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Where's Morphology?

In the early years of the development of a theory of generative grammar (roughly 1955 through the early 1970s), a striking difference between the research problems that characterized the emerging field and those that had occupied its predecessors was the precipitous decline of the study of morphology. The principles of word structure can be divided roughly between those that govern the distribution of "morphemes" or subconstituents of a word and those that govern the variations in shape shown by these elements; and early developments in phonology and syntax left little if any distinctive content to such a field in either of these two domains.

In phonology, the discovery was made that when we extend the scope of rule governed generalizations beyond the particular limits imposed (as in classical phonemic theory) by surface contrast, the effect is to increase the range of cases in which variation in shape shown by a linguistically elementary unit can be reduced to a single underlying form. This observation raised the very real possibility that (with the exception of the facts of lexically governed suppletion, which are comparatively uninteresting from the point of view of linguistic structure) all of the study of "allomorphy" would turn out to be encompassed within the domain of phonology.

In syntax, similarly, it seemed that the inherent basis of the principles governing the distribution of significant elements provided no particular justification for limiting their operands to units of (at least) the size of entire words. Work such as Lees's classic description of English nominalizations and much that followed, culminating perhaps in the program of "Generative Semantics" in the late 1960s and early 1970s, seemed to subsume the principles governing morphemes (and even phonologically unrealized "semantic" units) under exactly the same set of principles as those determining sentence structure. With neither morpheme distributions nor allomorphy to account for, then, morphologists could safely go to the beach.

Recent years have seen the reappearance of a field of morphology, since both of

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the above-mentioned programs for reducing it to other domains have proven overambitious. In phonology, it has been recognized that morphologically conditioned variation obeys somewhat different principles from those governing strictly phonological processes (cf. Anderson (1975), Dressler (1977), for discussion). In syntax, on the other hand, the introduction of the Lexicalist Hypothesis by Chomsky (1970) has gradually reestablished the significance of the notion that word structure is interestingly different in its basic properties from sentence structure.

It is not our intent to argue these basic propositions here, but rather to explore their implications for the nature of a field of morphology. Let us assume that it is appropriate to recognize, internal to the theory of grammar, a field of study concerning itself with the shape and internal structure of words. In characterizing a field of linguistic structure, we are of course required to specify the primes that are relevant to description within that field, and the principles which govern them. A part of this question involves the issue of whether the primes relevant to one subpart of the theory of grammar and those relevant to others have a (nonnull) intersection. In other words, to what extent do the elements of a field (say, morphology) overlap and interact with those of another (say, phonology or syntax)? The existence of such an overlap in the classes of primes relevant to different subparts of a grammar in no way compromises the proposed distinctness of the areas involved: it is the existence of a well-defined, unitary set of principles that defines a coherent field of study, rather than a unique set of objects these principles may refer to. It follows, however, that if the various subparts of a grammar overlap in significant ways, then the properties of the shared elements will be described only in terms of a complex interaction of principles from distinct areas; and an understanding of any one area can only proceed hand in hand with our understanding of others.

It should be emphasized that the question of overlap between portions of the study of language governed by distinct sets of principles is entirely an empirical one, to be answered by investigation of the facts of particular grammars rather than by pretheoretic stipulation or arbitrary definition of the fields of interest so that they must necessarily be disjoint. If one takes the field of syntax to be concerned with the internal organization of sentences, and that of morphology to be concerned with the internal organization of words, it is not necessary a priori either that these two disciplines intersect or that they fail to do so. It is the business of this article to explore the interaction between these two studies and to clarify the relation of this question to some traditional issues in the study of language.

In section 1, we survey the areas in which morphology and syntax evidently interact. Section 2 then explores in some detail a single example in which an aspect of word structure (agreement morphology in the Breton verb) plays the role of an element of syntactic structure. Section 3 starts from the observation that the relevant overlap appears in the domain traditionally known as "inflectional" morphology, and considers several frequently encountered but unsatisfactory definitions of "inflection"; it is concluded that it is precisely the theory-internal overlap with (independently motivated) syntactic operations that defines the domain in question. The consequences of this

definition are considered, and a model of morphological operations is proposed that locates inflection and derivation in distinct portions of the grammar. Section 4 then treats the inflectional rules of such a system in more detail. The consequences of replacing the traditional notion of the (meaningful) morpheme by a notion of inflectional rule are considered, and the properties of the morphosyntactic representations which constitute the interface between syntactic and morphological structure are explored. Principles governing the interaction of morphological rules are proposed, and their interaction with properly "phonological" rules is noted. Section 5 provides some general conclusions.

1. The Lexicalist Hypothesis and Its Consequences

The basic premise of the Lexicalist Hypothesis as suggested by Chomsky (1970) was the independence of syntax and word structure. In its strongest form, one might interpret this as the hypothesis that:

(1) Syntactic rules cannot make reference to any aspects of word-internal structure.[1]

If taken in a maximally literal sense, this proposal is obviously much too strong to accommodate the facts of natural language. Elements of morphological structure and of sentence structure are not totally unrelated; some of the properties of individual words are essentially dependent on their position in larger structures, and some principles operating over domains larger than a single word must be able to refer to properties of the words themselves. Some of the properties of words which are not independent of syntactic considerations are discussed below.

1.1. Configurational Properties

The most obvious kind of dependency between morphological and syntactic structure results from the fact that some words are assigned morphological properties which depend directly on their position in larger constructions and perhaps on lexical properties of other words within such a construction. The assignment of *case* in nouns is an example, since this generally depends on an interplay of grammatical structure (especially, but not limited to, the grammatical relations filled by the NP in question) and the idiosyncratic properties of particular case-assigning elements (verbs, prepositions, and perhaps others). Other word classes, however, also reflect such configurational properties. In the case of adjectives, for example, we can note such distinctions as that between a "weak" and a "strong" declension in German, which depends on the position of the adjective in a structure with certain determiner elements. Among verbs, the characteristic mor-

[1] This has been stated explicitly by e.g. Lapointe (1979); it appears to underlie much recent work. It should be emphasized that the account given by Lapointe (1979) addresses the issues of this section, and that he provides a view of morphological processes which is consistent overall with his statement of the Generalized Lexicalist Hypothesis. It is not our purpose here to detail or take issue with Lapointe's position in particular, but rather to develop an alternative view.

phology of the passive in languages in which this is transformational (rather than purely lexical; cf. Wasow (1977), Anderson (1977a) for some discussion of this distinction) might be said to reflect configurational properties of the structure in which the verb appears. Some languages have special, distinctive forms for verbs appearing in relative clauses (e.g. Irish and Fula), and the morphological realization of these distinctions obviously reflects configurational properties of structures larger than the word. Many more languages have special forms for verbs in subordinate clauses filling a variety of functions, and these too must be seen as reflecting properties of structures larger in scope than a single word.

1.2. Agreement Properties

In addition to properties reflecting in a more or less direct way the syntactic structures in which a given word appears, we must also recognize properties which are assigned as a reflection of the properties of other words in a structure. Routinely, we accept the notion that adjectives agree in gender, number, case, etc., with the head noun of the NP in which they appear. Similarly, verbs may agree in person, number, and perhaps other properties with their subjects (or sometimes other NPs as well). It is somewhat unusual for other categories than adjectives and verbs to show agreement, but in at least a few languages adverbs can be seen to agree in some property with other sentence elements; for example, in Avar adverbs agree with the absolutive NP in their clause in the same way that verbs do, and in Maori adverbs agree with their associated verbs in showing (or not showing) passive morphology. Evidently, the principles which assign such properties to the agreeing words must be based on structures larger than the word, since it is only within larger (typically phrasal) domains that the relation of agreement is defined.

1.3. Inherent Properties

Thus far, we have considered instances in which some property of a word is assigned to it on the basis of its appearance in some larger syntactic structure. This is not the only basis for saying that a property of words is referred to by a syntactic rule, however. In order for rules of agreement to assign the appropriate categories to the agreeing words, they must obviously be able to have access to the corresponding categories in the words these agree with, and thus the inherent properties of the head element are as relevant to such a process as the assigned properties of the agreeing item. If adjectives are to agree with their nouns, that is, the (syntactic) rule of agreement must have access to the features of case, gender, number, etc., on which the agreement is based. Some of these, of course, are features which are assigned on a configurational basis (e.g. case), but others are properties of the individual lexical item (e.g. the gender of the head N in an NP) with which agreement takes place.

In all of these instances, it seems clear that (on the most straightforward notion of the difference between morphology and syntax; that is, on the assumption that the former is responsible for the shapes of individual words and the latter for the inter-

relations of words within larger structure) rules operating within syntactic domains and on the basis of syntactic structure must assign or have access to properties of words. Insofar as this is the case, the sets of properties common to the theories of morphology and syntax are not disjoint, and the question of the interrelation of the two fields becomes a significant one. On its most literal interpretation, the hypothesis formulated in (1) is clearly too restrictive and the range of ways in which syntactic rules refer to elements of morphological structure remains to be determined on an empirical basis.

2. A Specific Example of Syntactically Relevant Morphology

The types of interaction between morphology and syntax suggested in sections 1.1–1.3, while significant, are clearly quite limited. We might in fact hope that the range of such interactions could be restricted to a narrowly defined class of rules (including in particular rules assigning a limited set of configurational properties, and rules of agreement which operate either on configurational or on certain inherent features). If that were the case, we might still be able to maintain the independence of the great majority of syntactic processes from the internal structure of words. While this seems by and large feasible, there are at least some instances in which it appears that word-internal elements are inextricably involved in other processes central to the syntax of a language. We present here one such case, that of the morphology of verbal agreement in Breton.

2.1. Some Basic Facts of Breton Agreement

Verbs in Breton can be marked inflectionally for a number of categories. Primary among these are the traditional ones of *tense* and *person/number*. Consider, for example, the partial paradigm below:

(2) Bemdez e lennan/lenn/lennomp/lennont/lenno eul levr.
every day prt I-read/he-reads/we-read/they-read/he-will-read art book
'I read/he reads/we read/they read/he will read a book every day.'

Verbs may be marked with one of up to six tenses (depending on dialect) and for the usual three persons and two numbers.[2] The pattern of marking in (2) for person and number, however, appears only when the subject NP is not overtly represented. When a subject NP is present, the verb shows only distinctions of tense, with "third person singular" forms appearing in all instances:

(3) a. Bemdez e lenn Yannig/ar vugale eul levr.
3sg-reads Johnny/the kids
'Johnny reads/the kids read a book every day.'
b. Warc'hoaz e lenno Yannig/ar vugale eul levr.
3sg-will-read
'Johnny/the kids will read a book tomorrow.'

[2] There is also a seventh form, used impersonally. The properties of this form will be discussed in section 2.3.

c. *Bemdez e lennont ar vugale eul levr.
3pl-read
d. *Warc'hoaz e lennint ar vugale eul levr.
3pl-will-read

The ungrammaticality of (3c,d) illustrates the fact that a form distinct from the third person singular is impossible in the presence of an overt subject NP, even when that NP is plural rather than singular.

Within the Government/Binding theory of syntax (cf. Chomsky (1981)), these facts can be rather naturally accommodated. Let us assume that the forms in (3a,b), while morphologically identical with "third person singular" verb forms, in fact show no person/number agreement at all (in line with the claim of traditional grammar, e.g. Benveniste (1946), that the third person singular is a "nonperson"). Then the generalization governing the difference between (2) and (3) is that overt agreement and an overt subject NP are mutually incompatible. This would be explained on the assumptions of the Government/Binding theory if we assumed that agreement marking itself constituted a referential element, subject to the binding conditions of the theory. These conditions require that (a) overt (non-"anaphoric") expressions such as pronominals and ordinary referring expressions be *free* in their governing category (roughly, that they not be coindexed with a c-commanding referential element in the same clause), and (b) that empty categories be properly bound in their governing category (roughly, that they be coindexed with a c-commanding referential element in the same clause). Assuming that the subject NP position is empty in the sentences in (2), the second of these conditions would be fulfilled if we assumed that the agreement element was capable of serving to bind the empty category. On the other hand, the impossibility of having agreement in the sentences in (3) would follow on the same assumption from the fact that, if agreement were present, it would bind the subject NP; but since the latter is an overt referring expression, such binding would be improper by the first condition cited above. Postponing for the moment the matter of how to generate the agreement element in question, we can note that the complementarity of overt agreement and an overt subject NP thus follows from the independently necessary binding conditions of the theory of grammar—if "agreement" has the properties of other pronominals.

