signs, represent such prosodic features of speech as are conventionally recorded. These include marks such as accents and punctuation, and devices such as word division, Sperrschrift, underlining, capitalization, difference of type font or of color, indentation, and even such things as page numbers. We may note particularly that despite the rule of linear sequence for lexigrams, the position of prosodic devices and marks may often by convention be different from that of the prosodic features they represent.

Spelling Rules

The class of 'diacritic' signs, including such things as the cedilla, the Umlaut, or the virāma, indicate specific or different values for the phonographic signs with which they are written (whether separately or in ligature makes no difference here). The effect of adding a diacritic mark is to produce a complex phonogram.

Other complex phonograms find their origin in 'spelling rules'. Rarely does an alphabet have a single letter for each element which can reasonably be discovered, and rarely does a syllabary have single signs for each syllable. Therefore some elements and some syllables must be conventionally represented either by a sign proper to another element, or by some combination of other signs, or by the addition of a diacritic mark to a letter or syllable. The French alphabet provides examples: *c* (before *a* and *e*) has the values of *k* and *s*, before *a*, *ç* has the value *s*; the combination *ph* has the value of *f*. Similarly in the Cypriote syllabary, which lacks individual signs for the syllables which begin with consonant clusters, and for those which end with a consonant, 'Stasikypros' may be written by the signs for *sa-ta-si-ku-po-ro-se*, where the sequences of *-sa-ta-* and of *-po-ro-se-* in other contexts might be read as *'-santa-'* or *'-porose-'*. The set of conventions which prescribe the range of values of single signs and the values of such combinations are the 'spelling rules' of the system, the knowledge of which is required in the writing and the correct reading of any phonographic system.

Orthography

From spelling rules we may turn to orthography and thus introduce the class of 'indicative' signs and devices. In the history of any phonographic system there is always the possibility, often realized, that through the advantages of a tradition historical spellings are retained, and even become productive, when these spellings cannot without greatly complicating the spelling rules with exceptions and additions represent the sequence of sounds now spoken for the written word. Then the written word becomes a logogram, whose value does not equal that of the string of phonograms by which it is represented, not even by the normal operation of spelling rules. Its pronunciation and its spelling must then be learned, and cannot be discovered simply by recognition of the values of the signs, and by the knowledge of the spelling rules. The effect of the introduction of a standard orthography is to set up a repertory of logograms (c.) within a system otherwise apparently and potentially phonographic. It will be apparent on a moment's reflection that written English, though apparently alphabetic, is in fact remarkably (and notoriously) logographic.

As a special type of orthography we may count the device of abbreviation. Here the choice of parts to represent the whole is rather a matter of deliberate convention than one of the historical

development seen in orthography. Note that a single abbreviation, just as any other logogram or phonogram, may in different contexts have different uses and significations. Note also that a phonographic sign arbitrarily chosen to serve as a logogram must count as a simple logogram and not as an abbreviation. E. g. π for the ratio of circumference to diameter, though in fact this was originally an abbreviation for 'perimetron', a part of that expression.

Complex Logograms

In turning finally to the 'indicative' signs, it is important first to remember that a logogram may be of any degree of complexity and may include more varieties of signs or devices and types of arrangements than we can consider. It will appear also that within a complex logogram the order of signs may be any, and need not correspond to the normal serial order which the logogram as a whole must preserve in lexigraphic writing. That is, we may take as a single logogram any intelligible expression, simple or complex, written in any non-lexigraphic system. Tradition and the sense of appropriate style restrict the use of most of such logograms to particular uses or jargons, but some poets have taken advantage of the opportunities offered by such unusual methods of writing. We have here to consider only the few types of complex logograms we should point out particularly because of their frequent occurence in systems contemporary with Linear B. These are complex logograms composed of a (relatively) simple logogram and one or another variety of indicative element. The function of the indicative element is, parallel to that of diacritic marks, to indicate specific or different values and significations for the (relatively) simple logograms with which they are used.

