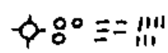
2
The Decipherment

The first step in trying to decipher an unknown script is the analysis of the texts. We need to know what sort of a script it is, and what can be deduced about the contents of the inscriptions. All scripts can be classified as one of three types: *a*) phonetic, *b*) ideographic, *c*) mixed. Phonetic scripts represent by their signs the sounds of the language. They do not of course give a detailed picture of those sounds; for one thing, it would be confusing if every speaker wrote exactly as he spoke, for then the same utterance would be recorded in many different ways. There is therefore a conventional element in scripts which eliminates most of the individual differences between speakers. Secondly, to represent even roughly the range of sounds employed would demand a much larger alphabet that the twenty-six letters we use in English; many languages employ diacritical marks on letters to indicate special values, but even so all phonetic scripts are only a notation adequate to permit someone who knows the language to reconstruct the word for himself. The segments into which the stream of speech is analysed for notation may vary in size. Alphabetic scripts aim at the ideal of one sign for each sound, though English, for example, often departs from this ideal. Other languages in the past have used syllabic scripts, where each sign represents a pronounceable syllable. These may vary from the simple type where each sign denotes a consonant followed by a vowel, to more complex types where there are signs for vowels followed by consonants, and for groups of consonant, vowel and consonant, and so on.

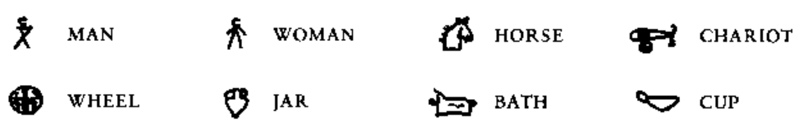
Ideographic scripts have basically one sign for each word, and this sign usually represents the meaning of the word, not primarily its phonetic form. They can therefore be easily transferred from one language to another. So the Japanese borrowed the Chinese ideographic script, and wrote the same signs for the same meanings, but gave them quite different sounds. The problem with ideographic scripts is that they need enormous numbers of signs, which have to be very complex in order to be different, and are therefore hard to learn and to write. However, the advantage for the decipherer is that they are easily recognisable by the large number of different signs and their complexity. Ideograms usually begin as pictures of objects, and they may despite development still remain recognisable, but they may also evolve to unrecognisable patterns, the meaning of which is simply conventional. A familiar set of ideograms, the numerals *1, 2, 3, 4, 5,* can be read in English as *one, two, three, four, five,* but the same signs may be used in other languages with quite different phonetic values, although their meaning remains the same.

Mixed systems are not uncommon, that is, ones where some signs are ideographic and some phonetic. When we read *1st* as *first*, and *3rd* as *third*, we are using ideograms with a phonetic complement. This serves to prevent us giving the wrong sound to the ideogram, and in some languages allows us to indicate inflected forms. Examples of mixed scripts are Hittite (a cuneiform script) in antiquity, and in modern times, Japanese.

This explanation is essential in order to understand how Linear B was deciphered. It was immediately obvious that there was a simple numeral system; virtually all tablets record numerals, and there are examples of addition to verify the system. There are signs for units (short upright bars), tens (horizontal bars), hundreds (circles) and thousands (circles with rays). Each sign can be repeated up to nine times. Thus the number 1357 would be written:

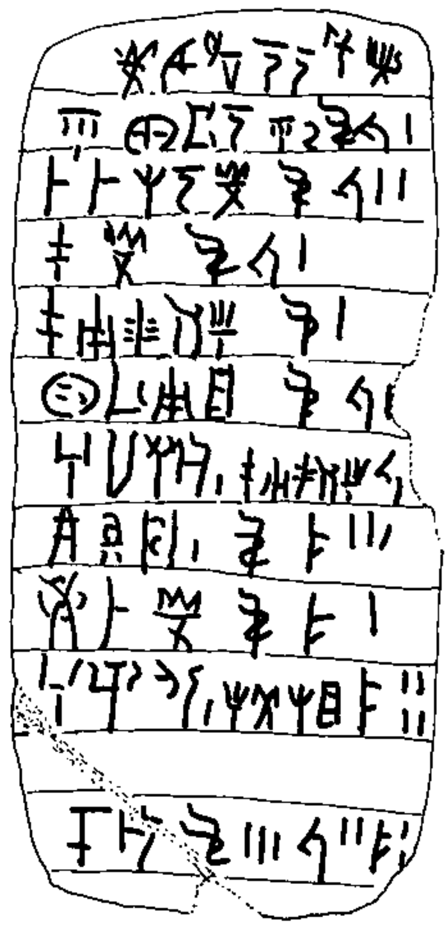


With this clue it is then possible to identify certain signs which occur only in isolation before numerals. Many of these are obvious pictures, or 'pictograms' as they are called:



But many others bear only a distant relationship to the pictures that must underlie them, and at this stage these are therefore still unidentified. Even so it is clear that some of these were animals:

There is also a special set of signs which occur before numerals and sometimes following an ideogram. The analysis of a Knossos tablet will illustrate this.



3 Knossos tablet Fp1

Now if we call  *A* and the signs  and  *x* and *y* respectively, we can tabulate the entries thus:

A	*x*	*y*
0	1	–
0	2	–
0	1	–
1	–	–
0	1?	–
0	1?	–
0	0	3
0	0	1
0	0	4
3	2	2

The last line is a much higher figure than any of the preceding ones, and this would be explained if it were a total. But since this is a sum like our old-fashioned pounds, shillings and pence, we need to know the relationship between the three columns to check this, because it will be necessary to carry over the appropriate figure from one column to that to the left of it. If we add up the figures in the right-hand column, they come to 8; but the total in the last line is only 2. It follows therefore that $x=6y$ or $3y$, either of which would give the remainder 2, if divided into 8. But since one entry has the figure $4y$, if $x=3y$, this would have been written $1x$ $1y$. Therefore $x=6y$, and 1 must be added to the middle column.

The figures in the middle column add up to 6, to which must be added the 1 carried over from the y column. But two of the figures are shown as 1?, because either or both of these could be read as 2. However, when the total of x is reduced to A units, there is again a remainder of 2, as shown by the total. Since only $1A$ is recorded in the left-hand column, 2 must be carried over from the x column to make the total $3A$. It follows that the total of x units, before being reduced to the higher unit A, must be an even number, if when divided by twice the value of x it leaves a remainder of 2. Therefore only one of the doubtful figures must be restored as 2, and the other is 1. Thus the real total for the x column will be 8, and therefore $A=3x=18y$. By such means we can establish that the word 𐀵𐀰 (and elsewhere 𐀵𐀮) is used to introduce a total, and must have an appropriate meaning.

Inspection of other tablets shows that x and y are fractions of other ideograms too, and thus we can can deduce that they are units of a system of measurement, like hundredweights, quarters, pounds and ounces, or bushels, gallons, quarts and pints. Thus the numerals lead directly to the identification of three series of metric signs: one, since its highest unit is a pictogram of a pair of scales, is clearly weights; the other two share the two lowest units, so they presumably represent volume, one for dry and the other for liquid measure.

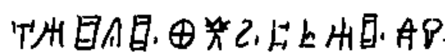
By such deductions it is easy to see that the tablets are for the most part lists of men and women, livestock, agricultural produce and manufactured objects. Without any knowledge of the language, we can still give a useful account of the subject matter of the records. As we shall see later, this is also the situation as regards the earlier, Linear A, script.

The real problem concerns the remaining signs, which constitute the bulk of the text. The first question to ask is: how many are there? This is not so easy to answer as might be thought. The scribes did not write a 'copy-book' hand, but showed a great deal of individual variation. One sign appears as:

These are fairly obviously variants of one sign. But another, rather similar sign, appears as:

