

Introduction

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Morphology is at the conceptual centre of linguistics. This is not because it is the dominant subdiscipline, but because morphology is the study of word structure, and words are at the interface between phonology, syntax and semantics. Words have phonological properties, they articulate together to form phrases and sentences, their form often reflects their syntactic function, and their parts are often composed of meaningful smaller pieces. In addition, words contract relationships with each other by virtue of their form; that is, they form paradigms and lexical groupings. For this reason, morphology is something all linguists have to know about. The centrality of the word brings with it two important challenges. First, there is the question of what governs morphological form: how is allomorphy to be described? The second is the question of what governs the syntactic and semantic function of morphological units, and how these interact with syntax and semantics proper.

There is a less enviable aspect to this centrality. Morphology has been called 'the Poland of linguistics' – at the mercy of imperialistically minded neighbours. In the heyday of American structuralism, morphology and phonology were the principal objects of study. Monographs entitled 'The Grammar of L', for some language L, would frequently turn out to consist of the phoneme system of L and its morphology. However, the study of morphology in generative linguistics was largely eclipsed by phonology and syntax in the early days (though it is up to historians of linguistics to say exactly why). Ultimately, it came to be that when morphology was considered at all, it was regarded as essentially either a part of phonology or a part of syntax. True, there were a number of important works on morphology, mainly inflectional morphology, such as Kiefer's (1973) work on Swedish, Bierwisch's (1967) study of German and Warburton's (1973) paper on Greek inflection; but it was not until Halle's (1973) short programmatic statement that linguistics at large began to appreciate that there was a vacuum in linguistic theory where morphology should be. This was followed in 1974 by two particularly influential MIT dissertations, later published as Aronoff (1976) and Siegel (1979), proposing radically different approaches to the subject.

Siegel's theory of Level Ordering brought with it a new way of looking at the phonology-morphology interface, which ultimately grew into Kiparsky's (1982a) Lexical Phonology. Siegel argued that those affixes in English which never affect stress (and which do not trigger other lexical phonological alternations) such as *-ness* are attached after stress rules have applied. These are the # boundary affixes of *SPE* (Chomsky and Halle 1968), renamed Class II. The + boundary (Class I) affixes are those which do affect stress, such as *-ity*, and they are attached before the stress rules. This led to an interesting prediction about the linear order of affixes: Class I affixes appear nearer the root than Class II affixes. This generalization is largely true, though it has been regularly pointed out since Aronoff (1976) that it is not entirely true. Fabb (1988) has argued that even if it is true, the Level Ordering Hypothesis is not sufficient to explain affix ordering in its entirety, and that alternative conceptions which do give reasonably broad coverage can also handle the Level Ordering phenomena.

Lexical Phonology is generally associated with Level Ordering (though a number of lexical phonologists have distanced themselves from it; cf. Booij and Rubach 1987). However, the leading ideas of the model do not actually require Level Ordering. The main thrust of Kiparsky's theory is to emphasize the traditional distinction between morphophonemic alternations and automatic alternations. The morphophonemic alternations are generally mappings from sets of phonemes into sets of phonemes (Structure Preservation), apply in contexts which are not defined in purely phonological terms, often have lexical exceptions, can be 'cancelled' by native speakers (e.g. in loan phonology), and generally apply only within words. The automatic alternations are generally allophonic (non-Structure Preserving), speakers are generally not aware of them, they apply to monomorphemic forms, and they often apply across words. Kiparsky argued that morphophonemic alternations are actually triggered by morphological operations of affixation. As an affix is added (or a cycle of affixation with a level is completed), the battery of lexical phonological rules applies. This gives rise to various types of cyclic effect, and accounts for a good many of the properties of the two types of rule.

This innovation was more significant for the development of phonology than for that of morphology, except that it (a) began to draw the attention of phonologists to morphology, and (b) tended to strengthen the view that morphology was the poor relation to phonology. Lexical Phonology retains the assumptions of *SPE* that every microgram of phonological regularity has to be squeezed out of the system before we have to throw in the towel and admit that it's 'mere allomorphy'. As a result, there have been very few attempts to examine the extent to which the alternations might themselves have a morphological function. To some extent this is addressed in Spencer's chapter, MORPHOPHONOLOGICAL OPERATIONS and also in Carstairs-McCarthy's PHONOLOGICAL CONSTRAINTS ON MORPHOLOGICAL RULES.

