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Morphology

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Morphology is the study of the structure of words and their constituent parts. The subparts of words are called *morphemes*. For example, the English (Indo-European) words *cat-s*, *walk-ed*, and *un-believ-able* can each be analyzed as consisting of two or three morphemes, indicated by hyphens. Plural *-s* and past *-ed* are examples of *inflectional* morphology, where the same word appears in several distinct forms, such as *walk*, *walks*, *walked*, and *walking*. But *un-believ-able* is a different type, i.e., *derivational* morphology, where one word (*believe*) is used as the base for distinct words (*believable*, *unbelievable*). Each language has its own unique morphological patterns. For example, many African languages express inflection using tonal shifts such as Chimwiini (Atlantic-Congo) *jũle*, “s/he ate,” and *jũlé*, “you ate,” instead of segmentable word parts as in *walk-ed*. Languages also vary in their overall morphological complexity, with some relying more on morphology to express meaning. For example, in the Australian Aboriginal language Murrinhpatha (Southern Daly), the word *dem-ngi-dhama-rtum* expresses “my throat is dry.” Morphology is a strikingly diverse aspect of human language, although there are also intriguing cross-linguistic regularities.

History

The European tradition of morphological analysis grew out of teaching methods for Classical Greek and Latin, at a time when these were prerequisites for scholarship (Seuren, 1998). This was also influenced by an earlier, similar tradition that had arisen in India for the learning of Vedic Sanskrit. What all three of these Indo-European languages have in common is very rich inflectional morphology, requiring special effort to learn the many distinct forms of each noun and verb. To this day, students of classics learn these *conjugation* patterns; for example, the partial conjugation of the Latin verb *laborare*, “work,” shown in Table 1. Rows are used to differentiate the persons doing the action, for example, first singular (1SG) “I work” or third plural (3PL) “they work,” while columns are used to differentiate tenses.

Table 1				
Partial Conjugation of Latin Verb <i>Laborare</i> , “Work”				
	Present		Past	
1SG	<i>labor-o</i>	“I work”	<i>labor-av-i</i>	“I worked”
2SG	<i>labor-as</i>	“you work”	<i>labor-av-isti</i>	“you worked”
3SG	<i>labor-at</i>	“(s)he works”	<i>labor-av-it</i>	“(s)he worked”
1PL	<i>labor-amus</i>	“we work”	<i>labor-av-imus</i>	“we worked”
2PL	<i>labor-atis</i>	“you (pl.) work”	<i>labor-av-istis</i>	“you (pl.) worked”
3PL	<i>labor-ant</i>	“they work”	<i>labor-av-erunt</i>	“they worked”

In the 18th and 19th centuries, didactic grammar was partially replaced by new modes of inquiry into the natural history of languages. Tracing the history of Indo-European languages inspired a new perspective on morphology, now viewed as the outcome of language change over hundreds or thousands of years. In the mid-20th century, syntax became the main focus of linguistic theory, and morphology was somewhat sidelined. However, the last decades have seen resurgent interest in linguistic morphology, including new connections to psychology and computation [see [Language Acquisition](#); [Psycholinguistics](#)].

Core concepts

Inflection and derivation

Inflectional morphology is when a word occurs in many forms with distinct grammatical properties. These are specific *wordforms* of a single *lexeme*; for example, the lexeme WALK has the wordforms *walk*, *walks*, *walked*, and *walking*. These wordforms are said to have distinct grammatical *features*, usually annotated in capitals such as *walks*, 3SG.PRESENT (third person singular present tense), or *walked*, PAST (past tense). These features apply to all lexemes of a particular word class in the given language. For example, every verb lexeme in Spanish (Indo-European) has wordforms with the same range of person and tense features (“have”: *tengo*, *tienes*, *tiene*; “walk”: *marcho*, *marchas*, *marcha*; etc.).

Derivational morphology is instead about distinct lexemes that are related to one another in their morphological structure. For example, the verb *believe* provides the base from which we can derive distinct lexemes such as *believ-able* or *un-believ-able*. In some cases, derived lexemes belong to a different word class than their base; for example, *believ-able* is an adjective, whereas *believe* is a verb.

