Nggem: 3,000 speakers along the middle Hafifoe River, north of Wamena. Closely related to Walak.

Samarakena: also called Samarkena, Karfasia, Tamaya, Tamaja. 400 speakers on northern coast island just east of Apawar River, west of Sarmi, villages of Karfasia, Samarkena, Maseb, Tamaya. Speakers bilingual in Airoran, Isirawa, and some in Kwerba.

Silimo: also called South Ngalki, Paiyage. 5,000 speakers in central highlands south of the range immediately west of the Balloon River, Ano, Kiniage valleys.

Trimuris: 300 speakers on the eastern bank of the Mamergamo River between Kauwera and Bagusa languages, Jaya Kupaten, Mamergamo Tengah Kecamatan. They do not understand Kwerba very well. All ages. Vigorous language use.

Walak: also called Lower Pyramid, Wodo. 1,500 speakers in villages of Ilugwa, Wodo, Bugi, Monokon, Warijebut.

Wano: 7,000 speakers. Closely related to Nggem, Walak. Western Dani, Dem, Moni, or Indonesian spoken by leaders, men, adults, young people, those who have been to school, about common topics, because of intermarriage.

Yali, Angguruk: also called Northern Yali, Angguruk, Yalimo, Yali Tengah. 15,000 speakers in the central highlands area northwest of Nalca, east of Grand Valley Dani. Different from Yali of Ninia and Yali of Pass Valley, but related.

Yali, Pass Valley: also called Western Yali, Pass Valley, Abendago, Yali Utara. 5,000 speakers in central highlands, east of Angguruk and northwest of Nalca, Jayawijaya, Kurulu, and Kurima. Dialects are Pass Valley, Landikma, Aplahapsili. Different from Yali of Ninia and Yali of Angguruk, but related.

Yali, Southern: also called Ninia, Yali, Yali Selatan, Jali, Jaie, North Ngalki. 10,000 speakers. Different from Yali of Pass Valley, Yali of Angguruk, and Hupla, but closely related.

B. GRIMES

DATIVE. See Case.

DECIPHERMENT. In a technical linguistic sense, “decipherment” refers to the decoding of a writing system which is no longer in use and no longer comprehensible. It is usual to distinguish decipherment from cryptanalysis or cryptology; the latter aims at understanding special writing codes or ciphers devised to disguise the meaning of a message. We also distinguish decipherment from interpretation: a text written in an obscure language but in a known script (e.g. the Latin alphabet) requires interpretation, not decipherment.

Some of these definitions and distinctions are less sharp than we would hope. First, the concept of decipherment is tied to the concept of writing, but it is not always obvious what counts as writing. Second, cryptoanalysis and decipherment often overlap in their techniques. Third, the interpretation of texts is the only test of decipherment: if the language is known, no problems arise—but if it is not, interpretation is necessary for decipherment. Fourth, we often hesitate between the use of “decipherment” and “interpretation.” Lycian was an Anatolian language of the 1st millennium BCE, written in an alphabet borrowed from Greek; yet the phonetic values of some of its signs differ from those of Greek, and there are additional signs not found in Greek. If we succeed in understanding these texts, is it decipherment or interpretation? (For general reference on scripts and decipherment, see Gelb 1952, Cohon 1958, Voegelin and Voegelin 1963, Friedrich 1966a,b, and Trager 1974.)

1. History of decipherment. Decipherment is normally required for scripts which fell out of use, either because they were employed for languages which also became extinct (e.g. Akkadian Cuneiform), or because literacy disappeared (Linear B), or because they were replaced by other forms of writing (Syllabic Cypriot). Modern scholarship has been immensely successful in deciphering all such types; but there are still many scripts (or supposed scripts) for which no full and generally accepted decipherment is available. They include the Indus Valley script of the 3rd millennium BCE, Cretan Hieroglyphic of the 2nd millennium BCE, the Easter Island script of the 19th century, and a number of others (see Gelb 1973:266, RAS 1975, Leclant 1975, Daniels and Bright 1996:139–188).