While Chomsky's original syntactic theorizing overturned structuralist thinking about that discipline, seminal studies in morphology from MIT served to

strengthen structuralist assumptions. McCarthy (1979) showed that root-and-pattern morphology could be handled very nicely as a kind of affixation by adopting the then new theory of Autosegmental Phonology. Lieber (1980) built a theory of the lexicon in which affixes are almost exactly like fully-fledged lexical items, with a phonology, a meaning, a syntactic category and a subcategorization frame. At the same time, Selkirk (1982) and E. Williams (1981b) were arguing that word structure is very much like phrase structure, by applying X-bar syntax to words. This very influential approach is reviewed in Toman's chapter, *WORD SYNTAX*.

Central to the debate over the relationship between phonology and morphology is a long-standing question in structuralist linguistics, whether morphology is best thought of in terms of Item-and-Process or Item-and-Arrangement. In an IA approach, a word is made out of a string (or tree) of objects; that is, word formation is the concatenation of morphemes, conceived of as mini-lexemes. In an IP approach, forms of a word are the outputs of processes applied to a lexeme. This idea has been revived in various ways. Categorical grammar has been co-opted to develop a formal way of describing the idea that affixation be viewed as a process (Hoeksema 1985). In a different vein, and working from a different tradition, McCarthy and Prince have studied the way in which non-concatenative effects are obtained by parsing out various phonologically defined subparts of words and stems before applying affixation (or other operations) to them, and this work is summarized in their chapter *PROSODIC MORPHOLOGY*.

However, the structuralist idea that words are just like phrases, and that the same set of principles applies to both domains, is very attractive, especially to non-morphologists, and it is a theme which runs through much of the research on the morphology–syntax interface over the past two decades. Its most obvious application is in compounding where almost everyone accepts that words have some kind of constituent structure. Somewhat more controversial is the view that derivational morphology is like phrase syntax, a thesis that is being explored in the domain of argument structure by Hale and Keyser (1993). This assumption was challenged by Aronoff (1976), and has more recently been attacked by Anderson (1992), for whom all non-compounding morphology is 'a-morphous'. Anderson's strong position is, perhaps, extreme (see Carstairs-McCarthy 1992 for a telling critique). However, the idea that morphemes are something other than just very short words which happen to be bound is particularly influential amongst morphologists. Many theorists view word formation not as the concatenation of two things to form a headed syntax-like structure, but as an operation on a lexeme. For such theorists, affixation tends to be thought of as just one type of morphophonological operation among several, and not a privileged syntactic process of concatenation. Word formation in Aronoff (1976) is accomplished by Word Formation Rules (WFRs), and this leads to a radically different conception of word structure. For one thing it opens the way to separating the phonological form of an affix from the morphological function or meaning of which it is an exponent. This is the

content of the Separation Hypothesis (Beard 1988). It is widely assumed in works on inflection, but Beard argues it for derivation too, and surveys a number of the arguments in his chapter, *DERIVATION*.

The domain where separationism has been most popular is inflection. Following Matthews's (1972) detailed critique of the structuralist notion of morpheme in inflection, Anderson (1977b) began a programme of research which took inflections to be the result of word formation rules much like those proposed by Aronoff (1976) for derivation, but with complex interactions. This work is summarized in Stump's chapter, *INFLECTION*.

In *Principles and Parameters* syntax the importance of functional categories, which include inflectional categories, was being stressed throughout the 1980s. At the same time, Baker's dissertation (written in 1985 and revised as Baker 1988a) developed an extremely influential view of valency alternations based on the idea of incorporation, coded as syntactic head-to-head movement. This meant that, for example, the causative form of a verb was treated as a syntactic compound of two verbs, one of them a causative. This led to the view that inflectional morphology could be handled in the same way, and that an inflectional piece, say, a third-person singular subject in the past tense, was syntactically a compound consisting of the verb, an Agreement head, Agr^0 , bearing the features [3sg] and a Tense head, T^0 , bearing the feature [+Past] (cf. Pollock 1989). Some general problems with this account are discussed in Borer's chapter, *MORPHOLOGY AND SYNTAX*, and a number of morphologists have pointed out problems with the full-blown version of the approach, mainly from allomorphy (Carstairs-McCarthy 1992, Joseph and Smirniotopoulos 1993, Spencer 1992). However, more recently, Halle and Marantz (1993) have attempted to combine the separationist tradition in inflection with the functional head-movement approach, arguing that only in this way can we capture certain alleged homologies between morphological structure and syntactic structure. Their model is discussed in Stump's contribution. In addition, Rice shows how the complex and arbitrary-looking structure prefix of Slave (Athabaskan) none the less reflects syntactic structure to an interesting degree.

