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W. U. Wurzel

Morphology, Nonconcatenative

In languages like English, words commonly are assembled by concatenating structural elements, called morphemes or formatives: *nation* + *al* + *ize* + *ate* + *ion*. Many languages, however, form words according to quite different principles. The study of this so-called nonconcatenative morphology offers important insights into the nature of morphology itself and its relationship to phonological structure.

1. Typology and Exemplification

Many different types of nonconcatenative morphology are generally recognized, although not all of them are widely attested or have received detailed theoretical attention.

In root-and-pattern morphology, words are formed by imposing fixed shapes or canonical patterns on roots that are themselves unpronounceable. This type of morphology is especially important in languages of the Semitic family. For example, in Modern Standard Arabic, the root /ktb/ appears in a large number of morphologically related words referring to the notion 'write,' as (1) shows.

katab	'to write'	(1)
kattab	'to make someone write'	
kaatab	'to correspond with someone'	
ʔaktab	'to dictate'	
ʔinkatab	'to subscribe'	
ʔistaktab	'to ask someone to write'	
kitaab	'a book'	
maktab	'an office'	

The only property these words consistently share is the

root /ktb/. All of their other characteristics are imposed by the patterns of the morphological system. For example the pattern of *kattab* marks causative verbs, as can be seen from other causatives like *darras* 'make someone study' or *ʔallam* 'make someone know (= teach).'

Arabic also marks morphological distinctions by imposing vowels on a word. For example, active verbs like *kattab* are systematically related to passives like *kuttib* by replacing the vowels /a-a/ by /u-i/. Plural and diminutive nouns like *mafaatiḥ/mufaytiḥ* 'keys/little key' are related in similar way. This process of vocalic change is sometimes called suprafixation, and it is one aspect of the general morphological phenomenon of internal modification (see *Internal Modification*), which also includes vowel ablaut (e.g., English *sing/sang/sung*) and consonant mutation (e.g., Irish *cait* 'Cait', *cait* 'of Cait').

In reduplication (see *Reduplication*), all or part of a word is copied to mark a morphological distinction. Of particular interest here is partial reduplication, in which a phonologically characterizable substring of a word is copied. For example, the plural of nouns in Ilokano is formed by copying the longest initial sequence that can be made into a single syllable: *lib* + *libro* 'books,' *sab* + *sabon* 'flowers' *pan* + *pantalon* 'pants.'

Subtractive morphology (see *Subtraction*) shortens words. One type of subtractive morphology specifies what remains, not what is deleted. For instance, Yapese vocative names are formed by retaining the longest initial sequence that can form a single syllable: *luʔag* → *luʔ*, *bayad* → *baʔ*. Another type, called truncation, specifies what deletes. Thus, in Papágo, the perfective of verbs is marked by deletion of the final syllable of the stem: *bidima/bidi* 'to turn around'; *huhaaga/huhaa* 'to haul.'

Infixation (see *Affixation as a Means of Word-formation*) is the insertion of a morpheme inside a word at some phonologically characterizable locus. Tagalog, for example, marks the completive form of certain verbs by infixing *w* before the first vowel: *būih* 'to buy,' *bumilih* 'bought'; *grádwet* 'to graduate,' *grumádwet* 'graduated.'

2. Early Studies

Work by American structuralists during the decades after 1930, much of it available in Joos (1957), offers little besides a typology and a set of terms like those above. There are two important exceptions to this, however, both of which are concerned with the problem of relating the kinds of operations found in nonconcatenative morphology to those found in concatenative systems. This issue is one facet of a larger question: is morphology basically syntactic—meaning that it specifies a set of formatives and rules for assembling them—or basically phonological—meaning that it specifies a set of processes for transforming one word into another.

Harris (1951) goes in one direction, extending the word syntax notion 'morpheme' to include the root-and-pattern morphological system of Arabic as well as the prefixes and suffixes of concatenative morphology. For Harris, the Arabic word *kattab* consists of the morphemes *k-t-b* and *a*, where 't' marks doubling of the preceding consonant. These discontinuous morphemes (which he calls long components) are interdigitated to form the actual word.

dānāgām 'he hit,' *dānāg^wānām* 'he hit him'; *dāmādām* 'he joined,' *dām^wādānām*; *qātārām* 'he killed,' *q^wātārānām* 'he killed him.' This process can be analyzed by a morpheme consisting entirely of the feature [+round]. This feature is associated to labial and velar consonants from right to left.

