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THE RELATION OF MORPHOLOGY TO SYNTAX

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INTRODUCTION

Based on the theory developed in *Syntactic Structures,* early generative models lacked a morphological component (9). Complex words—i.e. words involving a stem and an affix (like *un-clear* or *girl-s*), or compounds like *black-board*—were derived by syntactic transformation. For example, a compound like *blackboard* was the result of transformations acting on the relative clause structure *a board [which is black]* (by relative clause reduction *a board [black];* by adjective preposing *a black board*). By the early 1970s the problems with such a model had been demonstrated to the satisfaction of most workers in the field. The arguments turned in large part on the existence of forms that are not predictable from their parts and that therefore cannot be transformationally derived—e.g., *a white blackboard,* a form that has no acceptable source (*[[*a board [which is black]] [which is white]]*). As a result of this debate, modern generative models, resembling at least in this respect traditional and pre-Chomskyan structuralist models, almost uniformly posit morphology as an independent component of a grammar. [For a history of this aspect of morphological theory, see references 5 (Ch. 1), 17, 32.]

One consequence of the existence of a morphological component is to curtail the role of syntax in word formation. In fact, the basic premise of what is called the Lexicalist Hypothesis (see 10, 21, 24) is the independence of syntax and word structure. The guiding idea here is simply that the rules and principles involved in the construction of phrases (the syntax) and the rules and principles involved in the construction of words (the morphology) are disjoint. However, the execution of this has taken much stronger form. Principle 1 states one interpretation—arguably the strongest—of this hypothesis.

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1. Syntactic rules do not manipulate word-internal structure, nor do they have access to it.

That is, as far as the syntax is concerned, words are atomic units; their parts are inaccessible. Now, clearly, certain properties of words are relevant to the structures in which these words appear. For a simple case, consider that the plural number indicated by *-s* in *girls* is relevant to the form of the verb (in the present tense) that accompanies it.

2. a. Girls work hard.
   b. *Girls works hard.

Under Principle 1 this fact is a problem to be resolved. In fact, under any separation of syntax and morphology, the difference between the relevance of some parts of words to syntactic structures and the irrelevance of others has to be accounted for. Although the number of the subject noun phrase is relevant to the form of the verb, other morphological properties are not. For example, the verb doesn't vary with the presence or absence of the suffix *-ity*, as in *electricity*.

3. Electricity works for you.

In the first part of this article I summarize the range of data generally considered relevant to the interaction between syntax and morphology. In the second part I detail two distinct—and currently competing—responses to the perceived problem. In the third section I move away from work in morphology to work in syntax that bears directly on the problem (although the implications are generally not recognized in morphological circles). At each point I present natural language data bearing on the choice among these various possibilities.

SYNTACTIC RELEVANCE

Example 2 (above) of syntactically relevant morphology offers an instance of a morpheme commonly identified as "inflectional morphology." The line between inflectional morphology and derivational morphology (e.g., *ity* in *electric-ity*) has been a classical problem in morphological studies, but this issue is orthogonal to the present study. Rather, along with Anderson (1) I simply define inflectional morphology as that morphology which is relevant to the syntax. As Example 2 illustrates, the English plural marking satisfies this definition (and *-ity* does not). It is not the case, however, that plural

marking will necessarily be inflectional; if there is a language where plural marking lacks syntactic relevance it will not be inflectional. In fact, Anderson (1:589) claims that the category of plural in Kwakwala (an American Indian language spoken in British Columbia) is derivational. Indeed,

> number in Kwakwala behaves in a somewhat "derivational" way. It is only optionally marked on nouns; only some words have distinct plural forms, and these are constructed in a number of diverse ways, etc. The situation is thus quite parallel to that of other derivational (as opposed to inflectional) categories.

In any case, the range of inflectional morphology has been characterized by Anderson (1:25) as devolving to the following:

4. a. configurational properties
   b. agreement properties
   c. inherent properties
   d. phrasal properties

Anderson's characterization of these assumes a particular view of how they arise, but the phenomena at issue and the distinctions among them are clear enough. An example of a configurational property is Noun Phrase case, where the choice of a specific case turns on the choice of the governing verb. For example, in German some verbs require an accusative object and others, a dative. An agreement property is exemplified by adjectives that vary in form with the head noun in the same noun phrase, as for example in Spanish or Italian. An example of an inherent property is the property of the noun with which the adjective varies; that is, nouns in Romance languages have inherent gender. And a phrasal property is a property of a word that determines the character of the entire domain, as for example tense, which is localized to a verb but which defines certain properties of the sentence in which it is found.

The discussion of the interaction between morphology and syntax has considered as well, but only recently with any fervor, clitics and incorporated elements. The first is exemplified by the English third person singular auxiliary clitic *'s*. This form attaches to the last word of the phrase that immediately precedes it, as in Example 5 where it represents a reduced form of *is*.