Several of the varieties of such indicative signs can be illustrated in the following sentence, which as a whole is written lexigraphically, despite its appearance. "On July 2nd the Dutch Guilder (*f* 1.--) = approximately US$ 0.28; Engl. £ 2/-; Fr.Belg. 14.--; Dan.Kr. 1.91; Swed.Kr. 1.43; Can.$ 0.295." As an American I read this unambiguously as 'On July second the Dutch Guilder equals approximately twenty-eight cents, two shillings, fourteen Belgian Francs, one point ninety-one Kroner, one point forty-three Kronor, twenty-nine and a half cents Canadian.' Simple logograms are apparently represented by the abbreviations Fr., Belg., Kr., and Can., and by the arbitrary symbols 2 (in 2/-) and 1 and . (in 1.91 and 1.43); they are, however, in fact merely elements of more complex logograms (but relatively

simple for our present purposes). Note that the parallel abbreviations US, Engl., Dan., Swed., and the parallel symbols $ and £ are also possible logographic elements in complex logograms, but that their ultimate verbal expression does not include the words 'United States', 'English', 'Danish', 'Swedish', 'Dollars', or 'Pounds'. In other contexts 28, 14, 91, 43, and 29 might represent the complex logograms for the 'twenty-eight', etc. of the verbal form of the sentence, but here they too are elements of larger complex logographic expressions. The relatively simple (i. e. minimally complex) logograms which might represent the spoken words are these seven: 2 (in 2nd), $ 0.28, 2/-, Belg.Fr. 14.--, Kr. 1.91, Kr. 1.43, Can.$ 0.295. The means by which these symbols are made to represent logograms are appropriate to the other, not the lexigraphic division of writing, and will be indicated in a later section. The additional symbols, or logograms used as symbols, are the indicative signs we wish to describe.

The types of indicative sign to be pointed out include: I. a 'sign indicator'. (after Engl, etc.), which indicates the character of the sign used with it, i. e. that Engl. is an abbreviation; II. a 'phonetic indicator' (or 'complement') nd (in 2nd), which determines the value and signification of a more or less ambiguous or potentially unintelligible logogram 2 (after July, which will normally be read as 'second' even without nd, but might be read 'two'), generally by indicating or repeating part of the value of the logogram with which it is used (often, as in 12^{0}, 'duodecimo', that part which indicates the inflectional form intended); III. a 'semantic indicator' (or 'determinative') which 'determines' the signification and the value of a more or less ambiguous or potentially unintelligible logogram £ (before 2/-); or Dan. and Sw. (before Kr., to be read either 'Krone, er-' or 'Krona, -or') generally by indicating or repeating a part of the signification of the logogram with which it is used (Shilling, implied in 2/-, is part of a Pound; Kr[one] is a Danish unit, Kr[ona] is a Swedish unit).

Other indicators parallel to the (phonetic) 'complement' and (semantic) 'determinative' are also found, and may either be included under those terms or have special terms of their own. Often a determinative or complement is found where there is no apparent chance of ambiguity, but we have no special term for such redundant semantic or phonetic indicators. When, however, a semantic indicator is applied in a systematic extension of the function of a determinative to a whole semantic class, we may properly call it a

'classifier', e. g. the capitalization in July, Dutch, Guilder, etc., where the device indicates that the word capitalized belongs to the semantic class of proper nouns. We may distinguish another class of indicator, an 'appositive', for instances of the complete recapitulation (*f* 1.--) of either the value or the signification, or even both, of a logogram (Guilder).

Without considering the varieties of indicators exhaustively, and only pausing to point out that instead of the use of signs and marks as indicators we might equally well use other indicative devices, we may go on to a closely related class of signs and devices by which complex logograms may be made out of relatively simpler logograms. These I call 'adjectives'. Their mode of modification or qualification of the original logogram may correspond to that of any one of the semantic indicators, and there will be instances in which entirely reasonable doubt may be entertained whether a particular sign or device is indicative or adjective, and other cases in which we may count it as both. The adjective will normally add some information not conveyed by the simple logogram, the indicator will normally point out information already contained in the logogram. The instances of adjectives shown here are US qualifying $, Engl. qualifying £, Belg. qualifying Fr., Dan. and Swed. qualifying Kr. (and at the same time acting as semantic indicators), and Can. qualifying $.

Note that the adjective, though it adds something to the definition of the logogram it is used with, is not necessarily directly represented in the verbal expression. One might say 'twenty-eight United States cents', but in an American context this would be peculiar. Note also that the order of the elements of a complex logogram does not necessarily correspond to that of its verbal expression. The adjective Belg. added to the logogram Fr. yields the single concept which is expressed as 'Belgian Franc'. (For a French reader the order Fr.Belg. would be the 'lexigraphic order' of 'franc belgique', but Engl. £ would then have to be read as 'livre sterling'.)

Although the scheme here presented is not complete, and perhaps not immediately applicable to the classification of all examples of lexigraphic writing, it will be sufficient to indicate the place of Linear B lexigraphic writing, to contrast it with some systems contemporary with it, and particularly to contrast the lexigraphic elements in Linear B writing with the equally important sematographic elements. We should note that any actual example of lexigraphic writing will almost certainly incorporate elements of both types, logographic and phonographic.