1.1. Early steps. Interest in ancient scripts goes back to the Renaissance and earlier (Pope 1999). Evidence for languages and scripts was extensively collected in the 16th and 17th centuries, when languages like Coptic (a form of Neo-Egyptian) were rescued. In the 17th century, the interest in universal languages also led to discussions about universal writing, which helped to establish a typology of writing. However, the first serious decipherments belong to the 18th century. In 1754, two scholars—J. Swinton and the abbé Barthélemy—Independently deciphered the Aramaic script used in the Palmyra inscriptions of the 3rd century CE; in 1787, A.-I. Silvestre de Sacy deciphered Sassanian, the script used in Persia to write the Middle Iranian language of the Sassanian dynasty. In both instances, the script was a form of the Aramaic alphabet, closely related to the Syriac writing which was already known. Both decipherments were
based on bilingual texts that included Greek versions. The first methodological principles were also established in the 18th century. As early as 1714, Leibniz had advocated the use of personal names to establish the necessary links between the known and undeciphered parts of a bilingual text. Personal names were important in the decipherment of Palmyrene and Sassanian and played an essential role in later decipherments.

In the 19th century, the prerequisites for decipherment—extensive knowledge of scripts, adequate editions of texts, philological skills, and ability to reconstruct linguistic forms from limited evidence—became more widely available. Two great decipherments opened the way to further successes: that of the Egyptian Hieroglyphs, and that of the Old Persian Cuneiform.

**1.2. Egyptian hieroglyphs.** For a long time, mystery had surrounded the hieroglyphic script attested in Egypt from the 3rd millennium BCE to the 4th century CE. Later it was assumed that each pictographic sign represented a word or a notion. The decipherment was made possible by the discovery of an Egyptian stele, the Rosetta Stone, dated from 196 BCE, which contained three versions of a decree in honor of King Ptolemy V. One version was in Greek; the other two were written in hieroglyphic and in demotic (a very cursive version of the Egyptian script, often mistaken for alphabetic by early decipherers). Sequences of signs equivalent to the personal names of the Greek version were identified in the demotic, and in one instance (the name *Ptolemaios*) in the hieroglyphic part. The most impressive contributions came from a young Frenchman, Jean-François Champollion (1790–1832), who had prepared himself for the task almost from childhood, through a series of philological studies of the Egyptian evidence (including Coptic). He succeeded in showing that a number of names were written with signs which had phonetic values. This was announced in 1822; in his later work, through a simple count of the number of signs in the hieroglyphic part of the Rosetta Stone and of the number of words in the Greek part, Champollion discredited the old view that, except for personal names, each “hieroglyph” corresponded to a word. Some of the hieroglyphs indeed had logographic functions, but others had a phonetic value; a word could be indicated by both logographic and phonetic signs. Thus the phonetic values puzzled out on the basis of personal names could also be exploited elsewhere; further, some morphemes seemed to be related to the corresponding Coptic forms. What emerged from the work which followed Champollion’s results was a complicated writing system which included logographic signs, determinatives, and phonetic signs corresponding to one or more consonants (see Friedrich 196a:4–25, Pope 1999:43–84).