In addition to appearing in postverbal position (as in (3)), an overt NP representing the subject of a clause may appear preverbally, as its "topic".[3] In this position, we find a full range of pronouns and NPs representing all three persons and both numbers. The verb of the clause, however, is again (as in (3)) marked only for tense and shows only "third person singular" forms regardless of the person and number of the (topical) subject NP:

(4) a. Me/hennezh/int/Yannig/ar vugale a lenn eul levr bemdez.
I/that-one/they/Johnny/the kids prt 3sg-reads
'I/he/they/Johnny/the kids read(s) a book every day.'

[3] For a treatment of the syntax of topicalized structures in Breton, cf. Anderson (1981a).

b. Me a lenno/*lennin eul levr warc'hoaz.
I 3sg/1sg-will-read
'I will read a book tomorrow.'

The ungrammaticality of examples like (4b) inflected for first person shows again the impossibility of having verbs in other than third person singular form in the presence of an overt subject, whether this appears in the normal postverbal subject position or in the preverbal "topic" position.

The analysis proposed above can accommodate these facts without further modification. The possibility of an overt topic NP together with an empty subject NP position follows, of course, from the fact that the topic NP can be coindexed with (and thus bind) the subject position (as argued in Anderson (1981a)). The fact that such a topic bound to the subject position precludes the appearance of agreement morphology would again follow from the proposed status of agreement as a pronominal: if both it and a topic NP were coindexed with the (empty) subject position, then the agreement element itself would be bound by the topic NP, and thus would not be free in its governing category. If agreement is a pronominal, of course, this would be a violation of the binding condition cited above. We see, then, that agreement morphology exemplifies the binding properties of a pronominal from two distinct points of view: it can serve to bind an empty category (as in (2)), and it must itself be free in its governing category (as shown in (4)).

2.2. The Distribution of Pronouns in Breton

In the previous section we have argued that verbal agreement morphology in Breton has the properties of a pronominal. Let us now briefly consider the distribution of other pronominal elements in the language.

Pronouns representing all three persons and both numbers (as well as the distinction between masculine and feminine third person forms) exist to occupy most of the positions normally filled by NP in Breton. In (5a,b) we illustrate possessive forms, serving as genitive modifiers with a larger NP. In (5c,d) we illustrate pronouns as the objects of prepositions; in this case, the preposition and the pronoun appear as a single fused "conjugated preposition":

(5) a. Tri breur he-doa ma mamm.
three brothers she-has my mother
'My mother has three brothers.'

b. Hec'h-unan e oa en he liorzh?
she-alone prt was in her garden
'Was she alone in her garden?'

c. Me a zo o vont ganit.
I prt be prt come with[*gant*]-2sg
'I am coming with you (sg.).'

d. Dirazon a rafe goap ouzhin.
in-front-of[*dirak*]-me prt he-would-make fun at[*ouzh*]-me
'He would make fun of me to my face.'

When pronouns would otherwise be expected as the objects of transitive verbs, the forms that occur are conjugated forms of the preposition *a* 'of':

(6) a. N'em-eus ket gwelet anezhañ.
neg-I-have neg seen of[*a*]-him
'I haven't seen him.'
b. Ar c'higer en-doa kuzet ac'hanom.
art butcher he-had hidden of[*a*]-us
'The butcher hid us.'

In addition to the possessive and conjugated-preposition forms, there is another set of pronouns which occur in the position of topics:

(7) a. C'hwi a daolo dour war an tan.
you (pl.) prt 3sg-will-pour water on art fire
'You will pour water on the fire.'
b. { Eñ / Hi / Hennezh } a oar brezhoneg.
{ he / she / that one } prt 3sg-knows Breton
'He (she, that one) knows Breton.'

These "independent" pronouns appear *only* as topics, in fact. Their absence from genitive position or as objects of prepositions can be attributed to the existence of special forms for these functions. Similarly, the nonoccurrence of such proforms in object positions can be attributed to a language-specific rule marking object pronouns with the preposition *a*, which then merges with them as a conjugated prepositional form (as in (6)). No such independent explanation exists, however, for the absence of independent pronouns from (postverbal) subject position:

(8) a. *War an tan e daolo (/daoloc'h) c'hwi dour.
on the fire prt 3sg(/2pl)-will-pour you water
'You will pour water on the fire.'
b. *Brezhoneg a oar eñ(/hi/hennezh).
Breton prt 3sg-knows he(/she/that one)
'He (she, that one) knows Breton.'

The absence of such pronouns following verbs overtly marked for agreement would follow from the analysis already given above: overtly marked agreement, as a pronominal, would improperly bind an overt pronominal in subject position. This explanation ought not to apply, however, in the case of pronoun subjects of unmarked verbs.

In fact, however, a ready explanation is available for these facts. We have already seen that verbal agreement morphology in Breton has the properties of a pronominal. In (8), we see that an expected set of pronouns (those exemplified by the sentences in (7)) fail to appear in subject position. Suppose, then, that we *identify* the pronominal

agreement with the missing set of subject pronouns. Suppose, that is, that we posit a rule which locally moves a pronoun subject into the position of verbal agreement (obligatorily). In that case, the behavior of agreement as a pronominal would follow directly from the fact that it is basically a pronoun (in subject position), and the absence of expected subject pronouns would follow from their obligatory incorporation into the verbal morphology.

This analysis of the agreement morphology further clears up a postponed issue in the account given above. Recall that we wanted to generate agreement morphology exactly when there was no overt NP filling the subject position, or filling the topic position but interpreted as binding the subject. When either of these positions is filled by a "subject" NP, though, we want not to generate agreement morphology. We might of course have done this simply by assuming agreement to be an optional category in the base expansion of S; given that it is a pronominal, the binding conditions we have relied on above will ensure that it has just this distribution. Since person and number are fundamental properties of finite clauses, this seems a somewhat roundabout way of arriving at the observed facts. On the analysis we have just suggested, however, the explanation is simple and direct. Since agreement is identified with a pronominal element appearing in the (obligatory) base position of the subject NP, it is obviously incompatible with the appearance of another NP in this position (as in (3)). Furthermore, if an NP in topic position is bound to the subject position, the latter must be empty in the base (or else it would be improperly bound in its governing category), thus ensuring the absence of agreement in cases like (4) as well. On the other hand, if the subject NP position is empty, it must be properly bound; and thus when both agreement and an overt subject NP are absent, this will entail the necessary presence of a coindexed NP in the position of topic. This analysis accounts for the distribution of referential elements related to subject position, then, without requiring us to posit an optional category for agreement in the base rules. The only optionality involved is the general principle that base categories may remain unexpanded, which is quite independent of the specific facts relevant to subject elements in Breton.

It might be argued that such a rule incorporating an overt pronominal element into the agreement morphology of the verb is a rather strange process, posited ad hoc to simplify the statement of the facts surveyed above. Other facts of Breton, however, make this quite a plausible analysis in the present case. A rule of exactly the same sort is required independently to create the "conjugated preposition" forms: pronominal objects of prepositions must be incorporated into a unitary form with the preposition itself. The preposition *a*, for example, shows the paradigm in (9):

(9)

a Vreizh	'of Brittany'		
ac'hanon	'of me'	ac'hanomp	'of us'
ac'hanout	'of you (sg.)'	ac'hanoc'h	'of you (pl.)'
anezhañ	'of him'	anezho	'of them'
anezhi	'of her'		

When we compare this paradigm with that of other prepositions, such as *ouzh* 'against, at' in (10), we see that the "conjugation" involved here is not a simple matter of

phonological coalescence of reduced object pronoun forms with the independently occurring preposition (though this is no doubt the diachronic source of the forms involved):

(10)

ouzh ar remm	'against rheumatism'		
ouzhin	'at me'	ouzhomp	'at us'
ouzhit	'at you (sg.)'	ouzhoc'h	'at you (pl.)'
outañ	'at him'	outo	'at them'
outi	'at her'		

The suggested analogy between the formation of "conjugated prepositions" and the incorporation of subject pronouns into the verb morphology is supported by the fact that, in the former case, the same sort of complementarity obtains as in the latter. When a preposition has an overt object NP (as in *a Vreizh* 'of Brittany' or *ouzh ar remm* 'against rheumatism'), it is not conjugated (e.g. **anezhañ Vreizh, *outañ ar remm*). The inflectional material on such a preposition, then, is to be identified with the (pronominal) NP generated in the position of its object, just as we have identified the inflectional marking of subject person and number on the verb with an independently generated subject pronoun.

Our conclusion, then, is that the morphological material which represents agreement in Breton is an element which has an independent function in the syntax, and which is in fact generated by the rules of the base outside of the word in which it ultimately appears. As such, it is a rather different sort of counterexample to a literal interpretation of the Generalized Lexicalist Hypothesis in (1) from the usual varieties of case-marking and agreement rules. Notice that it is not possible to avoid this conclusion by saying that what is involved is really not morphology at all, but simply cliticization of the subject pronoun; this is because the marking for subject person and number is inextricably bound up with the (syncretic) marking of tense. Consider the following set of second person plural forms of the regular verb *skrivañ*:

(11)

skrivit	'you (pl.) are writing (pres.)'
skrivec'h	'you were writing (imperf.)'
skrivot	'you will write (fut.)'
skrivjoc'h	'you wrote (pret.)'
skrivfec'h	'you would write (condit.)'
skrivjec'h	'you would have written (condit. perf.)'

These forms are not plausibly to be derived from a basic uninflected form plus clitic *c'hwi* 'you (pl.)'; the uninflected forms are as follows.

(12)

skriv	'writes (pres.)'
skrive	'was writing (imperf.)'
skrivo	'will write (fut.)'
skrivas	'wrote (pret.)'
skrivfe	'would write (condit.)'
skrivje	'would have written (condit. perf.)'

A consideration of the morphology of "irregular" verbs makes this observation even clearer. It is impossible to avoid the conclusion, then, that in Breton an element of morphological structure (verbal agreement for person and number) is referred to by syntactic principles.

2.3. Breton Impersonal Forms

Since the analysis just given treats Breton person/number agreement morphology as generated in the position of the subject NP, rather than under Infl(ection), it follows that there is no reason to believe that Infl is in general coindexed with the subject position (as has been argued by Chomsky (1981), for English and some other languages). Since it is this relation of coindexing between Infl and the subject which is analogous to[4] the relation of "government" holding between, for example, a verb and its object, it thus follows as well that in Breton the subject position is not "governed" at all.[5]

In the absence of other differences between Breton and languages with coindexing between the subject NP and Infl, we might not expect this to have very many consequences. One possibility, however, concerns the distribution of the element *PRO*. This phonologically null element is argued by Chomsky (1981) to appear primarily in the subject position in nonfinite clauses in English. In many instances, the theory of control specifies the reference of PRO by coindexing it with some (designated) NP in a matrix clause. Where this does not happen, PRO is assigned "arbitrary" reference (as in *It is unclear how PRO to solve this problem*). The properties of PRO as a pronominal anaphor essentially prevent it from appearing in any governed position; in English, this restricts PRO to subject position in nonfinite clauses (and perhaps in NP). If we are correct in suggesting that the subject position in Breton finite clauses is also an ungoverned one, however, we might expect PRO to occur there as well.

There is in fact some reason to believe that this prediction is correct. In addition to the forms for first, second, and third person singular and plural discussed above, Breton verbs also have a seventh, "impersonal" form:

(13) a. N'ouzer mui petra ober.
neg-PRO-knows more what to-do
'One does not know what to do any more.'

b. Ne oar mui Yannig petra ober.
neg 3sg-knows more Johnny what to-do
'Johnny doesn't know what to do any more.'