Summary of Types of Lexigraphic Writing

Writing . . . any system of human intercommunication . . . visible signs . . .

I. Lexigraphic: writing representing speech, implying that the signs have a linear order directly corresponding to that of the speech represented.
   A. Logographic: with signs representing words. Or more generally, a system in which the fundamental repertory of signs is of logograms.
   B. Phonographic: with signs representing non-significant segments of speech.
      1. Syllabic: with signs representing syllables. Or more generally, a system in which the fundamental repertory of signs is of syllables.
      2. Alphabetic: with signs representing sub-syllabic elements of speech. Or more generally, a system in which the fundamental repertory of signs is of letters.

II. Sematographic: writing not representing speech, implying that signs may have any conventional order or arrangement.

Summary of Types of Lexigraphic Signs

Primary signs

I. B 2. Letters: a. simple, or
   b. complex: combinations of letters, or letter with diacritic mark.

I. B 1. Syllables: a. simple, or
   b. complex: combinations of phonograms, or phonogram with diacritic mark.

I. B. Phonograms: representing non-significant segments of speech.

I. A. Logograms: representing significant segments of speech.
   1. Simple: any sign from any lexigraphic or sematographic system, including among others:
      a. arbitrary logographic use of a sign normally a phonogram.
   2. Compound, phonographic: any lexigraphic sequence of phonograhic signs,
      a. following normal spelling rules.
      b. following historical orthography.
      c. an abbreviation, or monogram, of a phonographic logogram.

3. Complex, sematographic: any combination of signs, lexigraphic or sematographic, arranged and ordered on sematographic principles, including among others:
   a. Simple, compound, or complex logogram, with a sign, phonetic, or semantic indicative sign of device.
   b. Simple, compound, or complex logogram with an adjective sign or device.

Auxiliary signs and devices

I B * Diacritic marks, used to form complex phonograms; diacritic devices, including spelling rules and orthographical systems.

I A *1 Indicative signs (which may be of any type or complexity) used to form complex logograms by specification of information inherent in the (relatively) simple logogram; indicative devices, including conventional arrangement of signs.

*1a Sign indicators.

*1b Phonetic indicators (complements, normally partial; appositive, if completely recapitulating).

*1c Semantic indicators (determinatives, normally partial; appositive, if completely recapitulating).

*2 Adjective signs (of any type of complexity) used to form complex logograms by addition of information to the (relatively) simple logograms.

I* Prosodic marks and devices.

Lexigraphic Writing in the Linear B Script

We may now describe the lexigraphic writing and the lexigraphic signs of the Linear B script in terms of this classification. Not all of Linear B writing is lexigraphic, but that part which is is phonographic and syllabic, and the signs used are simply syllabic. There is no instance of a simple logogram. Compound logograms are composed only of regular lexigraphic sequences of syllabic signs, in the use of which a set of spelling rules was followed. These, which have since the decipherment of Linear B been described more or less accurately, prescribe alternate values for the several fundamental syllables, and the particular combinations of syllables which represent more complex syllables. There is a strong possibility that some instances of historical orthography can be detected, and there are certain instances of deliberate, as well as presumably accidental,

abbreviation. There is no instance of a complex logogram formed either by the addition of an indicative or an adjective sign. The only prosodic sign is the word-divider, which may be replaced by the devices of a space or of a change in the size of signs between words. The serial order of signs is left to right in simple horizontal rows, with the signs normally standing on a line. Rows normally follow below rows, but at need a text longer than a row may be completed by writing the remainder above the principal line of writing.

Since the only type of lexigraphic sign in Linear B is the syllabic sign, we may without ambiguity use as equivalent terms (in Linear B, that is) 'phonograms', 'phonetic signs', 'syllabograms', 'syllables', (*'signum vocis'*, *'syllaba'*), or any similar expressions, contrasting these not with other types of lexigraphic signs but with sematographic signs. To name the individual syllables we must, since we do not know the values of every one, assign an arbitrary identification in the form of a number (between 1 and 99), by which we may transcribe the signs when we are in doubt about their true value, or for other purposes. We assign to each sign for which we know something of its value an arbitrary syllabic transcription in Roman letters.

For the prosodic mark, the 'word-divider' (*'punctum'*), we need be no more restrictive in terminology. No one has ever thought to assign an identifying number. It is normally not transcribed at all, since modern word-division generally suffices, but it can easily and properly be represented by a comma.