**1.3. Cuneiform writing** was unknown to the West until the 17th century. The first reliable copies of the Persepolis cuneiform inscriptions were published in the second half of the 18th century; some (connected with the Achaemenid kings of Persia, who reigned in the 5th century BCE) were multilingual, with three versions of the same text in different cuneiform scripts used for different languages. At the beginning of the 19th century, a German schoolteacher interested in cryptoanalysis, G. F. Grotefend (1775–1853), recognized (as others had before him) the sign that divided words; he concluded from the number of the signs and the length of the words that the script was alphabetic or semi-alphabetic; he guessed from the pattern of repeated sequences that the text included the formula found in later Sassanian inscriptions (“X, great king, king of kings, son of Y, Achaemenid . . .”); and finally, he recognized the names of the king Darius and his son Xerxes. The first phonetic values could then be assigned, but Grotefend was prevented from going much farther by his insufficient linguistic knowledge. In 1826, the great comparativist Rasmus Rask identified the ending of the genitive plural in the phrase “king of kings” and compared it with the genitive plural of Sanskrit. It then became clear that Old Persian was closely related to Sanskrit and to Avestan; this led to further identification of sign values and allowed scholars to determine through comparison the meanings of a number of words. An Englishman, Henry Rawlinson (1810–1895), succeeded in reading the great Behistun inscription of Darius; on the basis of that evidence, he produced a new decipherment of the Old Persian texts, which partly overlapped with that of Grotefend, but went much further.

The decipherment of Old Persian was crucial: first, it was achieved without the help of a version in a known language; second, it opened the way to the even more important decipherment of Akkadian (Assyro-Babylonian) cuneiform (also started by Rawlinson). The script and language were used in one of the versions of the Persian texts—but also in innumerable clay tablets which formed the archives, recently discovered, of the main Near Eastern centers during the 3rd to 1st millennia BCE. The Old Persian version gave no help with the sign values, but it provided the necessary bilingual material and the personal names likely to be found in both versions. The language was found to be Semitic, and comparative
Semitic evidence was invaluable in defining the meaning of a number of roots. Like the Egyptian hieroglyphic script, the writing system included logograms, determinatives, and phonetic signs; the last were all syllabic, and indicated a V[owel], C[onsonant]+V, V+C, or (more rarely) C+V+C. The knowledge of the new writing system led to the understanding of a number of ancient Near Eastern languages whose existence had been barely suspected: most important was Sumerian, the non-Indo-European and non-Semitic language attested in Mesopotamia from the late 4th millennium BCE, for which the first forms of cuneiform writing were probably devised. Also important was Hittite, which was written in Anatolia during the 2nd millennium BCE. Most of the texts were written in a form of cuneiform similar to Akkadian; they were easy to read, but they remained incomprehensible until it was discovered that the language was Indo-European (indeed the oldest attested Indo-European language), and until a combination of contextual and etymological work led to the understanding of both grammar and vocabulary (Friedrich 1966a: 27–71, Pope 1999:85–122).

1.4. Linear B. The most celebrated decipherment of this century was that of Linear B, a script written on clay tablets in Crete and in mainland Greece in the latter part of the 2nd millennium BCE. The decipherment, announced in 1952, was the work of a young architect, Michael Ventris, who in the last stages of his work had the help of the linguist John Chadwick. It built on earlier discoveries (especially by the American Alice Kober): given the number of signs, the script was likely to be syllabic, possibly with V or CV signs like the obviously related Syllabic Cypriot; and the language was inflected, since the final parts of words showed regular types of alternations. On the basis of these alternations, Ventris established a grid of signs which had either the same vowel or the same consonant (though their values remained unknown). He then guessed the values of some signs on the basis of various criteria: identification of Cretan place names in the Cretan tablets; graphic similarity between the Linear B signs and the signs of the Cypriot syllabary; and the assumption that the sign most frequently found in word-initial position represented the [a] vowel. The grid was used to test these suggestions and to define the values of other signs. From his first tentative readings, Ventris was unwillingly led to the correct conclusion that most of the words and most of the patterns of word-formation had to be Greek. The script was shown to be syllabic, with approximately eighty phonetic signs of the type V or CV, and with logograms used separately from the phonetic signs (see Chadwick 1973).

2. Methods. The work just exemplified led to two immediate results: first, the typology of writing was better understood than previously; second, a rudimentary methodology for decipherment was developed. Yet it is doubtful that there ever was a logical decipherment in which guesswork did not play a considerable part; even now, there is no known recipe for decipherment. What we have is a series of heuristic devices, some of which are mentioned below (see Aalto 1945, Friedrich 1966a:134–39, Gelb 1973, 1974).