5. She is the one I think's gonna win.

This clitic has the phonological possibilities associated with *-s* suffixes, as for example the plural form already considered. The form of the plural *-s*

varies with the form to which it attaches; it is /ɨz/ after a strident fricative or affricate (e.g. judge-s), /z/ after a voiced (but nonstrident) element (e.g., hide-s), and /s/ after a voiceless (and nonstrident) element (e.g. hit-s). Compare:

6. a. She is the one I decided's gonna win.
   b. She is the one I judge's gonna win.

That is, the clitic *'s* in these cases is phonologically part of a word that syntactically it has nothing to do with. But the syntax has to be able to access this part of the phonological word; *gonna* occurs only in combination with some form of *be*.

Incorporated elements are less easily illustrated with English examples; however, the phenomenon has been well documented in a number of recent articles for a large variety of languages (see 7, 26, 30 in particular). The following is an example of noun incorporation in West Greenlandic taken from Sadock (30).

7. Hansi illu-qar-poq
   Hans house-has-3s:indicative
   "Hans has a house."

Here the verb word includes, as well as the verb, its noun complement. Compare Example 8, also from Sadock (30):

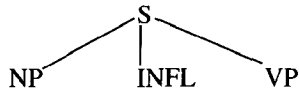
8. Hansi illu-mik sana-voq
   Hans house-instrumental build-3s:indicative
   "Hans built a house."

The verb *sanavoq* requires an (instrumental) argument, a requirement satisfied by *illumik*. The verb *qarpoq* also requires an argument, but its requirement is met internal to the word.

In each of these cases the property of a word is arguably relevant to the structure in which the word occurs; thus, each has been taken by some to offer an illustration of the necessity of recognizing the syntactic relevance of some aspects of morphology. However, there is no uniform agreement that inflection, cliticization, and incorporation are equally important to working out the interaction of syntax and morphology. Further, some take the position that one or the other of these does not, in fact, pertain to the interaction of syntax and morphology. LaPointe (24), for example, argues that at least some of what would be classed as inflection is to be handled in the semantics, not as the interaction of syntax and morphology. Similarly, the inflectional proper-

ties commonly identified in government-binding circles as part of the category INFL—i.e. tense and (subject) agreement—are treated as an interaction between syntax and phonology, not syntax and morphology. In English, for example, the suffixes *-ed* and *-s* are part of INFL in a structure roughly as in Example 9.

9.



But they appear suffixed to the first element of VP as a consequence of rules of phonological form. (For discussion, see references 11 and 12; for an example of the representation of other morphological elements in a phrase structure tree, see 14.)

In what follows, I take a reasonably broad view of what could count as the interaction of morphology and syntax, rather than relegating in advance much of what has been proposed to different kinds of interaction. However, I attend primarily to inflection.

TWO MORPHOLOGICAL APPROACHES

The two dominant approaches to accommodating a relationship between syntax and morphology take opposite views of the place of syntactically relevant morphology in a grammar. On one view, words are introduced into the structure fully inflected, and thus all morphology is part of a single grammatical component. On the other view, some of their morphological properties are a consequence of the structural configuration in which they occur and thus morphological properties are distributed across two separate components, one to which the syntax has access and another that is syntactically inaccessible. Those proposing the second view (e.g. 1–6) have been most careful to argue their case. Compare, for example, the extent of the argument for the first position offered in Selkirk (33:1):

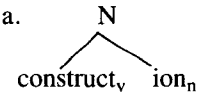
> In this monograph, as in other generative works on morphology . . ., the conclusion that words with derivational morphology and compound words are not formed by syntactic transformation is taken as a point of departure. Along with this view, I adopt the somewhat less universally held assumption that inflectional affixation is not accomplished by syntactic transformation, but that, with derivational affixation and compounding, it instead forms part of the morphological component of grammar.

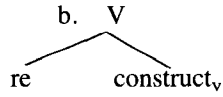
The argument for this distinction is based on observations suggesting that morphological properties do not present a unitary phenomenon—e.g. (*a*) even though "portmanteau" morphemes exist—i.e. forms that simultaneously en-

code two or more linguistic categories (like English *-s,* which indicates third singular *and* present tense), there are no portmanteau morphemes that simultaneously encode derivation and inflection; or (*b*) inflection appears external to derivation, an observation made early on and explicitly by Greenberg (16): If both derivation and inflection follow the root, or they both precede the root, the derivation is always between the root and the inflection.

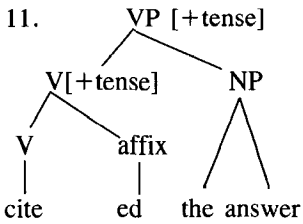
The Single Component Theory

The first approach (see 25, 30, 31, 33, 35 among others) takes a variety of forms. Williams's (35) idea is that words, like phrases, have "heads." The head of a noun phrase is a noun; the head of a verb phrase is a verb. The head of a word, on Williams's account, is its right-hand member. As the labels "noun phrase" and "verb phrase" indicate, the head contributes the categorial identification of the phrase. Similarly, then, the rightmost member of a word—its head—contributes its categorial identification.