The Unique Character of Linear B Lexigraphic Writing

The direction in which we must look for the origins of the shapes of the Linear B signs is not at all doubtful. In the Linear A script of Crete most of the Linear B signs have their parallels. We must suppose that the system in Linear A was to some degree of the same type, but we do not know to what degree. But it remains still quite uncertain where we must search for the origins of the type of lexigraphic writing we find possibly in Linear A and certainly in Linear B. Exact parallels will not be obvious among the earlier, contemporary and later writing system of the Near East. We will succeed better in looking for parallels to the sematographic elements in Linear B writing. But the most promising direction, I imagine, to look for comparable developments in lexigraphic writing will be toward those other scripts which in the second millennium B. C. were written with simple phonographic systems (however different

their choice of typical syllables or sounds) and avoided the indicative signs of the more complex logographic systems of Egypt and Mesopotamia.

Sematographic Writing

For the classification of the other signs of the Linear B texts we turn to the classification of the sematographic systems of writing, which I have had in l. c. art to anticipate in the discussion of complex logograms. In form the use of an indicator or an adjective to produce a complex logogram is not at all a lexigraphic, but a sematographic, device. Here I have not found many guides in studies of writing and shall almost certainly end up with an ad hoc classification and terminology. In sematographic systems, which do not represent speech, it is often the case that the writing itself is a language, which may be interpreted in speech (or as in 'one point ninety-one' simply reported in speech), but generally less economically. The chief characteristic of sematography is not that it has symbols different from the signs of lexigraphy, for they may be exactly the same, but that its symbols directly represent meanings and concepts (which of course will be nameable) and that when used in groups their association and relative positions generally represent by specific conventions not the serial order of any spoken language, but logical operations. Just as the phonographic signs in combinations represent larger segments of speech, in combination prescribed arrangements of sematographic symbols may represent single more or less complex concepts and meanings. We may again use the terms 'value' and 'signification' to apply to sematographic symbols and their combinations, but with a slightly different meaning. By 'value' we shall refer to the concept appropriate to the single symbol, i. e. 'twoness' in '2', and 'eightness' in '8'; while by 'signification' we shall refer to the concept of the complete (simple or complex) sematographic expression formed by the combination of symbols in their conventional arrangements; i. e., in the complete expression '2' we recognize the signification 'two', and in the expression '28' the signification 'twenty-eight'.

A fuller exposition of the types of sematographic writing would have a place for the identifying devices, the mnemonic devices, and the depictive (or programmatic) devices which we normally think of as characteristic of the forerunners and first stages of writing, though they are as prevalent in modern use as ever. But we may confine our attention to certain limited systems, represented in

Linear B texts, which communicate special classes of information. For the signs of these systems we may use the general term 'sematogram' or perhaps 'sema'; in its literal meaning 'ideogram' might be equally useful, but there are now perhaps valid reasons to avoid it in the discussion of the types of writing.

Numerical Systems

The most ubiquitous class of systems comprises numerical systems. Within the class of numerical systems which have been used since the first writing one may distinguish types (only roughly corresponding to the type distinctions of phonographic writing): A. Tallying; B. Step-tallying, e. g. MCXI; C. Ordinal, e. g. 'αρια'; D. Figural, e. g. 1111, which implies a principle of position, that is, that the value of 2 in 28 must be modified by the value of its position, the value of 8 in 28 must be modified by the value of its position, and that the signification of the whole expression must be derived by the logical process of addition of the modified values of all the symbols. The names for the symbols of these types may be taken as tally, numeral, ordinal, and figure. Similar typology would distinguish neumes from modern notation in music. But there need be no similarity between the types distinguishable within different classes of sematography.

The numerical system of Linear B is a step-tally, with numerals for 1, 10, 100, 1000, 10,000. The normal order is left-right/high-low, with the tallied numerals in compact groups. No instance of a symbol or a device for a numerical fraction is found, though they were used in Linear A. For the name of the numeral symbols we will continue to use 'numerals'. The principles of their combination and their values are sufficiently obvious to those who read and write that there is no reason to emphasize anywhere but here their classification by this scheme as sematograms, or by other schemes as something else. No one has ever thought of putting them in an irrational order, or of assigning identifying numbers or names to them.

Fiscal Symbols

The next class of symbols we may consider is that of 'fiscal' symbols. This is a new name, only roughly corresponding to what in Linear B studies have been called, in a terminology which must be reexamined, 'commodity signs' and 'ideograms'. By itself the repertory of 'fiscal' symbols does not form a system of writing

—unlike logography, syllabography, or grammatography—but fiscal symbols, when used with numerical symbols, may form a composite system appropriate to the keeping of books. Modern fiscal symbols include $, ¢, £, s., d., and ℔., g., qt., l., doz., pr., ʒ, ʒ; analogous are °, ′, ″; for some which have remarkably few modern parallels we must turn to Æ, ℞, 𝒩.