The importance of preparatory work has been underlined. The decipherer needs to know as much as possible about the linguistic and historical data relevant to the period and area to which the texts belong. Accurate drawings, photographs, or “squeezes” (moldings or casts) of the texts are also necessary—as well as a first-hand acquaintance with the monuments, if possible, and an understanding of their relative chronology. The direction of writing, and as many external features of the script as possible, must be identified. Above all, are there word-dividers or any other features which can distinguish words? The next task (only feasible if there are sufficient texts) is to separate the functionally distinct signs (graphemes) from the individual or distributional variants: for example, in English, the graphic distinction between a and o is significant, but z and y are merely graphic variants of the same letter. The total number of graphemes then helps to determine the nature of the writing system. A system with fewer than thirty signs is likely to be alphabetic, while one with fifty to one hundred signs is probably syllabic. Some two hundred to four hundred signs normally point to a system with both logographic and phonetic signs.

It is essential to study the frequency and distribution of the signs (Koskenniemi et al. 1970). It is also necessary to compare similar sequences of signs in the hope of recognizing grammatical features such as prefixation or affixation. Computers may be invaluable for this type of work (Packard 1971). In a simple syllabic system, the decipherer may be able to establish a grid of the type set up by Ventris for Linear B.

The crucial step is identification of the language, and the attribution of meanings and/or phonetic values to the signs or sequences of signs. When there is a bilingual document, those elements which are likely to recur in comparable phonetic forms in both texts (personal names,
place names, etc.) must be identified. It may then become possible to recognize other forms; and it may become clear whether the script conceals a known language. If the language is not known, interpretation is still possible if there are sufficient texts, and if the linguistic evidence is adequate. It is also possible that the language, though unknown, is related to known languages; if so, a judicious use of the combinatorial method (a contextual approach) and of the etymological method can lead to satisfactory results. A pure etymological approach is in general dangerous and ought to be avoided.

In the absence of a bilingual document, information about the content of the text can be provided by the typology of the texts themselves—funerary monuments, dedications, royal statements, and so on—and by their historical background. Some logographic elements may be immediately interpretable (e.g. numbers, or logograms for men and women); some formulae may be expected. Comparison of the signs with formally similar signs of other scripts must be done with extreme caution, but it may sometimes be useful. Yet even if some of the signs can be assigned phonetic values, there is no guarantee of interpretation if the language is not known.

A decipherment must be tested not on the basis of the method used to achieve it, but on its results. If correct, it must permit an interpretation of the text which does not contradict expectations based on external or internal factors: typology of the monument, historical considerations, arrangement of the text, pictograms, numerals, and so on. The text should be linguistically coherent. A decipherment of chronologically and geographically coherent texts which yields a mixture of early and late forms, or of geographically incompatible features, is suspect.

In general, the decipherment of a script used for a known language is possible if the body of evidence is not too small; alphabets and simple syllabic systems are easier to decipher than logographic-syllabic systems. It is far more difficult (and sometimes impossible) to decipher a script used for an unknown language. In favorable circumstances, a decipherment may be possible, but it is not always the case that all signs can be assigned a value, and that all texts can be fully interpreted. Contrary to usual belief, most decipherments do not result from the sudden cracking of codes by isolated geniuses who rely exclusively on the sheer power of their intelligence and erudition. In a number of instances, the process of decipherment is extremely slow, and advances are made through the cumulative efforts of a number of experts.