One of the traditional problems in morphology and lexicology has been defining what is meant by 'word'. There are various criteria based on form (which tend to be equivocal) and others based on behaviour and function (which tend to be even more equivocal). One symptom of this is the existence of elements which bear some of the hallmarks of words and also important features of affixes, namely, clitics. Ever since Zwicky's (1977) preliminary typology, there has been interest in this problem, and for many phonologists and syntacticians, as well as morphologists, it is an urgent practical matter, since both phonology and syntax appeal regularly to the distinction between 'proper' words and other elements. The issues are surveyed in Halpern's chapter, *CLITICS*.

One of the alleged criterial properties of words is 'integrity': words are 'islands' to syntactic and other processes, which are unable to 'see inside' words; in this way words contrast with phrases. There is a great deal of appeal

to distinguishing words from phrases in this way (see Bresnan and Mchombo 1995 for a defence of lexical integrity and a catalogue of advantages), but lexical integrity has been denied by many linguists. The head-movement approach to word structure is a clear case in point, as is the approach of Hale and Keyser (1993) to argument structure. One traditional problem related to lexical integrity is the distinction between compounding (morphology) and phrase formation (syntax). In many (if not most) languages with compounding, the distinction is far from clear (half of the annual *Yearbook of morphology* 1989 was given over to this: Booij and van Marle 1990). Compounding is surveyed in Fabb's chapter, COMPOUNDING.

The kinds of phenomena which tend to raise questions of integrity most keenly are serial verb constructions, light verb constructions, and, most notoriously, incorporation. The most studied type of incorporation is noun incorporation, in which a verb stem forms a morphological compound with a noun apparently functioning, say, as its direct object. Other sorts of incorporation are also found, as in Chukchee, where a noun may incorporate its modifiers (adjectives, determiner-like elements and so on; see Muravyova's sketch of the language and also Spencer 1995). Gerdt's contribution, INCORPORATION, discusses these issues, suggesting that there might be types of incorporation effectively midway between genuine phrase formation and *bona fide* compounding.

Cliticization and noun incorporation can both be thought of as instances of a kind of structural mismatch. Thus, in a sentence such as *John's here* the 's of *John's* is phonologically simply the last phoneme of the first word, but syntactically it corresponds to the main verb, which doesn't even form a constituent with the first word, *John*. Likewise, in a language in which object incorporation is possible and we can say *John bear=killed*, meaning *John killed a bear*, we seem to have a single word, *bear=kill*, functioning as a transitive VP [_{VP}[_Vkill] [_{NP}bear]]. In both cases we have a mismatch between form and function over what we expect in the 'canonical' case.

Such mismatches occur elsewhere, most famously in so-called bracketing paradoxes.¹ These are instances in which the apparent constituent structure of a word is at odds with some other aspect of its form or function. The mismatch in *John's* would be a case in point. In some cases, the paradoxes are in effect theory-internal. Thus, a frequently discussed case is that of *ungrammaticality*. Semantically, this is a nominalization of the adjective *ungrammatical*, entailing a constituent structure [[*un + grammatical*] *ity*]. However, in the theory of Level Ordering, *-ity* is a Class I suffix and *un-* is a Class II prefix. The order of affixation should therefore give rise to a constituent structure [*un* [*grammatical + ity*]]. Similarly, some theories of English synthetic compounds such as *truck driver* would have them derived by suffixing *-er* to a noun-incorporated form of the verb, [[*truck drive*] *er*], even though morphologically the compound is clearly made up of *truck* and *driver*.

However, there are structures which are anomalous under any reasonable description. English personal nouns provide numerous examples (see Beard 1990, Spencer 1988b, Stump 1991, Zwicky 1988, amongst many references). A

transformational grammarian is not (necessarily) a grammarian who is transformational; the bracketing appears to be [[*transformational grammar*] *ian*]. More extreme examples are *moral philosopher* (derived from, or at least motivated by, *moral philosophy*) and, with apparent truncation of a suffix, *monumental mason* (*monumental masonry*), *electrical engineer* (*electrical engineering*) and *theoretical linguist* (*theoretical linguistics*). The direction of motivation is clear from the semantics (the personal noun has to inherit all the semantic idiosyncrasies of the abstract noun) and from the fact that only established fixed terms can motivate such personal nouns (witness the absence of **abstract linguist* from the purely compositional, non-lexicalized phrase *abstract linguistics*, cf. Spencer 1988b). Clearly, conundrums such as these have to be handled in anybody's theory, but a number of linguists have paid particular attention to such questions. Sadock (1991), in particular, has developed an integrated theory of the mismatches caused by incorporation and cliticization processes. This and other approaches are summarized in Sproat's contribution, MORPHOLOGY AS COMPONENT OR MODULE.