Fiscal symbols in most cases have a compound meaning, referring to the two types of values which we may call 'substantive' and 'metrical'. By 'substantive value' we mean the identification of the commodity accounted for, and by 'metrical value' we mean the nature and size of its unit measurement. The substantive values of $, £, s., d., are money, British or American; of °, ′, ″, angular distance; of ° alone, thermal intensity. Æ, ℞, 𝒩, though not now normally used in accounting, have substantive without metrical values. The symbols ℔, g., qt., l., ʒ, ʒ, have metrical but no substantive value, being applicable to a wide range of substances. The metrical value of $ is one dollar (divisible continuously, but normally in cents); of £, s., d., monetary step-units; of °, ′, ″, angular step-units; of °, a single continuously divisible thermal unit; of VIR or OVIS, a single indivisible unit; of doz. or pr., composites of twelve or two units. We may then classify the fiscal symbols (*symbola fisci*), as 1. 'metrical', 2. 'substantive-metrical', and 3. 'substantive' symbols (*symbola mensurae, s. rerum mensurabilium, s. rerum*).

In a complete fiscal expression, there will be substantive, metrical, and numerical elements present. The order of a fiscal expression will be conventional ($ 0.50 = 50 ¢) and may or may not coincide with the normal verbal expression of its meaning (half a dollar is fifty cents).

The items and their quantities involved in the written records of the Mycenaean economy are indicated by the complex system involving the fiscal and numeral symbols. With indivisible substances (e. g. *Sheep*) the unit is implied in the identification of the substance, and only the substantive-metrical symbol, OVIS, followed on the right by the numeral, will appear. Substances conventionally counted in groups (e. g. *Chariot Wheels*, in pairs) show the substantive symbol, ROTA, the metrical symbol, ZE, and the number. Substances measurable (exx. g. *Bronze, Wheat*; and only step measurement is attested in Linear B) show left to right either substantive symbol, AES, major metrical symbol, L, number, minor metrical symbol, M, number, etc. or, more often, substantive-

metrical symbol, GRANUM (signifying also a major unit), number (only if the quantity recorded is at least as large as the major unit involved in that substantive-metrical symbol), minor metrical symbol, T, number, etc. Occasionally apparently incomplete expressions will be found — when the substance may be understood from the context, or is identified in a heading, or named in phonographic writing, or rarely when a metrical symbol may be understood, or a single unit of an indivisible substance may be indicated (e. g. George 1, where we understand VIR; or George VIR, where we understand 1).

Because of our monetary economy and because of the convenience of alphabetic writing, substantive fiscal symbols are found in our writing almost exclusively for kinds of money, although the metrical symbols are adequately represented. In Linear B there are a few substantive symbols, a large repertory of common fiscal symbols, and a good set of metrical symbols.

There remains the question of the name for the class and subclasses of 'fiscal' symbols. Fiscal, metrical, substantive-metrical, and substantive will do for the present descriptive purposes (unless one might wish to distinguish between substantives which are measurable and those which are countable), but probably a different terminology, having more in common with traditional practice, is to be preferred.

We should then ordinarily find a two-fold division of the fiscal symbols quite adequate. One for the metrical symbols and one for those which signify substances. The historian will assume without excitement that what is now measurable was then measured, and will be interested to find what substances were actually accounted for by Mycenaean scribes. The commodities these symbols represent (and we may count among them humans), their measures, and their numbers in the fiscal expressions of Linear B texts provide us with the better part of what we know of recorded Mycenaean economy. The name for the substantive class of fiscal symbols might well be 'ktematograms'—or simply 'substantive symbols'.

We should be aware of the tendency to apply only to the class of signs used as substantive symbols, as opposed to metrical symbols or to any other class of sematograms, the terms 'ideogram', 'sematogram', or their equivalents. By the second edition of Webster's New International Dictionary, 'ideogram' has a wider significance than that: "a graphic symbol . . . directly representing an idea rather than a word," with examples given as 3, +, &. This leaves

no room for a meaning restricted to symbols representing the 'ideas' of certain commodities.