Thus the study of the so-called Hieroglyphic Hittite (now Luwian), a logographic-syllabic script used to write an Indo-European language in Anatolia and Syria of the 2nd to 1st millennia BCE, started in the 1910s, obtained considerable results in the 1930s, most of which were confirmed by the discovery of a bilingual text in the 1940s. This led to the first glossary and full list of signs in the 1960s. The work gained new impetus in the 1970s and 1980s with the attribution of new values to some very frequent signs, and with a number of new editions of texts. Decipherment of the script of the 1st millennium is now almost complete, barring unexpected developments (Friedrich 1966a:72–84, Pope 1999:136–145, Hawkins et al. 1974, Hawkins 2000).

Hieroglyphic Luwian is not unique; a similar account could be given for numerous other decipherments.

3. Recent achievements. Two very recent decipherments, also due to cumulative work by more than one scholar, provide good examples of different approaches to the problem. The Maya glyphs were written from before the beginning of our era to one or two centuries after the Spanish conquest on different material (stone, wood, bark, pots, codices) by peoples inhabiting El Salvador, Belize, Guatemala, Honduras, and parts of Southern Mexico. There was resistance to the idea that the glyphs were in fact forms of writing and even stronger resistance to the suggestion that they might be used for phonetic writing. In the 19th century, a copy of a 16th-century account by Diego de Landa, a Franciscan friar (subsequently a bishop), of the so-called Mayan alphabet was found. This turned out to provide very difficult and sometimes hopeless evidence which, however, was crucial in the first steps of the decipherment. A helpful factor was that, though the Mayan language of the pre-Conquest period was not independently known, the descendant and related languages still survive. The two breakthroughs in the decipherment were (a) the discovery that a number of texts have historical value and (b) the demonstration that the glyphs were used as logograms but also as phonetic determiners in connection with a logogram or as syllabic signs in sequences used to render words in entirely phonetic form. In the middle of the 20th century, the starting point for the decipherment was the combination of pictorial signs that were clearly recognizable (e.g. a turkey or a dog) with glyphs for which (on the basis of Diego de Landa’s “alphabet”) it was possible to suggest syllabic values that fit with the words for turkey or dog known from the later language. After the first values were es-

For the Mayan glyphs, the main question was whether they were a form of phonetic writing; for the badly attested Carian script, that was never doubted but the breakthrough came when it became clear that some of the alphabetic values that had been taken for granted had to be abandoned. The Carians inhabited southwest Anatolia in the 1st millennium BCE and spoke a language that was soon replaced by Greek. They left short inscriptions datable from the 7th to 4th century BCE found partly in Anatolia, partly (and mostly) in Egypt, where there were a number of Carian mercenaries. The script is very close to the Greek alphabet but has a number of different signs, which at some point were taken as syllabic. Naturally the letters that matched Greek letters were assigned the same values, but this did not lead to any coherent interpretation of the texts. The first attempts to focus on the Carian texts of Egypt and to find in Carian the equivalents of Egyptian names date from the 1970s, but the most detailed and successful work was that of the Cambridge Egyptologist John Ray, who in the 1980s and 1990s used the comparison with Egyptian material to assign new values to the Carian letters; the work was continued independently in the 1990s by a young Spanish linguist, I.-J. Adiego, and by a German, Diether Schirr. The end result was a set of alphabetic values (no question of syllabic signs) which only partly matched those of the Greek alphabet; see, in addition to Pope 1999:192–194, Ray 1981, 1987, Adiego 1993, Schirr 1992, Giannotta 1994. The new values have now been proved to be correct thanks to the 1996 discovery and fast publication of a short Greek/Carian bilingual inscription (Frei and Marek 1997), which seems also to provide enough evidence to show that the language belonged to the Anatolian branch of Indo-European. The lesson once again is that even in related scripts similarity of letter shapes does not necessarily mean similarity of phonetic values.

[See also Cuneiform; Egyptian; Mayan Languages; and Writing and Written Language.]

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Anna Morpurgo Davies

DECLARATIVE. See Pragmatics and Contextual Semantics; Clause; Systemic Grammar; Computational Linguistics; and Mood.