The interface between morphology and syntax also surfaces in a number of ways. One area of great interest for both syntacticians and morphologists is that of agreement morphology, and it is an area where any specialist needs to have a careful eye on both subdisciplines. Corbett's chapter, MORPHOLOGY AND AGREEMENT, provides a clear, morphologist's view of the matter, informed by his extensive experience as a typologist. An area which stands at the crossroads between morphology, syntax and semantics concerns the way in which grammatical relations such as subject and object are realized and the types of alternations in valency that are found. This has led to an investigation of notions of argument structure. The semantic prerequisites are laid down in Levin and Rappaport Hovav's chapter, MORPHOLOGY AND LEXICAL SEMANTICS, which asks such questions as 'What semantico-syntactic relations can be packaged up inside a single lexeme?' Sadler and Spencer's contribution, MORPHOLOGY AND ARGUMENT STRUCTURE, then explores the idea raised by Levin and Rappaport Hovav that there might be a specific level of representation at which argument structure is encoded.

Levin and Rappaport Hovav's chapter can also be seen as an investigation of the relations between morphology and semantics. This is also explored, though from a different perspective, in Beard's chapter, DERIVATION. Recent research has been uncovering the ways in which semantic principles underly the organization of much of the lexicon, and this has an impact, of course, on the way that derivational morphology works. Finally, we must not forget that morphology can also serve as the exponent of pragmatic functions, and this is summarized in Kiefer's MORPHOLOGY AND PRAGMATICS.

So far in this introduction we have stressed the interface questions which are raised by morphology. These have not been the traditional concern of the discipline, of course, and to a certain extent the autonomy of morphology has been overshadowed by research at the interfaces (as well as being denied by a fair number of syntacticians and a smaller number of morphologists). However,

as Aronoff (1994) has recently reminded us, there is a good deal to say about 'morphology by itself'. One of Aronoff's most significant claims is that inflectional paradigms can be autonomous with regard to syntax, semantics or phonology, and thus motivate a separate component, module or some kind of level of representation. This set of questions is summarized in Carstairs-McCarthy's *INFLECTIONAL PARADIGMS AND MORPHOLOGICAL CLASSES*. Aronoff (1994) also argues that the existence of stems provides evidence for the autonomy of morphology. He points out that in Latin a verb has three stems (which may be idiosyncratic or derived by regular and productive operations), but that it is not possible to say that a given stem has a meaning as such. It functions as part of a morphological system, but as a pure phonological form – a further instance of separationism. The stem as such has no meaning, but contributes non-compositionally to the meaning of the whole word form. An illustration of stem autonomy in Sanskrit (recently discussed by Stump) is given in Spencer's chapter *MORPHOPHONOLOGICAL OPERATIONS*. Finally, another aspect in which words are different is the fact that words, unlike (most) phrases, have to have some component which is listed. This leads to the tricky question of productivity, an issue at the border between linguistics proper and psycholinguistics. The chapter by Aronoff and Anshen surveys these matters.

Part IV of the Handbook is devoted to what we may call 'hyphenated linguistics'. Joseph, in *DIACHRONIC MORPHOLOGY*, summarizes recent advances in historical morphology, another Cinderella subject which is undergoing something of a rebirth. The rest of this part is devoted to various aspects of psycholinguistics in which particularly important advances have been made of late. Clark summarizes recent research into first-language acquisition of morphology. While the acquisition of morphology has not received quite the same attention as the acquisition of syntax from linguists in recent years, it has none the less assumed considerable importance. In part, this is because of provocative and extremely challenging claims from researchers working in the field of connectionism, to the effect that the facts of acquisition, especially of inflection, can be handled by associationist networks without the mediation of linguistic rules, or indeed, of conventional linguistic representations. Another interesting recent development has been in the study of selective language impairment (SLI). Pioneering work by Gopnik and her collaborators, as well as other groups, has provided controversial evidence in support of a biologically defined innate predisposition for language in the form of language impairments, principally to the morphological system, which appear to be inherited genetically.