Many other cases of internal change are analyzed in these terms by Lieber (1987). It is by no means clear that all cases of ablaut or mutation can be accommodated in this framework; some may require the richer possibilities afforded by context-sensitive phonological rules. Nevertheless, it is encouraging that few cases of truly intractable internal changes—such as morphological metathesis—have emerged, and none thus far have survived closer scrutiny.

6. Morphological Circumscription

There are two types of infixes, distinguished by how the locus of infixation is defined. In the Tagalog example (*grum-adwet*) cited earlier, the initial consonant cluster is ignored and *um* is prefixed to what remains. In Ulwa, the examples in (4) show that the infix *ka* is placed after the first syllable if it is heavy (CVV or CVC), otherwise after the second syllable.

suulu	'dog'	suukalu	'his dog'	(4)
kuhbil	'knife'	kuh ka bil	'his knife'	
siwanak	'root'	siwa ka nak	'his root'	
anaalaaka	'chin'	ana ka alaaka	'his chin'	
karasmak	'knee'	ka ka rasmak	'his knee'	

The sequence 'first syllable if light, else second' is simply an iambic foot (" "); the morpheme *ka* is a suffix to the first iambic foot in the word.

Viewed in this way, infixes are just prefixes or suffixes to parts of words (Broselow and McCarthy 1983-84; McCarthy and Prince 1990). The parts of words can be circumscribed negatively, as in Tagalog—the part left after the initial consonants have been subtracted. Or the circumscription can be positive, as in Ulwa—the initial iambic foot is the domain of *ka* suffixation. With this circumscription or limitation of their domain of application, infixes become no different from ordinary affixes. Not surprisingly, circumscription can also be combined with reduplication or even root-and-pattern morphology. In the limit, circumscription accounts for truncation of the type found in Papago, in which the final syllable is subtracted.

7. Prospect

The most exciting and promising aspect of the study of nonconcatenative morphology is the emerging connection between phonological and morphological structure. The analysis of reduplication and root-and-pattern morphology through skeletal theory is an area of research where these connections have assumed a prominent role. Circumscription theory is another area where such connections are important: it is directly related to the central notion of extrametricality in phonology. Thus, future progress is likely to come from studies that support the analysis of nonconcatenative morphology with detailed investigation of phonology.

See also: Reduplication; Subtraction; Internal Modification.

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J. J. McCarthy

Morphology, Polysynthetic

The term 'polysynthetic' is loosely used to describe languages with complex morphologies capable of packing into a single word many morphemes that in more analytic languages would be independent words. There are, however, different ways whereby languages can obtain a high morpheme-per-word count and some linguists have questioned whether 'polysynthetic' represents a typological category on a par with 'isolating,' 'agglutinative,' and 'fusional.' This situation has not been helped by confusion between this term and 'incorporation' (see *Word-formation: Incorporation*). The latter is not a feature necessarily associated with polysynthetic morphology as such. Most polysynthetic languages are to be found in North America—where nominal incorporation is also prevalent—and it is in this context that the term has its origins. It can be argued that it does serve a useful purpose in distinguishing morphological systems so complex as to appear to cover much of what is more commonly handled by external syntax. Languages of this type display a number of typical morphological and nonmorphological traits, so the term can be said to have as much diagnostic value—and certainly as much fuzziness—as the three other major typological categories.

1. Can Polysynthesis be Defined More Tightly?

The identification of polysynthesis as the fourth major type amongst the world's languages has been credited to W. von Humboldt (1836). The term he actually used in German was 'eilverleibend,' which is usually translated as 'incorporating.' The American linguist W. D. Whitney appears to be the first to have used the word 'polysynthesis' as such. By the time of F. Boas at the beginning of the twentieth century the distinction between 'incorporating' and 'polysynthetic' was clearer and, as Boas pointed out (1911), not all North American languages incorporate nominal stems, yet nor can they all be termed 'polysynthetic.' It was up to E. Sapir (1921) to make the important distinction between the morphological dimensions of 'synthesis' (from analytic through synthetic to polysynthetic) and of 'technique' (whether isolating, agglutinative, fusional, or symbolic)