[4] In Anderson (1981b), an analysis is suggested for Kwakwala (like Breton, a VSO language) from which it becomes clear that the relation between agreement and the subject position ought not to be assimilated to other instances of government. While this conclusion does not of course automatically extend to other languages, the difficulty of providing a unitary definition of "government" (cf. Chomsky (1981)) that would encompass all of the relevant cases does suggest that more than one distinct relation is involved here.

[5] The fact that Breton subjects are ungoverned even in finite clauses need not, of course, prevent the assignment of (abstract, nominative) case to these NPs. This assignment of case might be either from tense (which is present in Infl in Breton) or on strictly configurational grounds, similar to the assignment of "genitive" in English.

c. Bremañ e skriver alies.
now prt PRO-writes lots
'One writes a lot now.'

d. Bremañ e skriv ar baotred alies.
3pl-write the kids
'The kids are writing a lot now.'

e. Me a grede e skrivjed eul lizher dezhi.
I prt 3sg-thought prt PRO-would-have-written a letter to-her
'I thought (some)one would have written a letter to her.'

Sentences (13a,c,e) represent impersonal forms, which are distinct from all other person/number forms of verbs in the Breton paradigm. (Compare (13a,c) with (13b,d) in particular to see the distinction between impersonal and third person singular forms.)

As the glosses for the impersonal forms in (13) indicate, the interpretation of this inflectional category is that appropriate to uncontrolled PRO (namely, arbitrary reference). These forms are often characterized in Breton grammars as impersonal "passives", but this interpretation is not accurate. For one thing, Breton has another, quite distinct, passive formation (a periphrastic form with the verb *bezañ* 'be' and a participial form of the main verb). This normal, full passive can be augmented by an agentive "*by*-phrase" (using the preposition *gant* 'by'), while the impersonal form in (13) cannot have any agent phrase. Furthermore, objects of impersonal verbs continue to be treated as objects, rather than as subjects. This is shown by the fact that, when pronominal, they appear as conjugated forms of the preposition *a*. It will be recalled that pronominal subjects never occur as such in Breton, and that conjugated forms of *a* are typical for pronominal objects. Finally, both intransitive and transitive verbs have "impersonal" forms. Probably no one of these points (illustrated in (14)) would be decisive by itself, but together they suggest that an interpretation of the impersonal forms as passive would not be suitable.

(14) a. Eul lizher a vez skrivet gant an den.
a letter prt 3sg-be written by the man
'A letter was written by the man.'

b. Eul lizher a skrived (*gant an den).
a letter prt PRO-wrote by the man
'(Some)one was writing a letter (*by the man).'

c. Al lizher a skrived anezhañ.
the letter prt PRO-wrote of-it
'(Some)one was writing the letter.'

d. Alies e vezer klañv.
lots prt PRO-be sick
'One is often sick.'

From the point of view of other Celtic languages, these forms are quite interesting. All of the languages of the family show cognate inflectional categories, with similar but

not identical properties. For example, in Scots Gaelic and Welsh (but not Breton or apparently Modern Irish), the notional "subject" of an impersonal can be expressed in an agent phrase (with *gan* in Welsh or *le* in Scots Gaelic). All of the languages allow impersonal forms of intransitives (cf. Irish *téitar*, Welsh *eir*, Breton *yeer* '(people, they, one, etc.) go(es)'; Scots Gaelic *chaidheas* '(they, etc.) went'). Furthermore, even such intransitive impersonals can have agent phrases in the languages which allow these (cf. Welsh *Eir yno gan lawer yn yr haf* '(there is) going there by many in the summer').

Beyond being marked as impersonals, these forms do not show any other person/number agreement (though they are marked for tense, as (13e) shows). If they were really passives, and thus had their notional objects in subject position, one might expect the verb to show some agreement with this NP like other Celtic finite verbs. In fact, Old Irish had a special form for the third person plural of impersonal "passives" ('they were seen') as opposed to all other forms ('I, we, you, he was seen'). There are a few relic forms which suggest the same for Old Welsh, but these forms are long since dead in all of the languages of the family, and there is no reason to assume that any agreement operates in impersonal forms.

With respect to the objects of (transitive) impersonals, the usual case is to treat these NPs as objects (rather than subjects), as we saw above for Breton. In Welsh, however, the object NP does not show the mutation expected for objects, and one might interpret this as the failure of these verbs to assign objective case. In that case, the forms would meet (in Welsh) the criterion suggested by Chomsky (1981) for passives: the absorption of object case assignment. In Breton, on the other hand, there is no evidence that the forms are other than impersonal transitive verbs.

While there is clearly much more to be said about the analysis of these verb forms in other Celtic languages, the most plausible synchronic account of the Breton facts seems to be based on treating them as having uncontrolled PRO in subject position. This element, like other pronominals in subject position, will be incorporated into the verbal morphology by a relatively late rule. Since PRO is in fact different from all of the other possible pronominals, it is not remarkable that it results in a distinct morphological effect when realized in verbal inflection. Notice that this morphological realization is not inconsistent with the view that PRO is a phonologically null complex of features: PRO is not in fact ever realized phonologically as such, though the features it bears may trigger morphological operations in the course of developing the inflection of an associated verb. For further details of the mechanics presupposed here, see the sections below.

A number of facts reinforce our treatment of the Breton impersonal forms as involving uncontrolled PRO as subject of a finite verb. We simply mention these here, without detailed exemplification. We can note first of all that impersonal forms are impossible if an overt NP appears in subject position, or if an NP appears in topic position which is interpreted as subject. Of course, if an overt NP appears in subject position, PRO cannot also occur there; and if an NP in topic position were interpreted as coindexed with the subject position, this would result in PRO being (improperly)

governed—just as finite verb agreement in a language like English precludes the appearance of subject PRO.

Second, we can note that the impersonal verb forms occur only with the "arbitrary reference" interpretation of uncontrolled PRO. They do not, for example, appear when subject position is unfilled but bound by some other element like the topic; nor do they occur when the empty subject position is interpreted as filled by a subject complement (as in 'It is necessary that John wash the car', etc.). Further, impersonal forms do not appear with weather expressions and similar "systematically subjectless" verbs. In all of these cases, the uninflected (or third person singular) forms of the verb are used. Indeed, in the case of weather expressions, certain oblique forms not discussed here show that the subject is not only third person singular, but also feminine.

Consistent with the observation that "impersonals" have a PRO as subject, we can also note that these verbs can be reflexive when this is appropriate (e.g. *Emeer oc'h en em gannañ* 'There is fighting going on', where *en em* represents the reflexive prefix on the verb 'hit'). A reflexive is only possible, of course, if an antecedent for it can be assigned; in this instance the antecedent is PRO.

Finally, we can note that some verbs do not display impersonal forms. This might be taken as evidence against the analysis given here, but in fact it constitutes strong evidence in its favor. The verbs which lack impersonal forms are exactly those whose "subject position" is not the usual one, but rather is to be found in a prepositional phrase. The verb 'have' for example is a periphrastic expression involving a special form of the verb 'be' plus a prepositional expression containing a pronoun coindexed with the subject. The most common expression of 'I like X' is literally 'to me, X is good' (where 'X' is structurally an object, and the subject position, while unfilled, is coindexed with the object of the preposition 'to'). In these and other similar cases, no impersonal forms appear. The PRO analysis immediately explains this, of course; if PRO appeared as subject of these verbs, it would be object of (and thus improperly governed by) a preposition. Since the periphrastic perfect tense forms of transitive and some intransitive verbs are formed with 'have', and this is a prepositional expression which excludes PRO subjects, we also have an explanation for the absence of impersonal perfect forms.

The conclusion we draw, then, is that Breton verb agreement represents the full range of syntactically possible subject pronominals (including, by virtue of the ungoverned status of finite subjects in this language, PRO). The properties of this agreement material behave in every respect like a pronominal with regard to the syntactic conditions on binding of pronominal elements; and thus we conclude that Breton presents a strong counterexample to the position that morphological material internal to a (surface) word is not referred to by syntactic rules.

3. Different Types of Morphology

In the preceding sections, we have surveyed a number of prima facie counterexamples to the claim that syntactic rules do not refer to elements of (internal) word structure:

the assignment of configurational properties to words, the operation of morphological agreement within larger syntactic structures (including the copying of both inherent features and configurational ones onto an agreeing item); and the behavior of verb agreement in finite clauses as a syntactic element (in Breton, as a pronominal). Within traditional theories of morphology, of course, these cases fall together as a natural class: they are exactly instances of *inflectional* as opposed to *derivational* morphology.

3.1. Distinguishing Derivation from Inflection

One of the classic chestnuts of traditional grammar (along with defining the "word") has long been the problem of providing a coherent definition of the difference between "inflection" (including cases of the sort we have just been considering) and "derivation" (other instances of word formation). Most writers on morphology have felt that there was a significant distinction to be captured here, and there is reasonably general agreement on just how to class particular processes. Attempts to articulate this understanding in the form of an explicit definition have, however, been less than successful. The unsatisfactory character of definitions such as those considered below has been noted in most surveys of the subject (e.g. Matthews (1974)), but no comprehensive alternative has been agreed upon.

Some have felt that the basis of the inflection/derivation difference was to be sought in the relative productivity of processes; that is, inflection is often taken to be completely productive in the typical case, while derivational processes are assumed to be limited in various idiosyncratic ways. It is certainly true that principles of case marking, agreement, etc., are usually quite independent of particular lexical choice, and thus completely productive, but it would appear that this still cannot be treated as the basis of the distinction in question. On the one hand, some "inflectional" processes do appear to have limits on their productivity. This is the case with so-called "defective paradigms"; the fact that certain Latin nouns do not have an ablative form, or that certain verbs are limited to the third person singular, etc., establishes a limitation on the productivity of case assignment or verb agreement, without really altering our feeling that these remain inflectional processes. A particularly dramatic example is furnished by Russian (cf. Halle (1973)), in which a substantial class of verbs lacks first person singular present forms. Surely this does not mean that subject/verb agreement in Russian is a derivational process.

The other side of this coin is the fact that certain derivational processes are apparently completely productive. Consider nominalizations in English. One such form (the "gerund" in *-ing*) is completely productive, since it is applicable to every (nonmodal) verb in the language. One might legitimately question the status of this formation as inflectional or derivational; but there is surely no issue in the case of action nominals. Yet here, too, the formation in question is (as a class) virtually completely productive. It is true that different verbs take different formations (*describe/description, laugh/laughter, recite/recital*, etc.); but the point is that *some* action nominal formation is available

for every verb (subject only to semantic limitations). One cannot really say that the diversity of the forms involved is a limitation on the productivity of the process, any more than that the existence of varying conjugation classes constitutes a limitation on the productivity of verbal inflection in languages in which these are found. The apparent conclusion is that, while inflectional processes are usually highly productive and derivational ones frequently quite limited, this difference cannot be seen as criterial.

Another proposal has been that only derivational processes can have the effect of changing (or determining) word-class membership: inflection simply further specifies an element within the same class. It is certainly true that processes forming nouns from verbs, etc., would generally be regarded uncontroversially as derivational in character; but again, this does not seem to be viable as a definition of the difference. Many undeniably derivational processes, of course, do not have the effect of changing word-class membership. The formation of English repetitives like *rethink* from *think*, for example, converts verbs into verbs and is certainly not a matter of inflection. We conclude that the fact that a given process changes word-class membership constitutes only a sufficient, and not a necessary, criterion for classifying it as derivational, and thus that we must look elsewhere for our definition.