10. a. 

b. 

These are examples of derivational morphology, but the idea is intended to apply to inflectional morphology as well, as indicated in Williams's example:

11. 

The feature +tense is contributed by the head of the word *cited.* (Williams doesn't explain why this word also bears the label V, the category of *cite,* which is not in head position.) The idea is, then, that certain properties of a word will be reflected in its category and thus will be syntactically accessible; others will not be so reflected and thus cannot be syntactically accessible. This application of the idea that words are introduced fully inflected considers inflectional morphology only of the three general areas introduced above—and it is applicable cross-linguistically to inflection only insofar as such indications are suffixes, not prefixes or infixes, or otherwise reflected in the rightmost member of the word. "We would expect [tense]-bearing items always to be in *head position,* not only in syntax, but also in morphology . . .

[case], when realized affixally, is always realized as a suffix . . ." (pp. 250–1). This view is problematic in a number of respects, some of which are recognized in DiSciullo & Williams (13). First, there are languages where inflection appears to be a prefix or proclitic. Tense in languages of the Pacific immediately springs to mind. Example 12 offers an example from Maung (an Australian language spoken primarily on islands off the Australian mainland) taken from Capell & Hinch (8).

12. n - un - ba - numna
    1sg-3sg-future-tell
    "I will tell it."

But other, more subtle, phenomena also offer problems for the hope that inflection is exclusively suffixing. For example, in Luiseño, a Uto-Aztecan language spoken in Southern California, certain verbs require that their argument bear an object suffix, as well as a possessive *prefix*. (The Luiseño data are drawn from my own work with a speaker of the language.) Both of the sentences in Example 13 are fine. The contrast between Examples 14a and 14b, however, argues that *yawq* requires a possessive-marked argument.

13 a. wunaal up no-toonav-i yawq
      he aux 1sg-basket-object has
      "He has my basket."
   b. wunaal up no-toonav-i 'ariq
      he aux 1sg-basket-object is:kicking
      "He is kicking my basket."

14 a. *wunaal up paa'ila-i yawq
      he auxturtle-object has

   b. wunaal paa'ila-i 'ariq
      he aux turtle-object is:kicking
      "He is kicking the turtle."

Although possessive forms are not usually included as case, the requirement here in regard to the possessive prefix is no different from the requirement for the object suffix, a noncontroversial case form. Even if Williams were right about suffixing, his characterization of syntactic accessibility would be problematic: It isn't only the rightmost part of a word that is accessible in a domain. As evidence, consider Luiseño again. Number marking in Luiseño is internal to object-marking.

15. paa'ila-um-i "turtles (object)"

Some verbs not only require an object-marked argument, they also are sensitive to the number of that argument.

16 a. wunaal up paa'ila-i moqnaq
he auxturtle:sg-object is:killing
"He is killing the turtle."

b. wunaal up paa'ila-um-i qe'eeq
he aux turtle-plural-object is:killing
"He is killing the turtles."

Under the assumption that the object suffix and the number marking are distinct affixes, Williams's account of the syntactic accessibility of the parts of words suggests that verbs should not be sensitive to the number of their object-marked arguments: The object suffix, not the plural suffix, is in "head position." A third and perhaps more fundamental problem for Williams's view has to do with his limited conception of morphology. As Hoeksema & Janda (20) show in considerable detail, only a subpart of morphology is easily described as simple concatenation to the right or the left; other processes include infixation, metathesis, and subtraction. Interestingly, they offer no examples of obviously inflectional morphology in their discussion of these. One possibility might be found in 'O'odham (formerly Papago), a Uto-Aztecan language spoken in southern Arizona. In this language the perfective form of the verb is formed by subtraction (of at least the final consonant and sometimes the preceding vowel as well) from the imperfective form. [The data and description are taken from Zepeda (36).]

17.

imperfective	perfective
golon "raking"	golo "raked"
ñeok "speaking"	ñeo "spoke"
cipkan "working"	cipk "worked"

On our definition of inflectional, the imperfective/perfective difference is included, because the form of another part of the sentence is sensitive to it. 'O'odham has a set of clitics, generally termed the "aux," that occur in sentential second position.

18. 'A:ñi 'an s-ba:bigi ñeok
I aux slowly speaking
"I am speaking slowly."