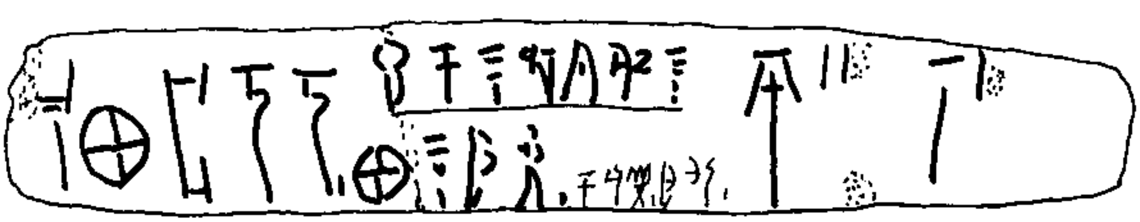
Is the number of strokes inside the circle significant, or are they all simply variants? Is it the same as the previous sign? The answers to these questions depend partly on judgment, but a hunch can often be confirmed if two forms behave alike and replace each other in the same sign group. Simple as this sounds, it does of course depend upon having a large body of material to work on. Statistical methods cannot be used when there are very few examples of a particular sign. For fifty years after the first discovery of Linear B, very few people had access to enough material to make this kind of work practicable. Evans produced some lists of signs based upon the Knossos tablets; but it was impossible to check his work, and when the fuller evidence was published in 1952, the job had already been done for the Pylos tablets by an American, Emmett L. Bennett. His signary still stands today, with minor modifications, as the definitive list of signs. But there are still a very few signs whose status is unclear. For instance, Bennett quite properly listed as separate signs and , although this would be the only case in the script in which the distinction between two signs depended on one being the mirror image of the other. Subsequently it has become clear that these were really variants of one sign, since new material has shown that one replaced the other in the same sign-group. Bennett in his table listed 87 signs, and even with corrections it is safe to say the total number in use was no more than 90.

Once the signary was established, it became possible to count the signs and list their frequencies. It is highly convenient for the decipherer that the Mycenaean scribes divided their signs into groups by using a short upright bar placed just above the line, thus:



The groups so divided off range from two to eight signs. Contrast this with the habit of Greek alphabetic inscriptions, which usually string the words together in a continuous sequence.

The direction of the writing is obvious, since most lines begin at the left-hand edge of the tablet and unfilled spaces are left at the right-hand edge. This left-to-right direction is uniform throughout Linear B. Tablets with several lines of writing usually have them separated by transverse lines running the full width of the tablet. It is tempting to call them rules, but they are in fact drawn by hand, before the text was written. Elongated tablets often have the first word of the text in large signs, and after this there is a division into two lines. In places a word, or even a complete line of writing, is added over the text; this is either an annotation, or may be a continuation of the main text for which there was not enough room.



4 Pylos tablet Eo 269, showing division into two lines

The tablets are generally speaking small enough to be held in one hand, while being written on by the other; they sometimes have the marks of fingers on the reverse. The largest tablet so far known is about six inches across, ten-and-a-half inches high, and about an inch thick, but the majority are very much smaller.

Thus it is possible to produce frequency lists of signs, showing not only their overall frequency, but also in initial, medial and final positions. It will often appear that a sign has a particular liking for one position in sign-groups. At this stage it is useful to compile an index of sign-groups, not merely to find repetitions of groups, but also to discover groups which begin alike but have different endings. Likewise a reverse index, that is to say, one in which the groups are arranged in the order of their signs working from the end of the word, is useful to find groups that have the same ending.

All of this work was performed for Linear B by the small number of people who had access to sufficient texts, but it did not at first lead to any significant advances. The most important step, seen with hindsight, was the discovery by the American scholar Alice Kober of a number of sign-groups at Knossos which occurred in three different forms, which she thought must represent some sort of inflexional endings.

The decipherment proper was the work of a British amateur named Michael Ventris. He had been fascinated by the mystery of Linear B since he was a schoolboy, and when he had qualified as an architect, he continued to devote much of his spare time to this hobby. In the autumn of 1951 the publication of the first batch of Pylos tablets, those found in 1939, gave him for the first time an adequate supply of material. He had already analysed the script and concluded that in view of the size of the signary it was likely to be a relatively simple syllabic system. He also understood the ideographic system, as outlined above.