In the face of the failure of attempts such as those just considered (and many more) to define inflection versus derivation, some authors have fallen back on a purely extensional definition: inflectional categories are those on the following list (case, number, gender, person, . . .), while derivational categories are those not on the list. Even this last resort fails, however, since the same category may be derivational in one language and inflectional in another. This is the case with diminutive formation, for example. In English, it is of course obvious that diminutives are formed derivationally (*pig* vs. *piglet* or *piggy* is surely not an instance of inflection). The same is true of most languages, including ones like German in which the formation is more nearly productive (here, by the addition of *-chen* or *-lein*) than is the case in English. In the West Atlantic language Fula,[6] however, the category of diminutive formation is completely integrated into the inflectional noun class system. Essentially every noun in Fula appears in a paradigm of seven forms: a singular (chosen from a range of possible classes, as in other African noun class systems), a (corresponding) plural, a diminutive, a "pejorative diminutive" ('scrawny, runty, crummy little X'), a diminutive plural, an augmentative ('enormous X'), and an augmentative plural. These categories are marked by noun class suffixes; and the seven class suffixes (for any given noun) are reflected as categories in agreement both within the NP and between subject and verb. Diminutive, augmentative, etc., are thus just as much inflectional categories in Fula as gender or number, in contradistinction to the situation in English, German, and most other languages. In the face of such language-particular choices, however, we must conclude that it is not even possible to define "inflection" by means of a (cross-linguistically valid) list of categories.

[6] See Arnott (1970) and Anderson (1976) for a description of Fula morphology, and especially of the noun class system relevant here.

The fundamental insight in all of these efforts to define inflection as opposed to derivation is that inflectional differences correspond to differences within a *paradigm* of a single lexical item, while derivational processes give new lexical items from old. One might attempt to define the distinction in question on this basis, but the prospects for significant advance are not good. This is not because the proposed criterion is a false one (as we have suggested that most others are), but simply because we have no independent basis for classifying two related linguistic forms as belonging (or not belonging) to the same paradigm. That is, if we ask what the "paradigm" of the English verb *think* consists of, we have no independent basis for saying that it includes *think, thinks*, and *thought* (past tense) but not *thought* (noun) or *rethink*. On what basis do we include the formation of past tenses, but exclude the equally productive (and in this instance, formally identical) category of action nominals? If the paradigm is to be the basis of a definition of inflection, we must first have a viable definition of the paradigm itself.

In fact, however, when we return to the basis of our discussion in sections 1 and 2, we see that there is an alternative possible definition of the difference we seek to characterize. The difference between inflection and derivation may not, in fact, have any foundation outside of the theory of grammatical structure; that is, it may be seen as corresponding to an aspect of the internal organization of grammars, and thus as being strictly theory-internal rather than as being susceptible of independent definition. We observed above that the central property of inflectional categories which brought them to our attention was their status as prima facie counterexamples to the extreme version of the Lexicalist Hypothesis stated in (1). We might, then, take this as the central property of inflection:

(15) Inflectional morphology is what is relevant to the syntax.

Of course, if this criterion is to be any less circular than, say, the proposal that inflection corresponds to variation within a paradigm (while derivation corresponds to a difference between paradigms), we must have some sort of independent criterion for "syntactic accessibility". What we must avoid is a strategy which first determines a priori that a given distinction must fall within "inflectional morphology" and then attempts to force that element into the workings of some syntactic principle. Only in the presence of a notion of "syntactic principle" which is independent of the appropriate classification of morphological elements can we avoid vicious circularity in the definition proposed in (15).

In fact, however, a reasonably literal interpretation of the traditional opposition between syntax and morphology seems to provide the basis we need: that is, syntax is concerned with the interrelations of words within larger structures (phrases, clauses, etc.), while morphology is concerned with the internal structure of words. We can say, then, that properties are "syntactic" in the relevant sense insofar as they are assigned to words by principles which make essential reference to larger syntactic structures. This entails "inflectional" status for categories which are necessarily accessible to such

a principle in order for it to operate on some other form; that is, if an agreement rule causes item X to agree with item Y in property *P*, then *P* is an inflectional property for both X and Y.

From the relevant notion of "syntactic principle", we specifically exclude the properties of lexical insertion per se and concomitant principles of subcategorization, etc., which govern its operation. Connections between distinct (but related) subcategorization frames are effected in the lexicon, rather than in the syntax, as will be clear in the picture of grammatical organization to be presented in (16). We may well be able to refine the notion further; in fact, most current work in syntax aims to provide a maximally restrictive set of principles governing syntactic structures and operations, and we can incorporate all such results into the notion of "syntactically accessible" which underlies (15). The central issue, however, appears to be the difference between processes which operate with essential reference to structure beyond the word level vs. processes which simply provide alternative words on the basis of the (word-)internal structure of their base. This leaves us with the problem of defining the "word", of course; surely a nontrivial one, but one on which it is probably safe to assume sufficient consensus to allow us to proceed with the investigation of inflection vs. derivation. Some problems in this area will remain (e.g. the distinction between inflections and clitics), but enough domains exist in which the relevant distinctions are clear to make the idea in (15) worth pursuing in substantive terms.

The relevance of the criterion in (15) to some of our cases will be immediately obvious. Configurational properties (e.g. case), for example, are clearly assigned exactly by reference to the larger structure in which a word appears, and thus fall under the principle of "syntactic relevance". Similarly, agreement properties as defined in section 1.2 are also assigned on the basis of crucial reference to larger structure; in particular, to another element occupying a designated structural position (such as "head of phrase") with which the item in question agrees. Furthermore, the inherent properties of such an element which must be accessible to the agreement rule(s) also fall within the above account of syntactic relevance. Finally, elements such as the agreement markers in Breton are obviously relevant (as we have shown) to the operation of principles (those governing the binding of anaphoric elements) which refer essentially to syntactic (as opposed to word-internal) structure.

One set of categories which are traditionally referred to as inflectional do not fall quite so obviously under the definitions just given. This is the category of tense/aspect inflection in verbs. Normally, there is no reason to think of this as assigned on the basis of configuration or agreement (except in the restricted case of "sequence of tense" phenomena), nor is it typically the basis of any other operation causing other elements to agree with the verb on which it is marked. Tense and aspect, then, might well be claimed to be noninflectional categories on the view just outlined, a counterintuitive (though not obviously incorrect) result.

Recent work in syntax, however, supplies an excellent foundation for treating tense/aspect in many languages as inflectional in nature. This is because the appearance of

tense in a clause has been shown to have significant syntactic consequences. A line of proposals beginning with the "Tensed-S Condition" of Chomsky (1973), and continuing through its refinement as the "Propositional Island Condition" and the "Nominative Island Condition" of later work, argued that the element *tense* is a fundamental characteristic of a certain type of essentially syntactic domain. In the most recent statements of the theoretical framework, in fact, *tense* is a constituent of the category Infl, viewed as the "head" of S. It is only assigned to the verb of the clause by virtue of a syntactic principle which moves it from Infl to this position in derived structure. For reasons quite independent of our morphological concerns, then, it appears that the material in Infl is relevant to the syntax, and thus the classification of tense/aspect (as well as agreement) as inflectional in a given language can be made on a noncircular basis.

It follows from the above account that the same category may be inflectional in some languages, but derivational in others, depending on the extent to which (in a given language) it is integrated into essentially syntactic principles. We have seen above that this is probably the case with the category of diminutives: in Fula, the role of diminutives in agreement rules establishes its inflectional character, while the absence of any such syntactic relevance is correlated with the derivational status of the process in English or German. Of course, it is difficult to establish the correctness of this result in particular cases, exactly because of the absence of an external criterion for distinguishing derivation from inflection. If we assume that derivation (as opposed to inflection) is assigned to the lexicon, however, we might expect that insofar as a process is noninflectional in type, it would tend to develop the kind of sporadic, idiosyncratic character which we associate with lexicalized processes. The arbitrariness of diminutive formation in English or German (as opposed to its complete regularity in Fula) is thus at least consistent with the claims made here.

In fact, other categories also show such variation in status across languages. In Kwakwala,[7] for example, the category of *plural* in nouns is not assigned configurationally, nor is it the basis of any agreement phenomena (either within NP or between subject and verb). There is no basis for calling it inflectional, therefore; and 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. Similarly, the category of *tensed* vs. *nontensed* clauses plays no significant syntactic role in Kwakwala (cf. Anderson (1981b)). Consistent with this, the category of *tense* appears to be marked only by an optional, derivational rule which is applicable to nouns as well as to verbs. Again, this suggests that morphology which is syntactically irrelevant (on a language-particular basis) is confined to the part of the grammar containing derivational processes.

Another, possibly more interesting example of a similar sort is suggested by the remarks of an anonymous LI reviewer concerning the present article. The reviewer

[7] See Anderson (1981b) for a description of the fundamentals of Kwakwala syntax. The most comprehensive reference on the morphology of the language is Boas (1947).

observes that in Warlpiri (see Hale (1973) and Nash (1980) for a description of the relevant facts), a number of different tense markers (e.g. past, nonpast, imperative, immediate future, present) can be suffixed to verb roots. If tense is an inflectional category in Warlpiri, the model to be developed below would require that the suffixes in question could be added only after the operation of all derivational processes. Now among the latter, Warlpiri has a rule of reduplication which forms intensives by copying the initial CV(C(C))V(C) of a verb. The interesting fact is that intensive reduplication copies the tense marker material, in the special case where the verb stem is itself only a single syllable. Thus, *pu-ngka* 'hit-imperative' reduplicates as *pungka-pungka* 'hit it quickly!' Such an example would appear to force us to the conclusion either that (a) intensive reduplication is also inflectional, which seems implausible in light of its other properties; (b) the framework under discussion is misguided in distinguishing inflection from derivation in the way it does; or (c) tense marking on Warlpiri verbs is really derivational, rather than inflectional (in the terms of the theory).

In fact, there is good reason to believe that it is this last conclusion which is to be accepted. We can note first that tense marking is not exclusively a fact about verbal morphology in Warlpiri. As detailed in the sources noted above, the Warlpiri auxiliary element also takes different forms based on temporal factors. These forms are not in any way isomorphic with the verbal tense marking: there are five distinct auxiliary bases which cannot be identified with the distinct tense markers (in terms of either form or meaning), and each of which in general appears with more than one possible "tense" form of the verb. In fact, it is the interaction of auxiliary base choice and verbal tense which gives rise in interpretation to the full range of possible aspectual distinctions in Warlpiri. This suggests that the auxiliary and the verbal tense marker are chosen independently, and thus that neither can be regarded as assigned configurationally or by agreement on the basis of the other.

Since neither auxiliary nor verbal tense thus qualifies as a configurational or agreement inflectional category (or, a fortiori, as an inherent one) in the terms of the above discussion, the only basis for treating either as inflectional would be its relevance to defining a sentential domain as the content of Infl, as suggested above for English. But with respect to this issue, the literature suggests strongly that it is the auxiliary rather than the verbal tense element which fills this role. For one thing, the auxiliary is also the locus of subject/object agreement; for another, it appears in a position which is crucially based on the structure of sentential domains (while the position of the tense-marked verb is free). Furthermore, at least some of the verbal tense markers (especially the nonpast marker) also appear in some nonfinite formations, while auxiliaries do not. This issue clearly merits further investigation, but it appears that the principles of the present theory dictate the assignment of auxiliary "tense" to the category of inflection, and preclude that status for verbal tense. This is, of course, exactly what we predict on formal grounds as well, as noted above. Warlpiri thus seems to be in the interesting position of a language which instantiates both inflectional and noninflectional marking of the same general category (tense/aspect) within a single system.

We can also note here the fact that, insofar as they appear to reflect generally (if not universally) valid properties of inflection, the characteristics rejected above as criterial follow to a large extent as theorems of this system. In particular, the necessary condition of productivity follows from the inherent productivity of (nonlexical) syntactic rules of agreement, case marking, etc., rather than as a stipulated property of inflection.

We conclude, then, that the correlation between "inflectional" status and syntactic relevance is a significant one. It appears, therefore, that (15) expresses an important aspect of the internal organization of a grammar. The content of this claim is that morphology is divisible into two parts: an inflectional part, which is integrated (and shares theoretical primes) with the syntax, and a derivational part, which is confined to the lexicon and opaque to the syntax. In the next section, we explore the nature of a theory of morphological organization which explicitly represents this aspect of the internal structure of a grammar.

3.2. The Organization of Morphology

In the previous section, we argued that some aspects of word structure are related to syntactic principles and proposed that this fact be utilized to define the domain of "inflectional" morphology. It is important to note that the fact that some morphological elements are "syntactically accessible" should not be taken to imply that all morphology is simply a subpart of the syntax, however. The content of the Lexicalist Hypothesis, and of much recent work in syntax, rests on the assumption that the internal structure of words is not in fact created by syntactic principles, and indeed that it is not even accessible to these principles. We want therefore to restrict as far as possible the overlap between syntactic and morphological theories.