Indicative and Adjective Symbols

Occasionally used with the symbols of the fiscal system are sematographic symbols of another series of classes. These may include symbols corresponding to the 'indicative signs' and 'adjective signs' already described. The function of the 'adjective' symbols is to indicate qualities, sizes, colors, sexes, and the like, of the substances accounted for. Such 'adjective' symbols (*symbola epitheta*) do occur with some fiscal symbols of Linear B. Among the 'indicative' symbols (*symbola exegetica*) we have no clear example of a sign simply determinative. (In the expression GRANUM T 1 the sign GRANUM is, as far as metrical value goes, determinative, but as expressing the substantive element it is essential.) We do, however, have instances of 'appositive' symbols (*symbola epexegetica*), either as resuming a word written syllabically (e. g. Un 718: *tu-ro*$_2$ *TURO*$_2$ 3) or as recapitulating by an abbreviation the meaning of the fiscal sign it accompanies, as in AMPHORA+*A*, where *A* is probably the abbreviation for *a-(pi-)po-re-we*.

It is possible that in some cases the symbols we suppose to be adjective or appositive are in fact determinative or complementary (and we should be hard put to it to show how the abbreviation of a phonetically written appositive differs from a [partial] phonetic complement). But we have certain instances of 'adjectives' and of 'appositives', and many uncertain instances all of which might be, as far as we can tell, either adjective or somehow indicative. These symbols, 'adjective' and 'indicative', are either juxtaposed to the substantive symbol (as e. g. in Fr.Belg.) or appear in ligature with it, and in some cases either the substantive symbol, or the adjective element of the ligatured symbol, has not yet been found in isolation. Most of these adjectives and appositives are phonetic signs (probably as abbreviations), but there are a few non-phonetic symbols such as AES, which is elsewhere a (simple) substantive symbol, with a measured quantity, but in the expression AES+LANX (if in ligature) or AES LANX (if simply juxtaposed), as an adjective it defines the material, AES, of which the cup, LANX, is made.

Bursarial Symbols

Still another class of symbols is found in association with fiscal expressions, which we may name 'bursarial' (*symbola bursarii*).

These, though found in juxtaposition to fiscal symbols, do not modify, indicate, or recapitulate the meaning of the sign, but rather refer to the whole transaction involved, and serve to indicate the status of the substance accounted for within the accounts, and may involve such notations as 'credit', 'debit', 'in arrears', 'on hand', or 'paid in advance'. Such signs appear in Linear B texts, all of them, as far as we know, in the form of syllabic abbreviations and none appearing in ligature with fiscal symbols.

Adjuncts

Since bursarial symbols are like some of the adjective and indicative symbols (those which are not in ligature) in their position and written relation to the fiscal symbols, and since our knowledge of the texts is not sufficient always to distinguish between signs of these three classes, it is convenient and necessary to have a common term for such signs. The term which has been used, and which essentially describes the position of the signs rather than its significance, is 'adjuncts' (*symbola adjuncta*). This should be retained as long as we cannot by an accurate knowledge of the texts classify each instance more precisely. We should not consider it simply the equivalent of a determinative or other indicative, or an adjective, or a bursarial sign.

The Sematographic Use of Syllables and Words

We have already noticed that occasionally among the metrical symbols, more often among the fiscal symbols, and very frequently among the adjuncts, a phonetic sign, probably as an abbreviation, may have the function of a sematogram. It is also important to note that a word or words written syllabically may serve as a fiscal symbol. In an accounting of men, we may expect to find a simple list of names, each followed by a numeral 1; here the name is more significant, but not by much, than the fiscal symbol VIR, and the syntax of the whole document will not be that of speech, but of accounting. More specifically we may point out that in the PY Aa tablets the words *ko-wa* and *ko-wo* appear before numerals (1, 2, or more) exactly as does the fiscal sign MULIER. If *ko-wa* is used as a complex fiscal symbol one will not expect it to follow the changes of declension before differing numbers which would be obligatory with normal lexigraphic writing. It is, in the spelling rules of Linear B, only the feminine dual which we would expect

to have a different form, but no different form appears at all. We have instances of the record of 1, 2, 3(+) girls, where we are particularly fortunate in having an adjective added (which does have the proper declensional form—for a parallel of very doubtful relevance here I find in the catalogue of the Librairie Niçoise the descriptions "... fort vol. relié..." and "... 8 forts vol. reliés..."). The evidence in Linear B texts may be seen in KN Ak 612, 613, 614, 627, 5884, and 5940. For the singular we find *KOWA me-zo*, or *me-u-jo*, 1; for the plural we find *KOWA me-zo-e*, or *me-u-jo-e*, or *me-wi-jo-e*, 3(+); but for the dual (where the form we should expect by analogy for the dual of the feminine *ko-wa* is *ko-wo*) we find *KOWA me-u-jo*, or *me-wi-jo* 2. There is then good reason to transcribe the word as a fiscal sign (by our conventions, *KOWA*) rather than as a simple word (*ko-wa*). We should explain *KOWA* as an uninflectable fiscal, sematographic, sign (as in $1 and $3) rather than as an abnormal lexigraphic spelling of the feminine **ko-wo*, abnormal, presumably, to distinguish it from the masculine *ko-wo*.