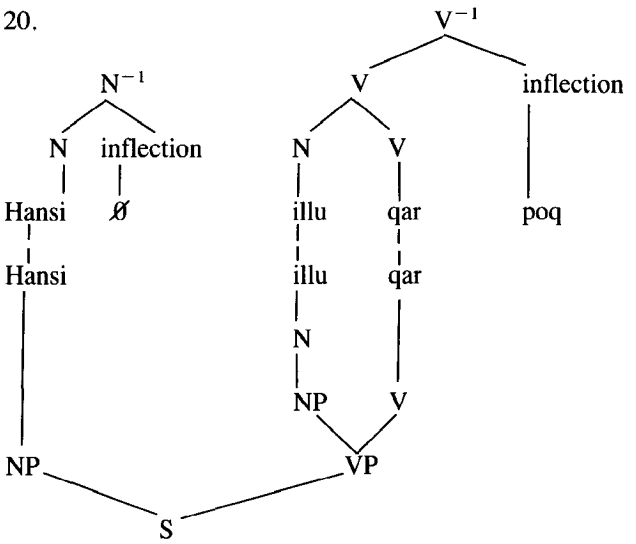
The shape of this clitic complex varies with the perfective/imperfective difference. In Example 18 is the imperfective 1sg form; in Example 19 is the perfective 1sg form.

19. 'A:ñi 'ant s-ba:bigi ñeo
I aux slowly spoke
"I spoke slowly."

In short, Williams's idea about how inflectional morphology might be represented in the syntax has only limited application.

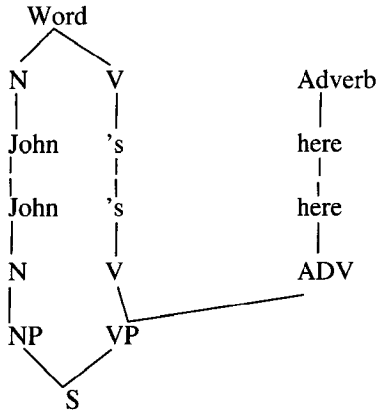
Sadock's (30, 31) proposal, termed "autolexical syntax," shares with Williams the idea that words are introduced fully inflected. The major difference is that for Sadock expressions *simultaneously* satisfy syntactic and morphological requirements. For example, the West Greenlandic sentence in Example 7 above has the representation in Example 20 below, with the morphology on the top and the syntax on the bottom.

20.



The autolexical approach is explicitly aimed at handling incorporation [as Example 20 illustrates) and clitics. Example 21 offers Sadock's representation of the English sentence *John's here*.

21.



The intended benefit of this framework is to obviate the necessity of modifying either the syntax to accommodate the morphology or vice versa—in either case raising questions about whether the lexicalist hypothesis is being obeyed. For example, clitics like the English *-s* are often introduced into a structure as their nonreduced counterparts (here *is*) and then subjected to cliticization through a special component of the grammar (the cliticization component). Similarly, the incorporated object in Example 20 would, on some accounts, be generated in a syntactic object position and moved into the verb word. The most essential thing to note about the autolexical approach is that it is primarily intended to be a framework within which the relationship between syntax and morphology can be stated, rather than a full-fledged theory of what the relationship is. Sadock's principle VI (30:409) straightforwardly illustrates this point: "Elements of morphological structure must be associated one-for-one with corresponding elements of syntactic structure to the maximum extent possible."

However, the framework does leave certain aspects of this relationship less than fully elucidated. Most obviously, we should note the existence of clitics that do not occur in the position of their unreduced form—indeed, they have no unreduced form. The best known of these are the relatively common "second position" clitics, clitics that occur after the first member of some syntactic unit. The clitic sequence of 'O'odham introduced above is an instance, as the alternative rendition of Example 18 makes clear.

22. S-ba:bagi 'an ñeok 'a:ñi
slowly aux speaking I
"I am speaking slowly."

Examples 18 and 22 contain the same elements, but in different orders. The one constant is the aux-clitics; in both sentences these occur after the first word. [See Klavans (23) for an attempt to delimit the properties of this kind of clitic.] In general, second position clitics form a phonological phrase with the immediately preceding word. Assumedly, then, for Sadock they would be represented in the morphological part of his structure as part of that word, along the lines of the clitic *'s*. The question is what the matching syntactic representation is supposed to look like. If it is supposed to be something like Example 23, have we made any progress in understanding the syntactic role of such clitics?

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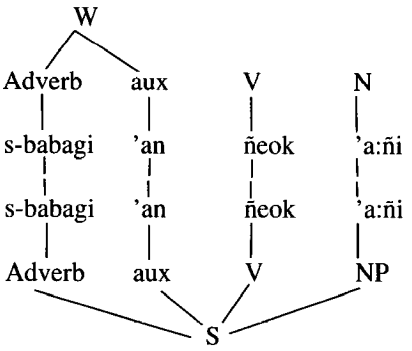
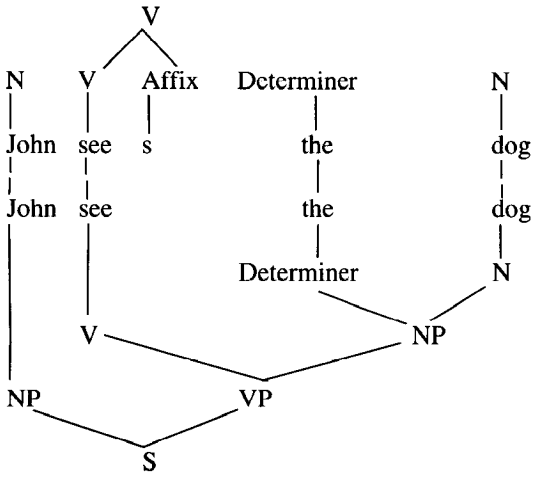


