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- Ngenkiwumerri:** 50 speakers reported in 1981, south of Darwin, east of Katherine. Also called Nangiomeri.
- Tyaraity:** 5 possible speakers reported in 1981, in Delissaville. Also called Dyeraidy, Daktjerat, or Wogadj. All or most speakers are bilingual in English.
- Wadjiginy:** 50 speakers reported in 1953, southwest of Darwin along the coast and inland along the Finnis River. Also called Wogaity or Wagaydy.

**DANI-KWERBA LANGUAGES** are a group spoken on the island of New Guinea, in north-central Irian Jaya, Indonesia. Stephen A. Wurm, *Papuan languages of Oceania* (Tübingen: Narr, 1982), pp. 149–151, proposes the subgrouping given in Figure 1 (apart from some terminological differences). He assigns the Dani-Kwerba stock to the Central and Western part of the main section of his controversial Trans-New Guinea phylum [*q.v.*].

#### LANGUAGE LIST

- Airoran:** 354 speakers reported in 1975, near the north coast of Irian Jaya. Also called Aeroran, Adora, or Iriemkena.
- Bagusa:** 300 speakers reported in 1987, south of Lake Rombebai.
- Dani, Lower Grand Valley:** around 100,000 speakers reported in 1987, from the central highlands of Irian Jaya.
- Dani, Mid Grand Valley:** around 50,000 speakers reported in 1989, in Baliem Valley. Also called Tulem.
- Dani, Western:** 150,000 speakers reported in 1985, in the central highlands of Irian Jaya. Also called Dani Barat, Ilaga Western Dani, Lani, Laany, Oeringoep, or Timorini.
- Hupla:** 3,000 or more speakers reported in 1982, in the central highlands of Irian Jaya. Also called Soba.
- Isirawa:** 1,500 to 2,000 speakers reported in 1987, in Jayapura and Sarmi, on the north coast. Also called Saweri, Saberi, Okwasar. Population includes 30 percent near-monolinguals, and 70 percent with routine ability in Indonesian.

- Kauwerawec:** 400 or more speakers reported in 1987, east of the middle Mamberamo River.
- Kwerba:** 1,500 speakers reported in 1987, in the upper Tor River area. Also called Airmati, Kamboi-Ramboi, Koassa, Nogukwabai, Naibedj, or Tekutameso.
- Nduga:** 10,000 speakers reported in 1985, in Jayawijaya and Tiom, in the central highlands, south of the high ranges. Also called Ndugwa, Ndauwa, Dauwa, Dawa, Pesechem, Pesecham, or Pesegem. Population includes 70 percent nearly monolingual, 20 percent with routine ability, and 10 percent with nearly native ability in a variety of Dani. Some speak Damal, Moni, or Indonesian.
- Nggem:** spoken along the middle Haffifoeri River. Has 50 percent lexical similarity with Western Dani.
- Nopuk:** 150 or more speakers reported in 1987, in the mountains east of the Mamberamo River. Also called Nobuk.
- Samarokena:** 400 speakers reported in 1982, near the north coast, east of the Apawar River. Also called Samarkena, Karfasia, or Tamaya. Speakers are bilingual in Airoran and Isirawa, and some in Kwerba.
- Sasawa:** 189 speakers reported in 1975, near the north coast in the Jayapura area.
- Silimo:** 5,000 speakers reported in 1987, in the central highlands west of the Baliem River. Also called South Ngalik or Paiyage.
- Walak:** spoken in Ilugwa, Wodo, and other villages. Also called Lower Pyramid or Wodo.
- Wano:** 3,000 to 3,500 speakers reported in 1987, on the upper Rouffaer River in the central highlands.
- Yali, Angguruk:** 15,000 speakers reported in 1989, in the central highlands area. Also called Angguruk or Yalimo. Distinct from Yali of Ninia and Yali of Pass Valley (Nipsan).
- Yali, Ninia:** 35,000 speakers reported in 1978, in the central highlands area. Also called Ninia, North Ngalik, Yaly, or Holowon. Distinct from Yali of Pass Valley (Nipsan) and Yali of Angguruk.

FIGURE 1. *Subgrouping of Dani-Kwerba Languages*

<b>Northern Dani-Kwerba</b>
Isirawa
Kwerba
Airoran, Bagusa, Kauwerawec, Kwerba (proper),
Nopuk, Sasawa
Samarokena
<b>Southern Dani-Kwerba</b>
Dani
Lower Grand Valley Dani, Mid Grand Valley Dani,
Western Dani, Hupla, Nggem, Walak
Ngalik-Nduga
Nduga, Silimo, Angguruk Yali, Ninia Yali
Wano

**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, cryptanalysis 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, Cohen 1958, Voegelin & Voegelin 1963, Friedrich 1966a,b, and Trager 1974.) [See also Writing Systems.]

**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 3d millennium BCE, Cretan Hieroglyphic of the 2nd millennium BCE, the Mayan glyphs of America, the Easter Island script of the 19th century, and a number of others (see Gelb 1973:266, RAS 1975, Leclant 1975).

**1.1. Early steps.** Interest in ancient scripts goes back to the Renaissance and earlier (Pope 1975). 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, Sylvestre de Sacy deciphered Sassanian, the script used in Persia to write the Middle Iranian language of the Sassanid 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 (cf. Friedrich 1966a:4–25, Pope 1975:43–84). [See also Egyptian.]

**1.3. Cuneiform writing** was unknown to the West until the 17th century [see Cuneiform]. 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 further 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 (1810–95), 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 3d 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 1975:85–122).

**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 2d 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: 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 (cf. 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 (cf. 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' 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: e.g., in English, the graphic distinction between *a* and *o* is significant, but *z* and *ʒ* 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 bilingual evidence is adequate. It is also possible that the language, though unknown, is related to known languages; if so, a judicious use of the combinatory 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, etc.—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, etc. 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, and had most of these 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 1975:136–145, Hawkins et al. 1974). Hieroglyphic Luwian is not unique; a similar account could be given for numerous other decipherments.

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**DEFOID LANGUAGES** constitute a group, also called Yoruboid-Akokoid languages, spoken in Benin, in Togo, and in southwestern Nigeria. They form a subgroup of the Benue-Congo branch of the Niger-Congo family [qq.v.]. The best-known language of the group is Yoruba [q.v.]. The subclassification of the Defoid languages given in Figure 1 follows Hounkpati B. C. Capo, 'Defoid', in *The Niger-Congo languages*, ed. by John Bender-Samuel (Lanham, Md.: University Press of America, 1989), pp. 275–290.

#### LANGUAGE LIST

- Aguna**: spoken in Zou Province, Benin. Also called Awuna or Agunaco. Speakers are bilingual in Fon-gbe.
- Akoko, North**: spoken in Akoko Division, Ondo State, Nigeria, and in Ijumu District, Kabba Division, Kwara State.
- Cabe**: spoken in Borgou and Zou Provinces, Benin. Also called Caabe or Ede Cabe.
- Ica**: spoken in Zou Province, Benin. Also called Ede Ica.
- Idaca**: spoken in Zou Province, Benin. Also called Idaaca or Ede Idaca. Many loanwords from Fon-gbe.
- Ife**: 100,000 speakers reported in 1987, including 68,100

FIGURE 1. *Subgrouping of Defoid Languages*

Akokoid (North Akoko)
Yoruboid
Edekiri (Yoruba-Itsekiri)
Aguna, Cabe, Ica, Idaca, Ife, Ije, Isekiri, Mokole,
Nago, Ulukwumi, Yoruba
Igala