Morphological features and formal expression

When a morphological feature is expressed by preceding or following morphemes, such as German (Indo-European) *ge-fahren*, PAST.PERFECT-travel, and *verbesser-te*, improve-PAST.PRETERITE, these are called *prefixes* and *suffixes*, respectively. A single wordform may include several prefixes and suffixes, as in the following Murrinhpatha example (1):

(1) <i>Pu-mam-ngi-ngintha</i>
3PL.SUBJ-say-1SG.OBJ-DUAL.FEM
‘They [two women] said to me.’

Strings of morphemes as in (1) are called *concatenative* morphology, but this is only one way that morphological features can be expressed. Other major patterns include changes of internal vowels (2), consonant strengthening or weakening (3), consonantal root patterns (4), and tonal shifts (5), as illustrated in the following examples. These also illustrate that morphological features may be expressed in complex ways, for example, a combination of vowel change plus suffix in *empfehl-t* (2).

(2) Vowel alternation: German <i>empfehlen</i> , “recommend,”		
<i>empfehl-e</i>	<i>empfehl-t</i>	<i>empfohl-en</i>
1SG.PRESENT	3SG.PRESENT	PAST.PERFECT

(3) Consonant weakening: Skolt Saami (Uralic) <i>kää'pp</i> , “hole, pit” (Feist, 2015, p. 143)		
<i>kää'pp</i>	<i>kää'v</i>	<i>kää'pp-ed</i>
NOMINATIVE	ACCUSATIVE	PARTITIVE

(4) Consonantal root patterns: Arabic (Afro-Asiatic) <i>k-t-b</i> , “write,”		
<i>kataba</i>	<i>aktubu</i>	<i>kātib</i>
3SG.PAST	1SG.PRESENT	“writer”

(5) Tonal shift: Chimwiini <i>jiile</i> , “eat” (Kisseberth & Abasheikh, 2011)		
<i>n-jiilé</i>	<i>jiilé</i>	<i>jiile</i>
1SG.PAST	2SG.PAST	3SG.PAST

Although all words of a given class generally inflect for the same features, the manner of expression may be quite different from one lexeme to another. This is evident in English past verbs, for example, *walk-ed*, *see-n*, and *bought*. *Regular* patterns are those found in many lexemes (like *walk-ed*), whereas *irregular* patterns are specific to a few lexemes (like *bought*). In some languages, there are several *inflectional classes*, each of which applies to many lexemes (e.g., Spanish verbs have three main classes with *-ar*, *-er*, and *-ir*).

Questions, controversies, and new developments

Words are a foundational concept of linguistic morphology, but, perhaps surprisingly, linguists struggle to define words in a principled way. In practice, linguists usually assume that the white spaces delimiting words in writing reflect some kind of basic linguistic unit. But it is difficult to find grammatical or phonological patterns that consistently align with these writing conventions, and many writing systems either lack white space altogether or lack clear community conventions about where the white spaces should occur ([Haspelmath, 2011](#); [Wray, 2015](#)). This is a theoretical and practical problem because without a clear definition of words, it is unclear which linguistic structures should fall within the purview of morphological analysis.

Recent morphological research increasingly uses mathematical, information-theoretic, and computational methods drawing on large corpora of language data ([Moscoso del Prado Martín et al., 2004](#); [Ackerman et al., 2009](#); [Hahn et al., 2022](#)). Intersecting with the explosion of neural network methods, these approaches may eventually side-step the theoretical problem of defining words, replacing discrete definitions with gradient probabilistic approaches [see [Large Language Models](#)].

Broader connections

Morphology provides a window into the workings of the mind and brain. For example, psychological experiments can test how morphology is activated in memory or use specially designed artificial languages to investigate the learnability of different patterns ([Gagné, 2017](#); [Saldana et al., 2021](#)) [see [Psycholinguistics](#)]. These behavioral studies are increasingly complemented by neurolinguistic experiments ([Bulut, 2022](#)). Morphology also reflects the long-term outcomes of cognitive and communicative processes. Many morphological affixes are derived from words that have eroded over centuries or millennia, and cross-linguistic investigation of such processes allows us to hypothesize general principles of linguistic cognition ([Hopper & Traugott, 2003](#)). This also reveals localized variations. For example, in the Amazon, many languages use *evidential* morphology to indicate how the speaker arrived at the assertion they are making, for example, by direct visual evidence or indirect inference ([Epps, 2005](#)). Such phenomena suggest that morphology is driven not just by universal principles of human cognition but also by more culturally specific communicative norms.

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