The value of the autolexical approach is even less clear for inflection. Sadock proposes that "purely inflectional material is represented in the morphology alone" (30:385). Consider his representation of *John sees the dog*, and compare the representation of the third singular present tense *-s* to the incorporated object or clitic *'s* above.,

24.



Because there is an interaction between this part of the verb word and other properties of the structure, this choice requires that inflection is analyzed not as part of the relationship between syntax and morphology but rather as purely semantic. For Sadock, apparently, as for LaPointe (24), the choice of inflectionally correct word forms is handled by assigning semantic features to words that reflect their agreement properties and requiring that elements that have to agree must be semantically compatible. This view of inflection is open to dispute. Steele (34) offers an extended argument that agreement has syntactic consequences: The application of agreement to a domain yields a unit whose parts are not syntactically accessible. For example, in some languages in the world it is possible for the members of a constituent to be discontinuous—that is, to be separated from one another. Example 25b from Luiseño is illustrative. Example 25b is simply an alternative way of saying the sentence in Example 25a.

25 a. hengeemal upil nawitmali yawaywichi 'ariqu$
boy aux girl:object beautiful:object was:kicking
"The boy was kicking the beautiful girl."

b. hengeemal upil nawitmali 'ariqu$ yawaywichi
boy aux girl:object was:kicking beautiful:object
"The boy was kicking the beautiful girl."

The words *nawitmali* and *yawaywichi* share in both cases the object suffix *-i*. The evidence that these two words are members of a single (discontinuous) constituent in Example 25b has to do with the requirements of verbs. The verb *'ariqu$* requires a single object-marked argument; even though *nawitmali* and *yawaywichi* are not contiguous, the combination of the two words behaves as a *single* object-marked unit, not as two object-marked units. Under the assumption that constituency is a syntactic and not a semantic phenomenon, the agreement here has clear syntactic consequences.

The Two-Component Theory

I have discussed briefly two approaches to the interaction of morphology and syntax that share the idea that words are introduced into the syntax fully inflected. The alternative—the idea that certain of the properties of words are introduced as a consequence of the structure in which the word occurs—is advocated most clearly by Anderson (1–4). Building on Aronoff's (5) argument that derivational processes create integral, atomic lexical items (i.e. forms whose parts are inaccessible) and on the fact that other properties of words are syntactically accessible, Anderson argues that words are introduced into the syntax lacking the morphological properties that identify their syntactically accessible properties. These are supplied by the surround as a set of

features—what Anderson calls a *morpho-syntactic representation*—and these features are translated into the requisite morphological form. "We conclude, then, that it is not the morphology per se that the syntax cares about, but rather a distinct, possibly more abstract, but certainly differently structured representation of the inflectional categories that a particular form indicates" (4:33). For example, the morphosyntactic representation of a transitive verb in a language where the verb bears person and number marking for both subject and object would, for Anderson, include a feature set identifying the temporal and other properties of the verb itself and two sets of person/number specifications, identified as to their grammatical relation.

26. $\text{Verb}_{\text{transitive}}$ [tense, etc, Subject: P/N, Object: P/N]

The two sets of person/number values would be read off the particular forms performing as subject and object—i.e. by a syntactic rule.

The thrust of Anderson's proposal is to make a clear separation between morphology with syntactic import and morphology without: Derivational rules apply to form lexical items, while inflectional rules convert these into surface inflected forms. Thus, inflectional rules represent the interaction between syntax and morphology; the categories manipulated by the inflectional rules are accessible to the syntax. A problem for this view arises in regard to properties that are not uniformly accessible. Consider the possibility that a particular morphological property might have syntactic import in some environments and not in others, a situation demonstrated by a number of affixes in Luiseño. One example is the possessive prefix. As we have seen, some verbs require a possessive-marked form, but some are insensitive to its presence. Compare again the sentences in Examples 13 and 14, illustrating that *yawq* requires a possessive-marked form, while *'ariq* accepts but does not require such a form. By Anderson's criteria, it would appear that the possessive bears syntactic import in the first case—it is a configurational property—and not in the second. Another example is the plural suffix. The plural suffix, as we have seen above in Example 15, may precede the object suffix. However, it may also be the final suffix in a word that lacks an object suffix.