If the language of the inscriptions had been known, it should not have proved too difficult to find values which would give appropriate words. However, as explained above, Linear B was seen as a Cretan script, which had unexpectedly appeared on the mainland of Greece in a Mycenaean palace. Evans had been in no doubt that his 'Minoan' Cretans were not Greek-speakers, and it could be held that the Pylos tablets supported his belief that the Minoans had for a time controlled southern Greece, as they certainly did the islands of the Aegean. Other scholars were less certain, for Homer gives what is acknowledged to be a picture of the Mycenaean age, however much the details are garbled. All his characters speak Greek, whether they are on the Greek or Trojan side; and many have names which are significant in Greek, and this too is true of the Trojans. But this could be simply a literary convention, and it is unsafe to deduce from Homer's poems that the Mycenaean inhabitants of Greece were Greek-speaking, though this certainly appeared for other reasons too to be probable. The upshot was that it was clearly impossible to predict the language of Linear B, and Greek would have been regarded as an outsider if this had been a betting matter.

There was however another valuable clue. At the easternmost fringe of the early Greek world lay the island of Cyprus, which was largely Greek-speaking in classical times, though early inscriptions in other languages showed that it had not always been wholly Greek. Down to about the third century BC the Greeks of Cyprus had not used the alphabet, but a peculiar script of their own. This had been deciphered in the 1870s, since it was assumed to be Greek, and few short inscriptions were known in which the same text was given both in the later Greek alphabet and in the native script. Fuller details will be given in chapter 6, but it was important that here was a simple syllabic script used for writing Greek. Even more interesting was the fact that a few of the simple signs were identical with or very similar to signs in Linear B. Evans had already noticed that a Knossos tablet listing horses contained the word 𐀡𐀫 and that 𐠡𐠒 in the Cypriot script would read *po-lo*. Now *pōlos* is the Greek word for 'foal'. Evans dismissed this as a coincidence, and in principle he was right to do so. For one thing the word is very short; a coincidence involving a longer word would be less easy to dismiss. To prove that Linear B was Greek would require a number of such coincidences, where the meaning of the word could already be deduced from the context. Evans was of course in any case irrevocably prejudiced against the Greek solution.

Ventris started by deliberately ignoring the Cypriot clue as the point of departure. Observing that the formula for 'total' varied between 𐀵𐀰 and 𐀵𐀭, he argued that in an inflected language this might correspond to a difference of gender, since one form appears with the ideogram for 'man', the other with the ideogram for 'woman'. If the gender difference was expressed by a change in the vowel of the termination, then 𐀰 and 𐀭 probably differed in their vowels, but had the same consonant. Detailed analysis of a number of such pairs of words enabled Ventris to build a 'grid', a table in which the signs sharing the same consonant were arranged in horizontal lines, and those sharing the same vowel in vertical columns. Once this stage had been reached for a fair number of signs, it was only necessary to obtain values for a few of the signs and it would become possible to read off the values of the rest.

At this point the Cypriot clue afforded some help, but the key discovery concerned the groups noticed by Alice Kober. Ventris, seeing that they did not occur on the Pylos tablets, deduced that they might be the names of Cretan towns, with their adjectival variants; and since the names familiar from classical Crete are not of Greek origin, it was not unreasonable to suppose that they came from the earlier language of Crete. He was quickly able to suggest that *ko-no-so* was a spelling for what in Greek is *Knōsos*, *a-mi-ni-so* was the name of its port, *Amnisos*, and a few other well-known names were identified. Up to this point the decipherment was still not linked to any language. But application of the values so obtained from the 'grid' to other words revealed that, for instance, the totalling formula would read *to-so* and *to-sa*, which bore a striking resemblance to the Greek word meaning 'so much' or 'so many', *tosos*, feminine *tosā*. A few other words also appeared which recalled Greek words of appropriate meaning.

Ventris therefore set out to test the hypothesis that the language was Greek, not expecting it to lead anywhere. But as he applied his values to more and more words, Greek words kept on appearing, but their spelling was nearly always incomplete, and the written skeleton needed to be filled out before it became intelligible as a Greek word. Even so, the form of the word was sometimes unfamiliar, as might be expected in a form of Greek far older than our earliest text, the poems of Homer.

For example, there were tablets from Pylos listing numbers of women, clearly recognisable from the ideogram, together with numbers of two other items written in the syllabic script. It was a fair assumption that these were the words for 'children', or more precisely 'girls' and 'boys'. Homeric Greek has for these the words *kourai* and *kouroi*, but the Linear B spellings emerged as *ko-wa* and *ko-wo*.