Work such as that of Aronoff (1976) makes it clear that much of the traditional domain of derivational morphology is governed by a distinctive set of principles, essentially unrelated to those governing syntactic structure per se. Aronoff's account of this fact was based on assigning derivational processes to a distinct component of the grammar, the lexicon, which is exclusively responsible for creating words. From the point of view of the syntax, the structures produced in the lexicon are essentially opaque; they may have internal structure, but this is not subject to manipulation or reference by the rules of the syntax, which treat lexical items as integral, atomic units. The content of the Lexicalist Hypothesis, on this view, is represented by this separation of syntactic and lexical components.

Some recent work in morphology (e.g. Lapointe (1979), Lieber (1980), Williams (1981)) attempts to extend this conclusion by assigning all operations of word formation (inflectional as well as derivational) to the lexicon. Our observations above, however, suggest that this may not be appropriate (or even possible) in some cases, given the fact that syntax and morphology overlap in some ways. In addition, examples such as the one discussed by Thomas-Flinders (1981b) show that in certain cases it is essential that some morphological operations take place only after words have been combined into

larger structures (and some phonological rules of a nonmorphological sort have applied). Such processes must evidently follow lexical insertion (and thus not be represented in the lexicon); they are apparently confined to instances of inflection in the present sense. We propose, then, to divide the rules of word structure into two parts: one, the lexicon, operates as suggested by Aronoff in isolation from the syntax, while the other, the rules of inflection, operates on the basis of syntactic structure (in part).

It is not our purpose here to elaborate a theory of lexical (or derivational) morphology, but rather to focus on the inflectional processes. However, for completeness, let us assume that the lexicon supplies a comprehensive set of well-formed stems within a language. These stems represent complete words, with the exception of inflectional material. In a language like English, all lexical stems will in fact be well-formed surface words, since no inflectional modifications are obligatory in this language; but in Latin, for example, many stems will not be well-formed words, since they will not carry any indication of case or number (for nouns and adjectives), gender (for adjectives), or tense, mood, person, number, etc. (for verbs). These lexical stem elements will include all internal structure of a derivational sort, and lack only the material supplied by (syntactically based) rules such as case marking and agreement.

Lexical stems, then, are created entirely in isolation from the syntax (though they are characterized by features of subcategorization which specify the range of syntactic structures in which each may occur) and also independent of the inflectional morphology. Inflectional structure, on the other hand, is developed in a way distinct from derivation. The central notion which unifies the two is that of a *morphosyntactic representation*: a complex symbol which constitutes the terminal node of a phrase marker.

We assume that the rules of the base generate lexical categories as the basic form of such a terminal node. Let us further propose that the base rules develop lexical categories as complexes of features (a suggestion that originates in Chomsky (1965)), providing specifications for any features that function as *inherent* in the sense of section 1.3. In English, for example, lexical nouns are further developed as [±Plural] (because the rule of subject/verb agreement in English needs access to this feature); in a language like Latin, nouns are also developed as [Masculine], [Feminine], or [Neuter],[8] since Latin agreement (unlike English) needs access to this inherent property of nouns. In both languages, pronouns are characterized as [+me] (first person), [+you] (second person), or neither; and as singular vs. plural. Presumably the element Infl in both languages bears features indicating tense/aspect.

Other rules of the syntax then operate to develop these morphosyntactic representations further. For example, rules of case assignment operate to add features for (?possibly abstract) case to the complex symbols of nouns on the basis of the position of the element in a larger configuration (perhaps together with various conventions for case assignment, such as the "percolation" of case from phrasal nodes to their heads, or the like). Other rules operate to assign further features to the morphosyntactic representation

[8] We take no stand here on the proper set of features for characterizing gender in Latin, or other inflectional categories except where explicitly indicated.

by agreement with some element in a designated position in the syntactic structure. In Latin, for example, a rule of case assignment may assign accusative case to an object NP, which is then incorporated into the morphosyntactic representation of the head noun; a rule of agreement then copies both the (inherent) features of gender and number and the (configurational) feature of case from the head noun onto the morphosyntactic representation of a modifying adjective. The result is a fully developed morphosyntactic representation (in the form of a bundle of features, with some internal structure as we will discuss below), characterizing the full range of inflectionally relevant categories in the language.

Lexical representations are then paired with these morphosyntactic representations, constituting lexical insertion. In general, lexical stems are characterized only by word class (together with subcategorization restrictions, which limit the appearance of stems as heads of phrases in terms of their phrasal complements within the phrase). When a given lexical stem is associated with a particular morphosyntactic representation, the inflectional rules then operate (as discussed below in section 4) to develop the surface form of the inflected word. These rules thus have access to (a) the inflectional specification provided by the morphosyntactic representation, and (b) the lexical (phonological) form of the stem.

While the basic form of lexical entries is specified only for word class, and this is sufficient to allow it to be inserted correctly in a phrase marker, it is clear that some lexical stems must contain further lexical specification. This follows from the basic notion of the lexicon as the repository of all idiosyncratic information about a word. Suppose, for example, that a verb (e.g. *think*) has an irregular or otherwise unpredictable past tense form (*thought*). In that case, the lexical entry for the verb must contain not only the regular stem (characterized only as a verb), but also the unpredictable stem variant (*thought*) characterized both as a verb and as [+Past].[9]

We then make the further assumption that, when such a complex lexical entry is associated with a morphosyntactic representation, the stem which is actually transmitted to the rules of inflection is the subentry which is maximally specified and nondistinct from the morphosyntactic representation in question. Thus, if "think" is inserted in a structure calling for a verb which is [+Past], the stem /think/ (which is perfectly consistent with this morphosyntactic representation) is superseded by the stem /thought/ (which is more specifically characterized, and still consistent with the syntactic requirements).

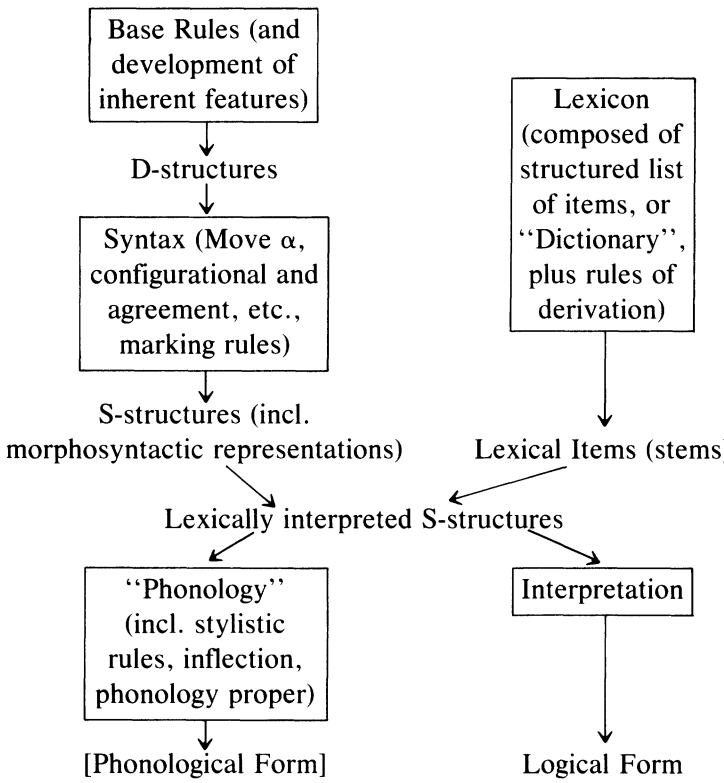
The principle involved here is actually a special case of the well-known principle (due originally to Pāṇini and reintroduced into phonology by Anderson (1969; 1974), Kiparsky (1973), and others) that when two rules conflict, the more specific takes precedence over the more general. The relevance of this notion of disjunctive ordering for

[9] We note here that, as pointed out by a referee for this journal, if only *ir*regular inflections are listed in the lexicon, we have no ready account of the problem of defective paradigms which was noted above. We can only hope that future research into "defective paradigm" cases will yield results consistent with our overall program here.

the treatment of irregularity in morphology is developed at length by Platt (1981) and Thomas-Flinders (1981a), and in related work. We will see in section 4.2 that it has further implications, governing in part the operation of the inflectional rules themselves.

The resulting picture is consistent with the general view of a grammar presented in Chomsky (1981) and elsewhere. On this approach, derivational morphology (as well as simple lexical listing, of course) operates within the lexicon, independent of the syntax, and supplies the content for lexical insertion. The rules of the syntax, on the other hand, develop morphosyntactic representations as the terminal nodes of phrase markers (for concreteness, let us assume, in S-structure), which are then associated with elements from the lexicon. The resulting lexically specified phrase markers are then subject to the rules of the "phonology", including[10] rules developing the overt realizations of inflectional categories:

(16)



Obviously, many aspects of this model are assumed without justification, and many points require further clarification and elaboration. Nonetheless, it seems to provide a reasonably accurate representation of the observations made above about the relevance

[10] See Anderson (1975) for evidence favoring the position that the rules of (inflectional) morphology are in principle intermixed with rules of phonology proper. In that work, the point is made that internal to the phonology, no rigid componential organization (separating, for example, morphological, phonological, and phonetic rules) can be imposed in the general case.

of syntax to morphology, while minimizing the possibilities for overlap among the various components of the grammar. In the following sections, we will provide further details concerning the nature of morphosyntactic representations, as well as the operation of the inflectional rules.

4. The Formal Description of Inflection[11]

The view of inflectional morphology developed in the preceding section can be identified as an *Extended Word and Paradigm* model. Its distinctive property consists in treating the inflectional apparatus of a language as a set of rules which operate on ordered pairs of the form {S,M}, where M is the morphosyntactic representation associated with the terminal node of a phrase marker, and S is the most specifically characterized phonological stem form associated with a given lexical entry, consistent with M. The rules in question derive a surface word by altering S in systematic ways: by affixation (the addition of prefixes, suffixes, or infixes), stem modification (ablaut, tone change, consonantal mutation, etc.), reduplication, or other formally specifiable changes conditioned by the fact that {S,M} meets a specific structural description.

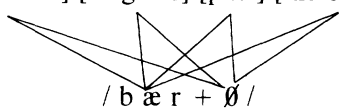
We can note that the combination of the pair {S,M} and the rules that act on it corresponds to the traditional notion of the morphological representation of the form. That is, on this view there is no unique association between particular elements of the morphosyntactic representation of a form (its syntactic "meaning") and particular formatives or other aspects of its surface form. The relation is rather a holistic (though decomposable) one between a representation and a surface form, and the rules of the inflection portion of the phonological component substitute for the usual inventory of sound/meaning pairs ("morphemes"). While somewhat untraditional, this move is clearly dictated by the lack of generality of the traditional notion of the morpheme. We can note here that Aronoff's (1976) work also rejects the notion of (meaningful) morphemes in the traditional sense, although he does not seem to be notably more successful than the American structuralist tradition in reconciling the apparently parallel status of discrete (if "meaningless") formatives and the various other sorts of processes by which morphological categories can be (equivalently) marked. We can also note the suggestion of McCarthy (1981) that a much richer notion of "morpheme", essentially prosodic in character, can accommodate a wide range of problematic cases (especially the holistic patterns found in Semitic). A discussion of this position cannot be undertaken here for reasons of space; however, it appears that the formal aspect of McCarthy's proposal (if ultimately validated) may well be perfectly consistent with the overall theoretical framework being developed here.