27. pom$waamay-um "their daughters" pom$waamay-um-i "their daughters"
paa'ila-um "turtles" paa'ila-um-i "turtles"

When a word ends in a plural suffix, its number marking is absolutely crucial to its syntactic possibilities. That is, certain syntactic situations require a form that bears *final* number marking. For example, verbs may vary according to whether they require an object-marked form (e.g. *'ariqu$* 'were kicking"), a postposition-marked form (e.g. *qalqu$* "were sitting"), or a number-marked form (e.g. *miyqu$* "were").

28 a. wunaalum mil pom$waamayum-i 'ariqu$
they aux their:daughters-object was:kicking
"They were kicking their daughters."

b. wunaalum mil $aama-nga qalqu$
they aux grass-on were:sitting
"They were sitting on the grass."

c. wunaalum mil pom$waamay-um miyqu$
they aux their:daughter-plural were
"They were their daughters."

By Anderson's criteria again, the plural suffix in Example 28c has syntactic import—just like the object suffix in Example 28a or the postposition in Example 28b. Now, where the plural suffix is internal to the object suffix, sometimes it is syntactically relevant and sometimes it isn't. Example 16 above illustrates verbs requiring a particular number for their object-marked argument; *moqnaq* requires a singular such argument and *qe'eeq* requires a plural. In contrast, *'ariqu$* in Example 28a is entirely insensitive to the number of its object-marked argument, as the contrast with Example 29 makes clear.

29. wunaalum mil pom$waamay-i 'ariqu$
they aux their:daughter-object was:kicking
"They were kicking their daughter."

These are not the only examples of this phenomenon in this language, suggesting a problem for the kind of distinction Anderson has been at pains to establish. Presumably, he would not want to distribute an arguably single morphological property across two distinct grammatical components, a move yielding massive homophony between the forms identified in inflectional rules and those identified in derivational rules. Presumably, he would take the position that if a morphological property ever bears syntactic relevance, it always is handled in a morphosyntactic representation. So, the possessive prefix and the plural suffix would always be the result of inflectional rules, even where they lack syntactic import. But if a morphological property is not called in a syntactic environment, there is no inflectional rule to supply the property to the form at issue. That is, while the morphosyntactic representation of *paa'ila* "turtle" in (16) might be:

30. paa'ila [NUM: pl; CASE: obj]

(yielding *paa'ila-umi*) because *qe'eeq* requires both properties, the morphosyntactic representation of *pom$waamay* "their daughter" in Examples 28a and 29 would lack a number value, because *'ariqu$* is insensitive to the number value of its argument.

31. pom$waamay [CASE: obj]

But, although there is no obvious way by which the number value is assigned here, *pom$waamay,* like *paa'ila,* is specifically singular in the absence of the plural suffix and specifically plural in its presence.

A THIRD OPTION

In short, implementations of the view that words are introduced into the syntax fully inflected must enrich the notion of what counts as syntactically relevant, as well as the mechanisms by which the properties of words are made accessible. On the other hand, the implementation of the view that the inflectional properties of a word are defined by the syntactic environment must address the consequences of the division it proposes between inflection and derivation. Further refinement of either of these two competing views of syntactically relevant morphology may resolve these problems. I want to explore here another option. The current interest in surface-oriented theories of syntax [i.e. generalized phrase structure grammar (15), head-driven phrase structure grammar (29), and categorial grammar (e.g. 19, 27, 28, and many other works)] suggests an approach worthy of further investigation by morphologists. As Moortgat (27; 1) puts it,

> Surface-oriented theories of grammar show a common tendency of shifting the explanatory burden from the syntactic component to the lexicon. For example, by developing a richer notion of category structure, G[eneralized] P[hrase] S[tructure] G[rammar] eliminates the transformational component of classical generative grammar. Categorial Grammar takes this move towards lexicalism a step further, and eliminates the phrase structure component itself. Syntactic information is projected entirely from the category structures assigned to the lexical items. In its most pure form, Categorial Grammar identifies the lexicon as the only locus for language-specific stipulation. The syntax is a free algebra: a universal combinatorics driven by the complex category structures.

The idea, basically, is this: Assuming that the categories of individual words should be significantly elaborated, we can base this elaboration on their inflectional properties, with the consequence that the syntactic properties of words necessarily turn on and are predicted by their morphological properties. The problems raised by accessing only those elements in "head position" are obviated; the category of a word is far richer than a single morphological property. Similarly, the difficulties associated with assigning values as the

result of a syntactic domain do not arise; syntactic information is projected from the words.