5 Pylos tablet Aa 62, showing women and children

Only a knowledge of the etymology and early history of Greek could show that the original form of these words had been *korwai* and *korwoi*. The letter pronounced *w* had been lost from Homeric Greek, though it was still heard in a few dialects. But it was necessary to set up rules stating that *r* might be omitted before *w*, and that diphthongs might have their second element dropped, so that the ending might be read as *-ai* and *-oi*.

It was at this point that Ventris formed an alliance with John Chadwick, a lecturer in Classics at Cambridge University, whose special interest was the early history of the Greek language. Together they worked out the rules governing the spelling, which will be discussed more fully in the next chapter; they were able to show that in many cases the archaic form of the words they reconstructed was supported by what was already known about the language.

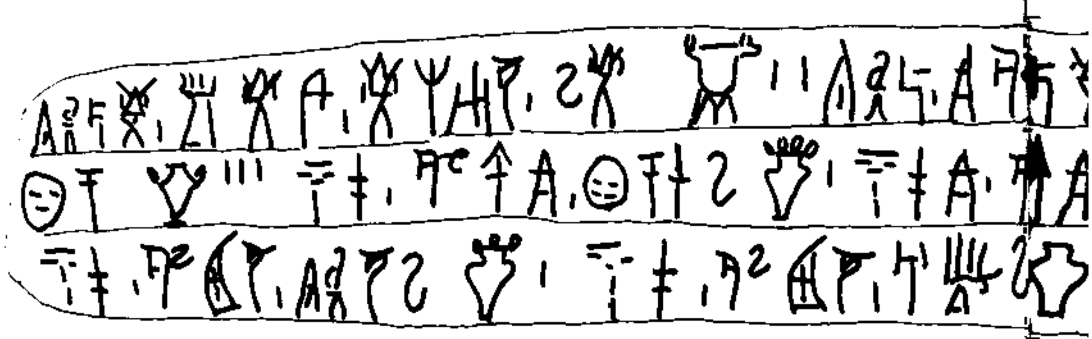
The increasing number of Greek words which appeared in promising contexts soon provided good evidence for the correctness of the decipherment. For instance, previous decipherments had sometimes yielded weird names, which their authors claimed as gods and goddesses; the Ventris decipherment applied to a Knossos tablet yielded no less than four divine names well known from Greek literature. But it was necessary to present these results in a scientific manner, so that any scholar with the skill and patience to apply the solution could see for himself the match between the interpreted forms and their contexts. Even where the context was itself obscure, the interpretation often produced a plausible sequence of Greek words.

All this was demonstrated in an article entitled 'Evidence for Greek dialect in the Mycenaean archives', written jointly by Ventris and Chadwick and published in *The Journal of Hellenic Studies* for 1953. The theory was so unexpected, and its testing demanded so much technical and archaeological knowledge, that its reception was at first mixed. But powerful support soon came from distinguished Greek scholars, and others began to contribute to the elucidation of the texts.

But the main reason why the decipherment carried conviction was an unforeseen event. In the summer of 1952, almost precisely at the critical period when Ventris was getting the first hint of Greek words, the American excavators of Pylos, whose work had been interrupted in 1939 by the outbreak of the Second World War, at last resumed digging. More Linear B tablets were quickly found, but as they came out of the ground they could not easily be read, and they were carefully stored for cleaning and consolidation during the ensuing winter. In the spring of 1953 the leader of the American team, Carl Blegen, returned to Greece to work on his finds. He had been supplied with an advance copy of the article reporting the decipherment, which was still being printed. Studying his new tablets Blegen quickly noticed a large one which bore pictures of three-legged cauldrons. He applied the values given to the accompanying signs, and was astonished to read *ti-ri-po-de*, almost exactly the Greek word *tripodes*, which of course means 'tripods' and is used of cauldrons of this type.