DEEP STRUCTURE. See Formal Grammar and Levels of Representation.

DEFINITENESS. See Anaphora; Deixis; Discourse; Philosophy of Language; Pragmatics and Contextual Semantics; Semantics; and Typology and Universals.

DEFOID LANGUAGES. These languages, also called Yoruba-Akikid languages, constitute a group spoken in Benin, in Togo, and in southwestern Nigeria. They form a branch of Benue-Congo.

LANGUAGE LIST

Arigidi: also called North Akoko. 48,000 speakers in Nigeria, in Ondo state, Akoko North LGA; Kogi state, Kogi LGA.

Figure 1. Subgrouping of Dialects

<table>
<thead>
<tr>
<th>Dialects</th>
<th>Languages</th>
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<tr>
<td>Akokoid</td>
<td>Arigidi</td>
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<tr>
<td>Ayere-Ahan</td>
<td>Ahun, Ayere</td>
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<tr>
<td>Yoruboid</td>
<td>Edikiri</td>
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<tr>
<td>Cabe, Ica, Idaca, Ife, Ije, Isokiri, Kambolé, Lucumi, Mokole, Nago, Ulukwumi, Yoruba, Igalá</td>
<td></td>
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Dialects are Oyin, Uro, Arigidi, Erůsú (Erushu), Ojo, Udó (Idó, Òwonú Ódó, Ódó Oke-Agbé), Afa (Afá, Òwon Áfá, Oke-Agbé), Óge (Ówọn Ógê), Aje, Ese (Ówọn Èsè), Igasi (Igbésì, Òwon Ègìsì). A dialect cluster.

Ayere: also called Aaan. 300 speakers in Nigeria, in Ondo state, Ekiti LGA, Ajowa, Igashì, and Oṣu towns.

Cabe: also called Caabe, Ede Cathe. 80,000 speakers in Benin, Borgou, and Zou provinces. Bilingualism in Ewe, Fon, Yoruba.

I ca: also called Ede Ica. 39,000 speakers in Benin and Togo. In Benin: Zou Province. In Togo: Dadja.

Idaca: also called Idacca, Ede Idaca. 30,000 speakers in Benin, Zou Province. Bilingualism in Yoruba.

Ife: also called Baite, Ana, Ana-Ife, Anuog, Ede Ife. 155,000 speakers in Benin and Togo. In Benin: 81,000 speakers in Zou Province. Bilingualism in Yoruba. In Togo: 74,000 speakers in southeast central, Ogoou Province. The main centers are Atakpamé, Kamer, and Dadja. Also in the town of Èsè-Ana in southern Togo. Dialects are Etschetti, Djasire, Dadja. Some bilingualism in Èwè in the south and Yoruba in the north. Some also know French.

Igalá: also called Igara. 800,000 speakers in Nigeria, in Kogi state, Ankpa, Idah, Dekina, and Bassa LGAs; Edo state, Oshimili LGA; Anambra state, Anambra LGA. Dialects are Ìbi, Idah, Ankpa, Ogugu, Iba, Ije, Anyugha. Speakers are able to converse in most common topics in Idoma and Agatu. Agatu, Idoma, and Bassa people use Igala for attending Ika Bible School.

Ije: also called Holé, Ede Ije. 20,000 speakers in Benin, Zou Province. Bilingualism in Yoruba.

Isokiri: also called Isokiri, Ishekiri, Shhekiri, Jekiri, Chekiri, Iwere, Irboro, Warri, Isalema-Offa, Selemo. 510,000 speakers in Nigeria, in Delta state, Warri, Bomadi, and Ethiope LGAs. Closely related to Yoruba.

Kambolé: also called Southwest Ede. 20,000 speakers in Togo, east central in the town of Kambolé and a few surrounding villages. Closely related to Ife. Bilingualism in French, Yoruba.

Lucumi: spoken in Cuba. A secret language used for ritual by the Santeria religion.