Part of this idea is simply an extension of the basic concept of phonological distinctive feature theory. One of the most important theoretical breakthroughs in modern phonological theory was the proposal of distinctive features, the idea that phonological segments are composed of sets of properties rather than being indivisible entities. [For a first statement, see Jakobson et al (22).] The idea that syntactic category labels such as "NP," "VP," "N," etc might be similarly nonmonadic was broached almost simultaneously (see 18). The observation driving phonological distinctive feature theory—in particular the observation that phonological segments can share properties—provided the impetus in syntax as well. That is, just as it is important to be able to state why /p/, /t/, and /k/—but not /z/—might undergo the same phonological process, so is it essential to state why, say, nouns and adjectives—but not prepositions—might share certain properties. However, while distinctive feature theory has played from its inception a central role in the development of phonological theory, syntactic features have only recently received significant attention: For both Generalized Phrase Structure Grammar and Head-driven Phrase Structure Grammar, the atomization of categories is absolutely central to the theory. Example 32 gives a sample of the feature set proposed in GPSG (15) for English and adopted in HPSG (29).

32. AUX
BAR (level)
INV(ertable)
PAST
PER(son)
PLU(ral)

While syntactic features are at last coming into their own, the investigation lags behind that of phonological distinctive features on another score. From the very beginning of phonological distinctive features, their formal basis has been an important issue. The original set of distinctive features was based largely on the acoustic properties of segments; current proposals are almost exclusively articulatory. However, the formal basis of syntactic feature sets as in Example 32 has, by and large, been ignored. Yet it is clear that an intuitive basis does exist: The majority of features listed in Example 32 are based on morphological distinctions—more specifically, on the distinctions defined by inflectional morphology and other closed class elements. (Of the six features listed in Example 32, four—AUX, PAST, PER, and PLU—are so defined.) These distinctions offer an enticing analogue to the articulatory basis of distinctive features. One attraction of the articulatory basis is that it defines

the number and types of distinctions that can be made cross-linguistically. One problem with the implementation of syntactic features has been the basis of such a definition. It is reasonable to believe that there is a regularity to the distinctions made cross-linguistically by the sets of closed class elements in individual languages, of which inflectional elements are an important subset. Languages clearly differ in the phonological features they employ; equally, we can expect that languages might differ in their relevant syntactic features. However, if the distinctions available to inflectional morphology (and other closed class elements) are finite and if inflectional morphology (as part of the set of closed class elements) is the basis for syntactic features, the available feature set is definable.

Assume, then, that category labels are nonmonadic. Assume, further, that the feature sets comprising a category are based on the distinctions drawn by the inflectional morphology and other closed class elements. For example, the category of the word *paa'ila-um-i* "turtles (object)" in Example 15 above would include values for both of its two suffixes:

33. <plural; object>

Both values in the category label—not just the final object suffix—are available to be called by the rules that compose words into larger and larger units. Thus, we might expect that some verbs would require an object-marked form with a specific number value, and we have seen that such verbs exist. Example 34 sketches the argument requirements of two verbs.

34. 'ariq "is kicking"
<object>
qe'eeq "is killing"
<plural; object>

Each of these verbs would accept *paa'ila-um-i* or any other form with the category in Example 33, as indicated in the categorial rules in Example 35.

35 a. 'ariq : paa'ila-um-i
<present|<object>> <plural; object>

→'ariq paa'ila-um-i or paa'ila-um-i 'ariq
<present>

b. qe'eeq : paa'ila-um-i
<present|<plural; object>> <plural; object>

→qe'eeq paa'ila-um-i or paa'ila-um-i qe'eeq
<present>

The second part of the category of *'ariq* (<. . .|<object>>) in Example 35a says simply that *'ariq* requires an argument of the category shown in Example 34; the second part of the category of *qe'eeq* (<. . .|<plural; object>>) in Example 35b, that *qe'eeq* requires a different kind of argument. In either case, the category of *paa'ila-um-i* satisfies the requirement, with the result of the combination bearing the present tense value of the verb forms, another morphological property—*'ari-q* (kick-present) and *qe'ee-q* (kill-present). (The order of the verb and its argument is left unspecified in both cases.) Necessary, in addition, is an organization to the value set in Example 33, since as we have seen the object suffix is always called, as is a final plural suffix, but an internal plural suffix need not be. (Consider, again, the examples in Example 28.) But a full exploration of the idea at issue is beyond the scope of this paper. The basic point is clear: If categorial labels are comprised of feature sets and if these feature sets turn (at least in part) on the morphological properties of words, there is a necessary and automatic relationship between syntax and morphology.

SUMMARY

A progression to views of the relationship between syntax and morphology is clear. In early generative studies, morphology was treated as part of the syntax. Current models distinguish between morphology and syntax, but the emphasis is still primarily syntactic, as indicated by what are taken to be the central questions: If words are introduced into a syntactic structure fully inflected, how are (certain of) their parts to be accessed; or, if words are introduced lacking their inflectional parts, how might these be determined by the surround? Given the vitality of surface-oriented syntactic theories and thus the focus on the properties of lexical items, future theories can be expected to give a greater role to the morphology, projecting the syntactic properties of a construction from the morphology of its members.