Psycholinguistic research of the mental lexicon, and the way in which morphological structures are perceived and produced, has been pursued intensively since the beginning of modern psycholinguistics. One of the challenges here is to reconcile the kinds of models which seem necessary to interpret the psycholinguistic data with the most plausible linguistic models of word structure, and with the facts of word structure across the world's languages

unearthed in morphological research. One important question is: How do we identify words in the speech stream? And in particular, how can we do this in such a way as to be able to incorporate words into a syntactic parsing? An important constraint on models of on-line processing is the fact that words have to be recognized and parsed as they are spoken (i.e. in a left-to-right fashion). McQueen and Cutler's chapter, MORPHOLOGY IN WORD RECOGNITION, presents an overview of recent findings in this field.

One of the most powerful tools for investigating the workings of an on-line mechanism is to examine the patterns of errors that mechanism produces. Word production studies, which often involve the careful analysis of large corpora of speech errors, have generated a number of sophisticated models, including connectionist-inspired ones. These are surveyed in Stemberger's chapter, which includes a convenient summary of the issues raised by connectionism for morphology. A further important source of informative errors has been provided by victims of language impairment due to brain injury or disease, giving rise to aphasias or, in the case of reading and writing, dyslexias. Study of these language disturbances has provided ample opportunity to investigate the way in which processes of word recognition and production 'fractionate' into their component subprocesses. This work is surveyed in Badecker and Caramazza's chapter, MORPHOLOGY AND APHASIA.

The Handbook closes with a collection of morphological sketches. These are written by linguists who have both a specialist interest in some aspect of morphology and a detailed knowledge of the language sketched, in some cases being native speakers. We have selected a group of languages which illustrate as many as possible of the phenomena we believe to be of interest to the widest circle of morphologists.

Among the phenomena surveyed which show interesting features in certain of the languages are the following (where a language appears in parentheses, the phenomenon is either restricted or only identifiable under certain theoretical interpretations of the facts):

non-concatenative morphology	Qafar
vowel harmony	Chichewa, Chukchee, Wari'
consonant mutation	Celtic, (Malagasy), (Slave)
apophony	Archi, Hua, Qafar
stress marking gender	Qafar
tone marking inflection	Chichewa
reduplication	Chichewa, Chukchee, Malagasy, Warumungu
infixation	Archi, Hua, Malagasy, Qafar
compounding	Chukchee, Malagasy, Qafar, Slave, Wari'
genitive complement	Malagasy
incorporation	Chukchee, Malagasy
clitics	Archi, Malagasy, Qafar, Slave, Wari', Warumungu

phonologically conditioned	
allomorph selection	Wari', Qafar
preverbs	Slave, Wari', Warumungu
conjugation classes	Archi, Qafar
agreement	
by prepositions	Celtic
inverse	(Chukchee), Warumungu
possessive	Archi, Hua, Qafar, Slave, Wari'
switch reference	Hua
with objects	Archi, Chichewa, Chukchee, Hua, Qafar, Slave, Wari', (Warumungu)
gender	Archi, Chichewa, Qafar
singulative	Qafar
diminutive	Chichewa, Chukchee, Slave
augmentative	Chichewa, Chukchee, Slave
case	Archi, Celtic, Hua, Qafar, Warumungu
ergative	Chukchee, Hua, Warumungu
localization	Archi
marked nominative	Qafar
multiple case marking	Archi, Warumungu
valency alternations and grammatical roles	
antipassive	Archi, Chukchee
applicative	Chichewa, (Chukchee)
autobenefactive	Qafar
causative	Archi, Chichewa, Malagasy, Qafar, Slave, Warumungu
comitative	Chukchee, Malagasy
inchoative	Malagasy, Qafar, Warumungu
passive	Malagasy
reciprocal	Chichewa, Malagasy
reflexives	Chichewa, Malagasy, Warumungu
reversive	Chichewa
stative	Chichewa
light verbs	Archi, Hua, Qafar ('compound conjugation'), (Chukchee)
predicate nominal	Chukchee, Hua, Qafar
proper names	Hua
aspect	Archi, Chukchee, Slave,
mood	
admirative	Archi
associated motion	Warumungu
commentative	Archi
continuity	Archi
evidential	Archi, Hua, Qafar, Slave
focus	Qafar

inconsequential	Hua
inferential	Archi
interrogative	Archi, Hua
negation	Archi, Chichewa, Chukchee, Qafar, Slave, Wari'
requestive	Qafar
topic (potential)	Hua
nominalization	Archi (masdar), Chichewa, Chukchee, Malagasy, Qafar, Slave, Wari', Warumungu
agentive	Chichewa, Chukchee, Malagasy, Warumungu
relativizer	Hua
gerund	Archi, Chukchee

NOTE

- 1 To refer to such phenomena as 'paradoxical' is a misnomer, of course, though the term has tended to stick.