We need not here discuss the complex problem of assigning conventional transcriptions to the metrical and substantive symbols and the adjuncts.

Actuarial Marks

To the phonetic signs, the prosodic marks, and the sematographic symbols must now be added a fourth class, which we may call 'actuarial marks' (*notae actuarii*). These are the check-mark, and the 'tick', and all counter-marks employed by the accountant (or by the rest of us at income-tax time). These marks refer to the action of the accountant, and serve as an aid in preserving the accuracy of his records. In Linear B there is the 'actuarial mark' ×, normally called by the name 'check-mark', which is equally clear and certainly less stuffy than 'actuarial mark'. It has never been identified by a number in the repertory of signs, and it is normally transcribed simply as X.

We have discussed only a few aspects of sematographic writing, that is, those which are far removed from primitive approximations to writing and which were chosen for discussion because they are found in Linear B. I imagine however, that much of the writing in the accounting texts of the Near East before, in, and after the second millennium, B. C. can be described in these terms, and that a few and simple extensions will cover the rest.

Summary of Types of Sematography

Writing . . . any system of human intercommunication . . . visible signs . . .

I. Lexigraphic

II. Sematographic writing not representing speech, implying that signs may have any conventional order or arrangement. Including, among an indefinite number of other types:

a. Numerical systems
b. Fiscal systems

Summary of the Types of Sematographic Symbols Found in Linear B Texts

Primary

I. Sematograms (or, Ideograms — *in Linear B only*)

A. Numerals

B. Fiscal symbols

1. Metrical
2. Substantive-metrical } (together, Substantive Symbols)
3. Substantive

Supplementary to fiscal symbols

I B * 1 Indicative symbols (apparently all appositive)
I B * 2 Adjective symbols } —(together, Adjuncts)

Supplementary to fiscal expressions
I AB * Bursarial symbols

Supplementary to bookkeeping records

II * Actuarial marks (Check-mark)

Pro and Con the Term 'Ideogram'

The numerals, the two or three varieties of fiscal symbols, and the different classes of adjuncts exhaust the types of sematographic symbols found in Linear B texts. Should we find a common name to set fiscal symbols and adjuncts over against numerals, or should we find a name to cover all of them? It has been traditional to set off the numerals as a separate class, which because of their simplicity

and immediate comprehensibility needed no more interpretation or arbitrary identification or transcription than did punctuation, and to name the rest 'ideograms'. By Webster's definition, already cited, or by that of the Oxford English Dictionary ("a character or figure symbolizing the idea of a thing, without expressing the name of it," with the example +) this is not proper, and the numeral signs should be included among the ideograms. There is in fact no reasonable justification for refusing the name ideogram to the class which represent numbers (which surely are ideas) while assigning it specifically to types of commodities (which are not ideas but things).

It has been objected, however, that the term 'ideogram' is entirely a misnomer for the signs here described as sematograms, and that in its place there should probably be used the word 'logogram'. That may be so, if my understanding of what I call sematographic writing is completely mistaken. But I cannot conceive of the symbols of musical notation as logograms and must count them as ideograms or sematograms, and by a simple extension I am willing to recognize Linear B numerals and fiscal symbols and adjuncts equally as ideograms or sematograms, and not as logograms. And if it be objected that the abbreviations and monograms, which are numerous among the fiscal symbols and adjuncts, necessarily represent words, I shall retreat to the contention that the ideas these words represent are subjected to logical operations together with the numerals, the metrical and substantive symbols, and the accompanying adjuncts, before the form and order of the words they represent can be determined and spoken. And although I retreat this far, I still find the terms 'ideogram' and 'ideographic writing' suitable. I shall, however, probably prefer 'sematographic' when discussing writing in general, and use 'ideographic' only in discussing the Aegean scripts.