As argued at length by Matthews (1972), a representation of morphological structure in terms of morphemes (unitary, localized, continuous formatives associated with discrete portions of the meaning of a form) is only appropriate in the limiting case of a

[11] Much that appears in this section is adopted (and adapted) from the discussion of inflection in Anderson (1977b).

strictly agglutinating language. That is, this representation is appropriate in the special case in which elements of meaning are associated one-to-one (or perhaps many-to-one) with the elements of a discrete partitioning of a form. In a great many morphological systems, however, the presence of one-to-many or many-to-many relations between meaning and form (including the whole gamut of problems encountered by writers on American structuralist morphology; cf. Hockett (1947) among many other references) dictates an alternative representation. For a simple example, consider the Old English form *bær* 'he carried'. This form expresses the morphological categories of third person, singular, past tense, indicative mood. It does so through two formal mechanisms: (a) the stem vowel /æ/, and (b) the fact that the stem is followed by no phonological ending. Interestingly, if any of the four categories expressed in this form is changed minimally, *both* the stem vowel *and* the ending change as well. We must, then, say that each of these two elements of form is linked to all four of the categories expressed by the form:

(17) [3 person] [singular] [past] [indicative]



While quite simple in character, this example is also entirely typical of the morphological structure of "inflectional" languages. It is true that some languages approach quite closely to the ideal agglutinating type, in which the form/meaning association is completely well behaved; but these appear to be the exception rather than the rule. We conclude, then, that the present view of an association between an internally complex morphosyntactic representation and a complex form, mediated by the operation of a system of rules, provides a more general account. Of course, languages of the agglutinating type are perfectly describable in these terms: their special character consists in the fact that (a) all of their inflectional rules are affixations, rather than internal changes, etc., and (b) no two inflectional rules refer to the same elements of a morphosyntactic representation. In the general case, however, which we wish a morphological theory to capture, neither of these constraints is satisfied.

In filling out the picture of how inflection is to be described in an Extended Word and Paradigm framework, there are two fundamental aspects to clarify: (a) the nature of the {S,M} pairs, and especially the structure of morphosyntactic representations, and (b) the internal organization of the rules of inflection. In the following sections we address each of these issues in turn.

4.1. The Structure of Morphosyntactic Representations

We have assumed thus far that the morphosyntactic representations provided by the syntax have the character of a complex symbol, consisting of a number of (mutually unordered) specifications for morphologically relevant features. The class of features specified in these representations is at least in part a matter for language-particular

specification, and corresponds to the traditional notion of the inflectional categories of the language. It may well be possible to establish some universal inventories of features that are (or are not) available for use in this way, but we have no proposals to make along those lines at present.

There is reason to believe, however, that the morphosyntactic representations have more internal structure than is present in a simple unordered feature complex. This is because the same form may require more than one distinct specification for the same feature to be realized; and the distinctness of the two (or more) specifications must be preserved in a way that seems impossible in an unordered representation. This is the case, for example, in a language in which verbs agree simultaneously with their subjects and with some other NP (typically, their direct and/or indirect objects).[12] In such a case, of course, the subject and object markers must be kept distinct. For a concrete example, consider the following set of present tense forms of the Georgian verb *xed-av-s* 'see':

(18)	v-xedav	'I see him'	m-xedav-s	'he sees me'
	g-xedav	'I see you (sg.)'	m-xedav	'you see me'
	xedav	'you see him'	g-xedav-s	'he sees you'

As we will see in the discussion of Georgian agreement below, additional forms exist when one or both of the participants are plural. For now, however, we wish simply to make the point that subject and object person markers must be kept distinct, since reversing them in any of these examples results in a change in the form.

We might propose to keep the two sets of agreement indicators separate in the morphosyntactic representation simply by establishing two distinct sets of features: [±1st person subject] vs. [±1st person object], etc. This is not a particularly attractive move: if the features in question are genuinely agreement features, there is no reason to distinguish in this way between the features present in subject NP and those in object NP, for example. Besides this otherwise unmotivated proliferation of features, however, there are clear cases in which generalizations would be lost if this analysis were adopted. It is shown by Anderson (1977b) for Potowatomi and by Hammond (1981) for the Uralic language Vogul (as well as in section 4.2 below; cf. rule (29b) there) that such subject/object agreement systems sometimes contain individual rules that generalize to the same feature in different positions. Thus, among the morphological indicators of agreement in Algonquian languages, we quite typically find that a form is prefixed with /n-/ if *either* the subject *or* the object is first person (similarly, /k-/ is prefixed if either is second person). Other rules in the same system, however, require us to distinguish between subject agreement features and object agreement features. If we do this by multiplying features, we will be unable to express the unity of the generalization about the prefixes: the features [+1st person subject] and [+1st person object] have nothing to do with one another in principle.

We propose, therefore, that instead of proliferating features, we represent differ-

[12] Anderson (1977b) provides a detailed account of such a system in the Algonquian language Potowatomi.

ences such as these in terms of the internal structure of the morpholexical representations. Suppose we accept the following convention of *layering of features*:

(19) "When a rule of grammar assigns features to [a morphosyntactic representation], and that [representation] already carries specifications for those features, then (unless, of course, the rule is explicitly stated so as to *change* the features involved, rather than simply to add them), the result is not that the new features and the old merge within the same complex, but rather that a new layer of structure is created, taking the old feature complex as its base." (Anderson (1977b, 21f.))

For a concrete example, let us consider one of the Georgian verb forms in (18): *m-xedav-s* 'he sees me'. We assume that (perhaps by virtue of a transfer of features from the Infl element) this verb is characterized as [+I tense series], [+present/future], [−perfective] (the appropriate features for the simple present tense). A rule of Object Agreement applies, assigning the morphosyntactic representation [+me], [−you], [−plural] by agreement with the object NP. Thus far, there is no need to assume any further internal structure than that of a simple feature complex; but when Subject Agreement applies to assign the features [−me], [−you], [−plural] by agreement with this NP as well, convention (19) comes into play to yield the representation in (20):

(20)[13]
$$\left[\begin{array}{l}\left[\begin{array}{ll}-\text{me} & \left[\begin{array}{l}+\text{me}\\ -\text{you}\\ -\text{plural}\end{array}\right]\\ -\text{you} & \\ -\text{plural} & \end{array}\right]\\ +\text{I series}\\ +\text{pres/fut}\\ -\text{perfective}\end{array}\right]$$

In this representation, the features assigned by Subject and Object Agreement are distinguished: Object Agreement features are found in an "innermost" layer of structure, while Subject Agreement features are found in the "outermost" layer of structure. In fact, the Georgian verb is capable of agreeing with three NPs at a time: an indirect object, in addition to the subject and direct object. Assuming that Indirect Object Agreement follows Direct Object Agreement, but precedes Subject Agreement (that is, that agreement processes are ordered roughly from the "nearest" complement to the agreeing

[13] Notice that, by contrast with the account in Anderson (1977b), we assume here that only the features actually involved in convention (19) are "layered". Notice also that linear order is completely irrelevant in these representations. [A,B,[C,D]] should for example be taken as an unordered complex of three items: A, B, and the (internally complex) element [C,D]. For further exemplification of the mechanisms assumed here, see Hargus (1981), Hammond (1981), Platt (1981), Thomas-Flinders (1981a,b), and Tuller (1981), as well as Anderson (1977b). Specific rules relating representations like (20) to forms such as those in (18) will be presented in section 4.2.1.

item to the most distant in syntactic structure), the indirect object (when all three are present) will form an intermediate layer in a three-layered representation.[14]

We should note that it is not only subject/object verb agreement that motivates the internally structured representations produced by convention (19). In Georgian, nouns can also involve such layered representations. This is the case when a genitive modifier within an NP is associated with a phonologically null head. In that case, the features of case and number associated with the entire NP are realized on the genitive modifier, in addition to its own. In a sentence such as 'I couldn't find my paint brushes, so I painted the picture with the children's (ones)', the NP '(with) the children's (ones)' is represented by the word

(21) bavšv-eb-is-eb-it
child-pl-gen-pl-instr
'with the children's (ones)'

In this case, the noun has two layers of features for case and number: one for its own specification, as a genitive modifier within the NP, and one representing the features which would have appeared on the head of the NP if that had been phonologically realized. This internally structured representation is created by the operation of convention (19), which is thus shown to extend to cases other than verb agreement.

We conclude, then, that morphosyntactic representations contain a certain (limited) amount of internal structure. In fact, there is a certain amount of evidence which suggests that such structure is not only available to be referenced by inflectional rules, but that it can even be manipulated by rule in some instances. Anderson (1977b) discusses evidence for a rule which systematically inverts the internal structure of certain morphosyntactic representations in Potowatomi; we discuss here an example of the same general character from the Georgian agreement system.

As noted above, Georgian allows verbs to agree with an indirect object as well as other NPs. It should be noted, however, that this is only possible under restricted circumstances; in particular, it is not possible if the direct object is other than third person. This constraint appears to be motivated by the fact that a third person object would be phonologically unmarked on the verb. Evidently, then, the problem is that the verb cannot show *overt* agreement with more than two NPs at a time. Georgian has a number of alternative constructions (discussed by Harris (1977)) for replacing direct or indirect object NPs with oblique phrases when this constraint would otherwise be violated.

In general, agreement with indirect objects is formally similar to agreement with

[14] A somewhat different view of the nature of "layering" is proposed by Hammond (1981), who establishes representations with considerably more internal structure so as to state interesting constraints on the relative ordering of morphological material in the form of a type of "cyclicity" and "subjacency". If the rather narrowly constrained model proposed by Hammond can be maintained for a wide variety of (suitably complex) languages, this would be a very interesting result.

direct objects, except that third person singular indirect object agreement is by means of the prefix /h-/ (alternating phonologically with /s-/ and /Ø-/, depending on the following segment). This agreement pattern, part of which was illustrated in (18) and which we will describe in greater detail in the following section, is constant across all tenses in the first (*present series*, containing 6 distinct tenses) and second (*aorist series*, containing 2 more, assuming that perfective and imperfective forms are not distinguished) groups of tenses.

In addition to these, however, there is a third set of tenses in Georgian: the so-called "perfect" (really, reportive) tenses of the *third series*. In these tenses, the pattern of subject and object agreement is systematically inverted from what is found in other tenses. That is, the series of markers used elsewhere to mark subjects instead marks the person and number of the direct object in third series tenses; and the markers used elsewhere for indirect objects mark subjects here. The internal morphology of these forms (like so much of Georgian morphology) is rather complex; but in a form like *gi-naxav-v-ar* 'you (are said to) have seen me' the prefix /gi-/ is one used elsewhere for a second person singular indirect object; while the embedded prefix /-v-/ is one we would expect to find marking a first person singular subject. Similar inversions exist for all other combinations of subject and object persons.

Harris (1977) gives a large number of excellent arguments which determine the appropriate analysis of these forms. She shows that, with respect to all structural syntactic criteria (control of reflexives, etc.) the subjects of these forms behave like other subjects, and the objects like other objects. With respect to a large number of morphological criteria, however, the subjects behave like indirect objects, and the direct objects like subjects. Harris's account of these facts assumes that a syntactic inversion takes place in the third series of tenses: subjects are demoted to indirect objects, and direct objects are promoted to subjects. On that view, the forms in question have two distinct syntactic representations: one prior to inversion, which is appropriate for the statement of the strictly syntactic generalizations; and one subsequent to inversion, which is appropriate to the morphology. This view reconciles the morphological and syntactic properties of the forms.

Given a theory of morphology that accords internal structure to morphosyntactic representations, however, an alternative view is available that also accords with the data, and that has certain advantages. That is, suppose we assume that the inversion in third series forms is limited to the morphosyntactic representation and that the syntactic structure per se remains unaltered. We could then formulate a rule such as (22):

(22) $$\begin{bmatrix} \alpha\text{me} & \begin{bmatrix} \delta\text{me} \\ \epsilon\text{you} \\ \zeta\text{plur} \end{bmatrix} \\ \beta\text{you} & \\ \gamma\text{plur} & \end{bmatrix} \quad \begin{matrix} 1 & 2 \end{matrix} \Rightarrow \left[2 \left[1 \begin{bmatrix} -\text{me} \\ -\text{you} \\ -\text{plur} \end{bmatrix} \right] \right] / \overline{[+\text{III series}]}$$

The effect of this rule is to transfer the object features from the innermost to a new outermost layer in the representations of third series forms. As a result, the original direct object features are reduced to the combination (third person singular) which does not trigger overt agreement; and the original subject features wind up on an intermediate layer, parallel (as suggested above) to the agreement material for indirect objects. Note that the result of this operation would not be well formed if the form already contained agreement material for an indirect object; but it is independently necessary to constrain third series forms so that their indirect objects, if present, must appear in a nonagreeing external postpositional phrase.