Literature Cited

1. Anderson, S. 1982. Where's morphology? *Linguist. Inq.* 13:571–612
2. Anderson, S. 1984. On representations in morphology: case, agreement and inversion in Georgian. *Nat. Lang. Linguist. Theory* 2:157–218
3. Anderson, S. 1986. Disjunctive ordering in inflectional morphology. *Nat. Lang. Linguist. Theory* 4:1–32
4. Anderson, S. 1988. Inflection. See Ref. 17, pp. 23–44
5. Aronoff, M. 1976. *Word Formation in Generative Grammar*, Linguist. Inq. Monogr. 1. Cambridge, Mass: MIT Press
6. Bach, E. 1983. On the relationship between word-grammar and phrase-grammar. *Nat. Lang. Linguist. Theory* 1:65–90
7. Baker, M. 1988. *Incorporation: A Theory of Grammatical Function Changing*. Chicago: Univ. Chicago Press
8. Capell, A., Hinch, E. 1970. *Maung Grammar, Texts and Vocabulary*. The Hague: Mouton
9. Chomsky, N. 1957. *Syntactic Structures*. The Hague: Mouton
10. Chomsky, N. 1970. Remarks on nominalization. In *Readings in English*

Transformational Grammar, ed. R. Jacobs, P. Rosenbaum, pp. 184–221. Waltham, Mass: Ginn
11. Chomsky, N. 1981. *Lectures on Government and Binding*. Dordrecht: Foris
12. Chomsky, N. 1982. *Some Concepts and Consequences of the Theory of Government and Binding*. Cambridge, Mass: MIT Press
13. DiSciullo, A. M., Williams, E. 1987. *On the Definition of Word*. Linguist. Inq. Monogr. 14. Cambridge, MA: MIT Press
14. Finer, D. 1985. The syntax of switch reference. *Linguist. Inq.* 16:35–55
15. Gazdar, G., Klein, E., Pullum, G., Sag, I. 1985. *Generalized Phrase Structure Grammar*. Cambridge, Mass: Harvard Univ
16. Greenberg, J. H. 1963. Some universals of grammar with particular reference to the order of meaningful elements. In *Universals of Language*, ed. J. H. Greenberg, pp. 73–113. Cambridge, Mass: MIT Press
17. Hammond, M., Noonan, M. 1988. Morphology in the generative paradigm. In *Theoretical Morphology*, ed. M. Hammond, M. Noonan, pp. 1–22. San Diego: Academic
18. Harris, Z. 1946. From morpheme to utterance. *Language* 22:162–83
19. Hoeksema, J. 1984. *Categorial morphology*. Doctoral diss. Univ. Groningen
20. Hoeksema, J., Janda, R. D. 1988. Implications of process-morphology for categorial grammar. In *Categorial Grammars and Natural Language Structures*, ed. R. T. Oehrle, E. Bach, D. Wheeler, pp. 199–248. Dordrecht: D. Reidel
21. Jackendoff, R. 1972. *Semantic Interpretation in Generative Grammar*. Cambridge, Mass: MIT Press
22. Jakobson, R., Fant, G., Halle, M. 1951. *Preliminaries to Speech Analysis*. Cambridge, Mass: MIT Press
23. Klavans, J. 1985. The independence of syntax and phonology in cliticization. *Language* 61:95–120
24. LaPointe, S. 1979. *A Theory of Grammatical Agreement*. Doctoral diss., Univ. Mass., Amherst
25. Lieber, R. 1980. *On the Organization of the Lexicon*. Doctoral diss., MIT
26. Mithun, M. 1984. The evolution of noun incorporation. *Language* 60:847–93
27. Moortgat, M. 1988. *Categorial Investigations: Logical and Linguistic Aspects of the Lambek Calculus*. Doctoral diss., Univ. Amsterdam
28. Oehrle, R. T., Bach, E., Wheeler, D. 1988. *Categorial Grammars and Natural Language Structures*. Dordrecht: Reidel
29. Pollard, C., Sag, I. 1988. *Information-Based Syntax and Semantics*, Vol. 1. Stanford: Cent. Stud. Lang. Info.
30. Sadock, J. M. 1985. Autolexical syntax: a proposal for the treatment of noun incorporation and similar phenomena. *Nat. Lang. Linguist. Theory* 3:79–439
31. Sadock, J. M. 1988. The autolexical classification of lexemes. See Ref. 17, pp. 271–90
32. Scalise, S. 1984. *Generative Morphology*. Dordrecht: Foris
33. Selkirk, E. O. 1982. *The Syntax of Words*. Linguist. Inq. Monogr. 7. Cambridge, Mass: MIT Press
34. Steele, S. 1989. *Agreement and Anti-Agreement: A Syntax of Luiseño*. Dordrecht: Reidel
35. Williams, E. 1981. On the Notions "Lexically Related" and "Head of a Word". *Linguist. Inq.* 12:245–74
36. Zepeda, O. 1983. *A Papago Grammar*. Tucson: Univ. Ariz. Press