Even more remarkable was a series of vessels pictured on the same tablet with different numbers of loops at the top, clearly indicating the number of handles. Here the text revealed a word which read *qe-to-ro-we* accompanying the vessels with four handles, and one reading *ti-ri-o-we-e* or *ti-ri-jo-we* with those with three handles. Obviously the second word began again with *tri-*, the Greek form for the number 'three' in compounds; and those who knew about the history of the language could accept that *quetro-* was a possible form in very early Greek for 'four'. The classical form corresponding to this would be *tetra-*. There was even a pictogram of a vessel without handles; here the text read *a-no-we*, and Greek regularly has *an-* as a negative prefix. The second part of these words is related to the word for 'ear', which is also used in Greek to mean 'handle'.

As soon as the 'tripod' tablet became known, most scholars accepted the validity of the decipherment. The odds against a coincidence of this sort would be astronomical. In other tablets too, new examples were found of ideograms

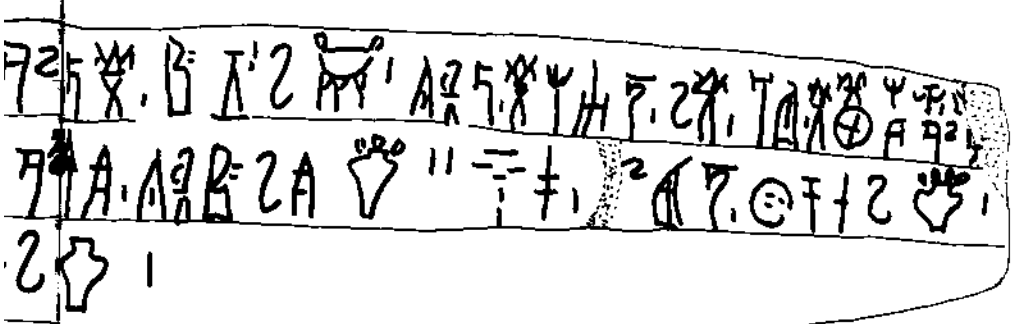


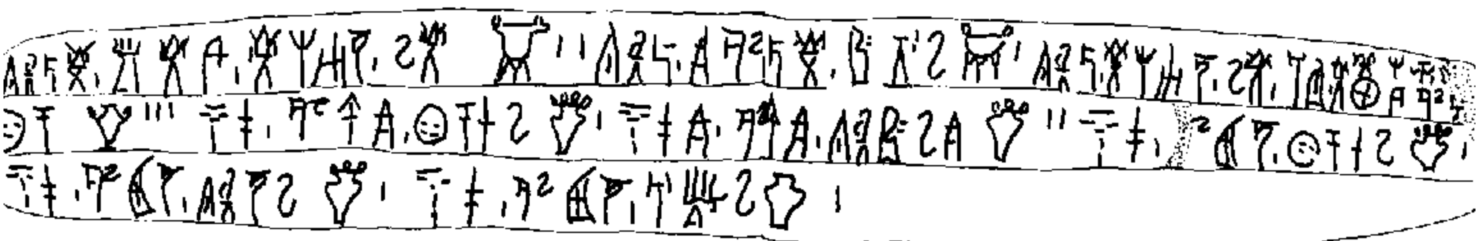
6 Pylos tablet Ta 641, showing tripod-cauldrons

corresponding to the syllabic text. The Knossos tablet listing horses has already been mentioned; a new fragment joined to this gave the Greek words for 'horses' in one line and 'asses' in the other. Added to the word for 'foals' already suggested, but rejected, by Evans, this made three words on one tablet in close agreement with the evident subject.

This did not mean that all was now plain sailing. A number of the rarer signs remained to be solved, and there are still a few left in this class. Some signs appeared to have an optional function, and the limits within which they could be used had to be determined. The nature of the spelling rules had to be elucidated, and the new dialect revealed had to be studied. The vocabulary proved, not surprisingly, to differ from that current a thousand years later, and only gradually has it become possible to suggest meanings for some of the new words.

Some of the early difficulties turned out to be due to wrong readings of the originals, and a great deal of effort has gone into their study. As a result we have much better texts now than were available to the decipherers. In particular, the joining of fragments in the material from Knossos has revealed many new facts. It is pleasant to record that all this work has been performed by the co-operation of scholars all over the world.





Pylos tablet Ta 641, showing tripod-cauldrons