The account of inversion in Georgian based on rule (22) has the advantage that it does not posit an otherwise unevidenced shift in grammatical relations within syntactic structure. The movements involved in a strictly syntactic account of this inversion would of course violate basic principles of the Government/Binding theory (cf. Chomsky (1981)); but even the theory of Relational Grammar assumed by Harris offers only morphological and not syntactic evidence for the presumed inversion. It seems most appropriate to treat such a morphological fact with a limited, morphological analysis, rather than to assume a syntactic movement which is not otherwise supported.

The morphological account has some other advantages, internal to the study of Georgian, which we cannot go into here. We can note, however, that on Harris's account it is necessary to block the operation of inversion in nonfinite clauses, even in third series environments. On the account proposed here, no such statement blocking inversion is necessary: there is no agreement in nonfinite clauses, and hence no morphosyntactic representation of agreement morphology which could possibly undergo rule (22).

To support this proposed account of inversion in Georgian in as much detail as Harris gives for her Relational account would take us much too far afield here. There are obviously many details to be filled in, but it appears that the morpholexical account offers significant advantages to a constrained theory of syntax and is worth pursuing. Our purpose in presenting it here is to lend further support to the suggestion that morpholexical representations have internal structure, by arguing that this structure is in some cases manipulated by rule. In allowing such operations, we achieve the result that morphological facts can be accounted for by morphological means, rather than having to invoke otherwise unattested syntactic operations in order to adjust syntactic structure so that it will be appropriate to the observed idiosyncrasies of morphology.

4.2. The Internal Organization of Inflectional Systems

In the preceding section, we discussed the nature of the morphosyntactic representations which form the element M of the {S,M} pairs that serve as input to the rules of inflectional morphology on the model in (16). We turn now to the rules themselves and, by extension, to the elements S.

As noted above, the inflectional rules in this model serve the function of a list of morphemes on more traditional views. Thus, the element /-d/ 'past tense' in English

verb inflection is represented by the rule (23):

(23) $\begin{bmatrix} +\text{Verb} \\ +\text{Past} \end{bmatrix}$

$/X/ \rightarrow /X\#d/$

This rule specifies both a morphosyntactic and a phonological representation in its structural description. The morphosyntactic representation in this instance is satisfied by all past tense verb forms; while the phonological representation (consisting in this instance simply of the variable X) is satisfied by anything at all. The structural change specified consists in the addition of the suffix /#d/.

This example involves the addition of a suffix; but the range of phonological changes which can be performed by inflectional rules is by no means limited to this. For example, in Sanskrit, the perfect stem of verbs is formed by reduplication. The reduplication in question consists of a copy of the first consonant of the root (the second, if the root begins with a cluster of sibilant plus obstruent), followed by a copy of the root vocalism in the zero grade. This corresponds to the following rule:

(24) $\begin{bmatrix} +\text{Verb} \\ +\text{Perfect} \end{bmatrix}$

$$/\langle \begin{bmatrix} +\text{coronal} \\ +\text{cont} \end{bmatrix} \rangle \begin{bmatrix} -\text{syllabic} \\ \langle +\text{obstruent} \rangle \end{bmatrix} \quad C_0 \text{ (a) } [+\text{syllabic}] \quad X \quad /$$

$$\begin{array}{cccccccccc} & & & 1 & & 2 & 3 & 4 & 5 & 6 \\ /2 & & 5 & 1 & & 2 & 3 & 4 & 5 & 6 \end{array} \Rightarrow \quad /$$

Rule (24) derives, for example, the perfects *tutoṣa* and *tutroṭa* from the stems *tuṣ-* 'be content' and *truṭ* 'come to pieces' (respectively), as well as *pusphoṭa* from *sphuṭ-* 'burst'.

In most instances, distinct rules within the morphology correspond to different morphosyntactic representations. In some cases, however, distinct subrules are differentiated primarily on the basis of distinct phonological structural descriptions. This is the case, for example, in the rules for forming plurals in Hausa, as described in detail by Tuller (1981).

Given a set of rules of this type, the surface forms of a word can be derived by applying them in some (language-particular) appropriate sequence to the {S,M} pair corresponding to its stem together with its morphosyntactic context. A part of the interaction of these rules corresponds to the linear order of formatives in surface structure. In Finnish, for example, the formative representing plural number in nouns precedes the formative marking case (in e.g. *talo-j-en* 'house-pl-gen; of the houses'); as a result, the rule developing the feature [+plural] precedes those developing the case suffixes.

4.2.1. Disjunctive Organization of Rule Sets. In many instances, however, a form satisfies the structural descriptions of a number of rules, but not all of these can be allowed to apply. This situation corresponds to the case in which some affixes (e.g.) are mutually exclusive: the appearance of one precludes the appearance of the other(s). This state of affairs is often described by treating the affixes in question as members of the same "position class", and saying that only a single formative can appear in each position

class. In some instances, however, the relation of mutual exclusion obtains between formatives appearing in different positions with respect to the stem, and a more general account is required than that provided by a device such as a "morpheme order chart". Lounsbury (1953) presents examples of this situation in his description of Oneida.

On the view taken here, such mutual exclusion of affixes is appropriately described as an instance of disjunctive ordering between the rules developing them. One might well expect such cases to fall within the general principle of disjunctive ordering (described above, originally due to Pāṇini) between more and less specific rules. In fact, as shown by Tuller's (1981) analysis of Hausa and Hargus's (1981) analysis of Middle Irish verbal inflection, it does appear to be the case that when two rules are related as more specific to more general in their structural descriptions, they are disjunctive; but this convention is not adequate to cover all instances of disjunction among inflectional processes. In fact, as argued by Anderson (1977b), it is necessary to allow for the language-particular specification of disjunctive relationships between inflectional rules (corresponding to the language-particular statement that two formatives belong to the same "position class" in traditional terms), and it is even possible for such systems to change over time exactly with respect to the disjunctiveness of a relation between two rules.

To make these matters somewhat more concrete, we describe here the system of person markers found in Georgian transitive verbs. We begin with the forms employed when the direct object is third person singular (and thus phonologically unrealized):

(25) a. v-xedav 'I see him'
b. xedav 'you (sg.) see him'
c. xedav-s 'he sees him'
d. v-xedav-t 'we see him'
e. xedav-t 'you (pl.) see him'
f. xedav-en 'they see him'

From these forms (of the first series, present tense verb /xed + av/ 'see'), we can observe several things: (a) when the subject is first person, the prefix /v-/ appears; (b) when the subject is first or second person plural, the suffix /-t/ appears; (c) when the subject is third person plural, the suffix /-en/ appears; and (d) when the subject is third person singular, the suffix /-s/ appears. The second person singular form is not marked. Ignoring for the present the fact that these particular third person subject markers appear only in certain tenses (cf. footnotes 15 and 16), while the first and second person markers are common to all tenses, we might represent these facts by the following rules:

(26) a. [+me]
/X/ → /v + X/

b. $\left[\begin{array}{l} \left\{ \begin{array}{l} +\text{me} \\ +\text{you} \end{array} \right\} \\ +\text{plural} \end{array} \right]$
/X/ → /X + t/

c. $\begin{bmatrix} -\text{me} \\ -\text{you} \\ +\text{plural} \end{bmatrix}$
/X/ → /X + en/

d. $\begin{bmatrix} -\text{me} \\ -\text{you} \end{bmatrix}$
/X/ → /X + s/

We have omitted here the specification of rule (26d) as applying only to [– plural] forms; we assume that, by the convention of disjunctive ordering referred to above, any form that could undergo rule (26c) will thereby block the applicability of (26d).

Consider now other forms of the same verb, taking object agreement into account. We note first of all that subject and object agreement features must be kept distinct, and propose that this should be accomplished as outlined above (by a "layering" of morphosyntactic representations). The forms involved (in addition to those in (25)) are the following:

(27)	a. i.	g-xedav	'I see you (sg.)'
	ii.	g-xedav-t	'I see you (pl.)'
	b. i.	m-xedav	'you (sg.) see me'
	ii.	gv-xedav	'you (sg.) see us'
	c. i.	m-xedav-s	'he sees me'
	ii.	g-xedav-s	'he sees you (sg.)'
	iii.	gv-xedav-s	'he sees us'
	iv.	g-xedav-t	'he sees you (pl.)'
	d. i.	g-xedav-t	'we see you (sg.)'
	ii.	g-xedav-t	'we see you (pl.)'
	e. i.	m-xedav-t	'you (pl.) see me'
	ii.	gv-xedav-t	'you (pl.) see us'
	f. i.	m-xedav-en	'they see me'
	ii.	g-xedav-en	'they see you (sg.)'
	iii.	gv-xedav-en	'they see us'
	iv.	g-xedav-en	'they see you (pl.)'

Taking these forms one part at a time, we can first identify a set of prefixes: /m-/ for first person singular objects; /g-/ for second person objects; and /gv-/ for first person plural objects. We could of course introduce these prefixes by a set of rules analogous to those in (26); but when we do so, an additional complication enters the picture. Notice that in the forms with first person subject, we would expect a prefix /v-/ by rule (26a); but where a prefix marking the object appears, this /v-/ does not. Given the complexity of consonant clusters otherwise allowed in Georgian, there is no particular reason to hope that this is due to a phonological effect, and thus the most reasonable description seems to consist in treating rule (26a) as disjunctive with (and subsequent to) the object

prefix rules. The rules in (28) thus form a disjunctive "block":

(28) a. $\left[X \left[\begin{matrix} +\text{me} \\ -\text{pl} \end{matrix} \right] \right]$
/X/ → /m + X/

b. [X [+me]]
/X/ → /gv + X/

c. [X [+you]]
/X/ → /g + X/

d. [+me]
/X/ → /v + X/ (= rule 26a)

We assume here that an internal layer of structure in a morpholexical representation is only analyzed if the structural description of the rule in question makes explicit reference to this fact. As a result, rule (28d) only analyzes the outermost (subject feature) layer of structure. By virtue of the disjunctive relationship which obtains within a block (corresponding to the notion of a prefix "position class"), a rule such as (28b) does not have to be explicitly restricted to first person plural objects: a form having a first person singular object will undergo rule (28a), thus preventing the application of (28b).

We turn now to the suffixes illustrated in the forms of (27). We saw previously that /-t/ marked forms with first or second person plural subject. We see from forms (27aii), (27civ) that /-t/ also marks forms with second person plural objects (though not those with first person plural objects unless their subjects require it). Furthermore, forms (27dii), (27eiv) show that only one /-t/ suffix appears. A final point, established by the forms in (27c), is that if a /-t/ is required by the object, the /-s/ suffix otherwise required to mark third person singular subjects does not appear; while the /-t/ is itself prevented from appearing by the /-en/ marking third person plural subjects. This suggests that all of these suffixes constitute a single position class, corresponding to the disjunctively ordered block:

(29) a. $\left[\begin{matrix} -\text{me} \\ -\text{you} \\ +\text{pl} \end{matrix} \right]$
/X/ → /X + en/ [15]

b. $\left[(X) \left[\begin{matrix} +\text{you} \\ +\text{pl} \end{matrix} \right] \right]$
/X/ → /X + t/

[15] Actually, the marker /-en/ only appears in forms of the first series, present/future tenses. Other third person plural subject markers are introduced by other rules. These include /-nen/ for first series, [−pres/fut] tenses; /-es/ for second series, aorist; and /-on/ for second series, optative. All of these suffixes preclude the appearance of a plural marking /-t/, and we thus assume that they are all related to the rest of the rules in (29) in the same way as (29a).

c. [+pl]
/X/ → /X+t/

d. $\begin{bmatrix} -\text{me} \\ -\text{you} \end{bmatrix}$
/X/ → /X+s/ [16]

Note that rule (29b) includes a provision for an optional outer layer of person/number marking: it thus represents the fact that /-t/ marking for second person plural agreement generalizes across both subject and object agreement categories (although first person plural /-t/ does not).