I suppose that the quarrel with the term ideogram is chiefly that it has been misapplied in the discussions of many systems to signs which would in the present classification be logograms. There is indeed a danger in lexigraphic systems which are generally logographic, and not in codes, but particularly in the ancient logographic systems which employ a considerable element of pictography, that the immediate comprehensibility of the idea of a pictogram without the intervention of language, together with the necessary use of such things as phonetic complements and determinatives to escape ambiguity, have led those who take the signs one by one to suppose that such systems are essentially ideo- or sematographic. (Picto-

graphy of course belongs to a classification of signs by shapes, and finds no place in the present classification. Even letters and numerals may be pictograms.) It is, however, more reasonable in such ancient systems to take the unit composed of a simple or compound logogram, together with the complements conventionally added to it to avoid ambiguity and misinterpretation, as one in a series of complex ideograms in a lexigraphic system. The first test to apply, I should think, would be that of serial order. The order within a complex logogram may be either linear or determined on sematographic principles, but if the complex logograms are themselves arranged on lexigraphical principles, the system may properly be called logographic.

I should then agree that many common uses of the term ideogram are imprecise, because they are based upon an imperfect understanding of the mechanism of the various systems of writing in which they are said to be used. To avoid them we may invent other terms, and where it is in fact applicable, logogram will prove to be the most accurate, while we must equally avoid using logogram where it is not applicable. Nevertheless, in a restricted field such as the study of Linear B, where the function of ideogram has not been to describe logograms but to distinguish the signs used in the sematographic portions from those used in the lexigraphic portions of Linear B texts, its use may be tolerated.

So far I have spoken of all signs used ideographically (or sematographically) as ideograms, including numerals, metrical and substantive fiscal symbols, and adjuncts. There is, however, a more restricted use, which is as well supported by tradition as this more general use of 'ideogram'. By it, 'ideogram' is limited to those signs which are not also used as phonograms. We have assumed, though I suppose not unanimously, that in all the syllabic signs it is the syllabic value which is primary and fundamental. We have therefore described any 'phonetic sign used ideographically' by those words, and assumed that its sematographic value in such instances is derivative (through abbreviation) or arbitrary. As a shorter alternative we might label such signs 'sigla'. We then would name only those signs whose primary value is phonetic, 'syllabic signs', and only those whose primary value is sematographic (i. e. in practice, fiscal), 'ideograms'. A practical justification for this, in addition to our natural prejudice in favor of the importance of phonographic writing, is that the list of signs is more economically made up, and the identifications of signs less confusing, if each shape, rather than

each value, is identified. If then the signs used as syllables are identified in one list, the list of the remainder, which are not used as syllables, will include all the numerals (if we are to count them), many of the substantive and metrical symbols, and few adjuncts. 'Ideograms' has been a convenient name for this remainder, one which emphasizes properly the contrast between them and the phonetic signs. Simply as a matter of convenience in naming those signs (ideograms by this definition) to which numbers 100 and up have been assigned we will continue to speak of them as ideograms. We shall need something of the sort as long as we lack a complete understanding of the values of the signs of Linear B, and until we can accurately assign each sign to its proper specific class.

We should perhaps eventually abandon the name 'ideogram' if its normal meaning has come to be that of a logogram in logographic systems. But as long as there is within Linear B no temptation to apply 'ideogram', by a faulty theory of lexigraphic writing, to what should be called logograms, or confuse Linear B 'ideograms' with the signs usually called 'ideograms' in other systems of writing, we may continue to use 'ideogram' in this restricted sense, only being sure to recognize that the numerals are also strictly ideograms. I should be glad to receive suggestions for an alternate name.

Conclusion

The Linear B texts include, as does most writing, elements of both lexigraphy and sematography. Where it is sematographic the serial order of speech is absent. In the texts we have, since their purpose is accounting, we see that it is the sematographic writing which generally dictates the arrangement. We frequently find that the texts are put into tabular form, and that the headings are often or normally not complete statements and that the lemmata of bookkeeping entries are often without consistent syntax. And we observe that the more economical sematograms are employed wherever possible in place of the phonographically written words with which must be expressed proper names, common names for the rarer commodities, and verbs for which no sematographic sign or device is available. Unlike some of the earlier scripts, however, where Linear B writing is lexigraphic it is simply syllabic, without any mixture of sematographic devices. We must count the invention of a simply phonographic method of recording speech, in the face of the complex logographic systems of Egypt and Mesopo-

tamia which might have served the Aegean peoples as ultimate sources of the idea of writing, as a remarkable achievement. The numeral system, and the fiscal system (the fractions possibly excepted) we know Linear B owed directly to Linear A. To what extent we may credit the inventors of Linear A with the remarkable achievement of simple phonographic writing is still in doubt (at least I remain in doubt), but to at least one of these Aegean peoples, as to those peoples who produced the writing systems from which developed the *Alphabet*, we give boundless admiration.