The patterns of mutually exclusive marking demonstrated here are described quite directly in terms of disjunctively ordered blocks of rules. However, it is easy to see the difficulties that would arise if we were to try to treat each possible agreement element as a unitary "morpheme". In that case, complex rules deleting some of the "morphemes" in the presence of others would be necessary to account for the fact that (for example) /g-xedav-t/ is four ways ambiguous. Such patterns of mutually exclusive formatives are in fact quite common in complex inflectional systems, and we conclude from the facility with which they can be described in the present terms that disjunctive relations between rules are an appropriate formal mechanism to accommodate them.

4.2.2. Disjunction and Lexical Specification. We turn finally to one further issue in the operation of inflectional rules in an "Extended Word and Paradigm" description. Recall that we proposed in section 3.2 that suppletive or otherwise irregular stems, like other instances of lexical idiosyncrasy, are separately listed in lexical items. Thus, the lexical entry for the English verb *think* contains not only the basic stem, but also another stem (*thought*) characterized specifically as [+Past]. This is sufficient to ensure (on the convention proposed above) that *thought*, rather than *think*, will be inserted in association with a morphosyntactic representation characterized as [+Verb, +Past], but it leads to another problem. Recall that we proposed rule (23) to add the suffix /#d/ to past tense verb forms. This is exactly what is required for regular verbs, but of course we must ensure that it does not operate with irregular stems like *thought*: if it did, the result would be an incorrect form like **thoughted*.

The solution appears to lie once again in the basic principle that more specific rules are disjunctive with respect to general rules (so long as the domain of the specific rule is a proper subset of the domain of the general rule). That is, the problem here arises from the fact that the stem *thought* is already characterized for the feature [+Past] as a lexical specification, and of course lexical specification is the most specific possible principle. We want to ensure that when some category is already specified in a lexical representation, a productive inflectional rule does not further specify the same category

[16] Again, this marker for third person singular subject is restricted to certain tense forms (first series present/future, and second series optative). Other rules develop other third person singular markers in other tenses.

again. This could be done by adopting a principle along the following lines:

(30) When an inflectional rule refers to a set of features M = $\{F_1, \ldots, F_i\}$ in morphosyntactic representations, and all of the features in M (with the exception of major category features [Noun], [Verb], etc.) are already specified as part of the lexical identity of a given stem S, then the rule in question is blocked from applying to the pair {S,M}.

Principle (30), whose essence is discussed at some length by Platt (1981) and Thomas-Flinders (1981a), is of course simply a special case of the principle of disjunctive ordering referred to above.[17] It implies, we should note, that a lexically specified stem S preserves any associated lexical specifications for inflectionally relevant features; that is, that S may be (lexically) specified for some of the same features that M is. While these specifications are independent, the specification of S must of course be nondistinct from that of M in the pair {S,M} in order for lexical insertion to be valid. On the basis of (30), taking M = {[+Verb],[+Past]} and S = *thought* ([+Past]), rule (23) will then be properly blocked from applying to {S,M}.

A particularly elegant example of the interaction of principle (30) with the disjunctive ordering of inflectional rules in blocks is provided by the morphology of German, as analyzed by Janda (in progress). Janda notes that many verbs in German have a past subjunctive form distinct from the basic past tense form:

(31)

	Infin.	*Past*	*Past Subj.*	
a.	haben	hatte	hätte	'have'
b.	bringen	brachte	brächte	'bring'
c.	wissen	wußte	wüßte	'know'
d.	sitzen	saß	säße	'sit'

As can be seen, the past subjunctive is formed from the stem of the past by umlauting the stem vowel and adding a final schwa (*-e*) if the past does not already end in one:

(32)
$$\begin{bmatrix} +\text{Past} \\ +\text{Subjunctive} \end{bmatrix}$$
$$/X \quad V \quad Y \quad (e)/$$
$$1 \quad 2 \quad 3 \quad 4 \quad \Rightarrow$$
$$1 \quad 2 \quad 3 \quad e$$
$$[-\text{Back}]$$

Note that the formulation of rule (32) incorporates a sort of "morphological haplology" (cf. Stembarger (1981)): if the stem already ends in a schwa, the replacement of term 4 by a schwa makes no change, but if it does not, a vowel is added.

The interesting point about the past subjunctive form is that a great many verbs do

[17] Essentially the same constraint is proposed for essentially the same purposes in the framework of Bresnan's theory of lexical grammar by Andrews (1982).

not have such a form which is distinct from the basic past tense:

(33)

	Infin.	*Past*	*Past Subj.*	
a.	machen	machte	machte	'make'
b.	wollen	wollte	wollte	'want'
c.	kaufen	kaufte	kaufte	'buy'

Janda notes an interesting generalization about the verbs like (33a–c) which fail to undergo the past subjunctive rule (32): they are exactly the verbs which have a regular past form, rather than an idiosyncratic, irregular past. That is, verbs like (33a–c) form their past by means of a rule like (34):

(34) [+Past]
/X/ → /X+te/

The verbs like (31a–d), on the other hand, which do undergo (32), form their past tense forms by a variety of restricted, partially idiosyncratic processes and thus must list these past stems in their lexical entries.[18]

We now have an explanation for the failure of the verbs in (33) to undergo the regular past subjunctive rule. Note that the generalization is that *if* a verb undergoes (34), then it fails to undergo (32). This suggests that these two are disjunctively related, which we could express by organizing them into a single disjunctive block as illustrated above in our description of Georgian. Evidently, rule (34) takes precedence and is thus ordered first within this block.

Consider now the difference between forms like /mach-/ 'make', as in (33), and /sitz- ~ sass-/ 'sit', as in (31), when inserted into a phrase marker in association with a morphosyntactic representation containing [+Past, +Subj]. In the case of /mach-/, the stem has no lexically specified features; by virtue of the feature [+Past] in the morpholexical representation, it undergoes rule (34), and since this rule is disjunctive with rule (32), no further change takes place. In the case of *sitzen*, however, the stem /sass-/ (characterized as [+Past]) must be inserted, since it is the most specific subentry consistent with the morpholexical representation in question. Because this stem has the feature [+Past], principle (30) prevents rule (34) from applying to it. Since rule (34) does not apply, however, rule (32) is allowed to apply; and since the stem is characterized only as [+Past], and not [+Subj], principle (30) does not come into play. The result is that exactly irregular verbs, like (31a–d), undergo rule (32).

This result follows directly from the interaction of principle (30) with the language-particular organization of inflectional rules into disjunctive blocks proposed above. It would seem, however, that it is virtually unstatable in the absence of such principles, at least without a great deal of ad hoc machinery. On most views, the class of forms

[18] This does not, of course, mean that strong verb classes are not rule governed in German. Derivational rules, operating within the lexicon, can describe the systematic relations among stems in the case of irregular stem-alternation patterns, without requiring us to claim that these cases are not distinct from fully suppletive listing.

that do *not* undergo a given rule is not a natural one; and indeed that is the case here. The imperfect subjunctive rule does not need to refer explicitly to such a class, however, since the limitation on its application follows from the interaction of other principles. This example, then, presents a substantial argument in favor of the overall organization of a grammar proposed in the "Extended Word and Paradigm" framework developed above.

5. Conclusions

In the sections above we have argued that there is a nontrivial intersection between the theories of syntax and morphology, in the domain traditionally described as "inflection". In order to capture both the relation of inflectional morphology to the syntax, and the exclusion of derivational morphology from "syntactic accessibility", we proposed the organization of a grammar presented in (16). In section 4, we have provided the outlines of a theory of "Extended Word and Paradigm" morphology as an account of the mechanism of inflectional specification.

Such a view of morphology, and in particular of the separation of inflection from derivation, has a number of advantages. For one, it represents the fact, often noted but never really explained, that (with certain well-defined exceptions) inflectional morphology appears "outside of" derivational morphology. For instance, if a morphologically complex form contains both derivational and inflectional suffixes, the inflectional ones will follow the derivational ones. On the view sketched here, this is a necessary consequence of the operation of inflectional rules: they take as their starting point a fully formed derived stem and may add further affixes, but they do not then allow the inflected form to undergo further derivation. Only in the case of inflectional processes which specify stem-internal changes (such as ablaut, umlaut, or the alternations among verb patterns characteristic of Semitic languages) or which explicitly insert infixes is it possible for an inflectional formative to appear "inside of" a derivational formation. Of course, in order for this claim to be a substantial one, we must effectively constrain infixation processes so as not to render it vacuous, but genuine infixation operations are intuitively different enough from simple anomalous affix order to hold out some promise that this can be done.

This view also yields a properly constrained description of the interaction between morphology and semantic interpretation. Note that inflection takes place in the "phonology", which is one of the interpretive components operating on lexically interpreted S-structures. As a result, the operations of inflection are not accessible to the rules creating Logical Form, and they cannot affect semantic interpretation. Insofar as inflection contributes to "meaning", then, it can only be through the medium of the features in the morphosyntactic representation (which is present in S-structure). Derivation, on the other hand, takes place entirely within the lexicon; thus, its results are available in S-structure to contribute to meaning. Of course, it is entirely traditional to suggest that inflection and derivation differ in their relation to semantics in this way; indeed, some authors have taken this to be a basic criterion for differentiating the two.

A further point concerning the interaction of rule types requires some further remarks. As was argued by Anderson (1975), rules of the phonology proper do sometimes interact with morphological processes in that morphological rules such as reduplication may presuppose the prior application of some phonological processes. If this interaction were confined to inflectional processes, it would be exactly what the model in (16) predicts: since inflection is a part of the phonology, but derivation is not, we ought to expect such interactions in the one case but not in the other.

We have not, however, explored this issue in sufficient detail to be sure that significant interactions between derivation and phonology do not exist. If they do, we would then be motivated to adopt something like the model of "Lexical Phonology" recently proposed by Kiparsky in unpublished lectures, on which the lexical representation of stems is one to which phonological processes have already applied (though they may apply again after the addition of further material, such as that provided by inflection). This issue remains a matter for future research; in any event, it is not as intimately related to the nature of the model in (16) as is the interaction between morphology and semantics.

Another advantage of the proposed separation of inflection from derivation is that it eliminates at least one class of apparent counterexamples to a possible strong constraint on the inputs of derivational processes. Aronoff (1976) has proposed that Word Formation Rules (derivational rules, in our terms) always relate full words to other full words, rather than operating on parts of words or a lexicon of formatives. Lieber (1980) has noted, however, that in languages with significant inflectional structure, derivational rules often operate on lexically restricted irregular stems, but not on fully inflected independent words. This follows, on the view taken here, since the derivational rules in the lexicon have access to any stem listed there (including lexically restricted irregular subentries), but not to the output of the inflectional rules. The constraint that the (stem-) formation rules of derivation relate whole stems to other whole stems, a natural reformulation of Aronoff's claim taking inflection into account, thus appears to give us more appropriate limitations on the material which they can take as their input. If, as some have argued, it is necessary to include roots (as well as, or instead of, stems) in the lexicons of some languages, it is not clear how much can be salvaged of Aronoff's original proposal; but the general exclusion of specifically inflectional material from the bases of derivation may be as close as we can come.

We conclude, then, that the framework sketched above (and in particular the proposed separation of inflection and derivation) presents a number of advantages over alternatives that would assimilate all of morphology into a single component of the grammar. If we pose the question in the title of this article, then, the answer is that morphology is to be found in more than one place. Some of it is in the lexicon, where we find the principles for composing complex stems out of other stems by derivational processes. Another portion is to be found in the syntax, where the principles for constructing morphosyntactic representations are localized. Finally, the rules of inflection, which derive a morphologically complete surface word from the {S,M} pair provided by

the lexicon and the syntax, are to be found in the "phonological" interpretive component. While there is little doubt that each of these sets of rules is subject to unique principles and constraints that set them off from other rules with which they interact, the result may be taken to confirm the original position of generative grammar that there is no completely isolated, uniquely "morphological" component of the grammars of natural languages.

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