2: Teleology

The purpose of this chapter is to explore further the general relationship between morphemes and words. In what sense do words consist of morphemes? Is there some constant relation between the two, as in syntax, where practically all sentences can be said to be synthetic entities, constructed out of words in a single way? We will see that words are very different from sentences, that their structures are much more varied, and that though there is a single principle governing the structure of most complex words, this principle must be applied in different ways to different classes of words. I will discuss these various classes.

Before going on to words, however, I must say a few things about morphemes, for though these units are basic to several aspects of the theory of language, their properties have been more asserted than studied, and since they are so central to our investigation we must be particularly careful that we know whereof we speak.

2.1. Trouble with Morphemes

The units into which words are analyzed, out of which they are composed, are termed *morphemes*. We will be concerned in this section with some problems concerning the defining characteristics of the morpheme, concentrating on a central premise of the approach which has been most pervasive in American linguistics. This premise is the definition of the morpheme as "the smallest individually meaningful element in the utterances of a language" (Hockett (1958, 123)). Acccpting this premise entails that every polymorphemic word is a compositional entity. It is compositional in two senses, both semantically and structurally, the semantics being a function of the morphemes and the structure, just as a sentence is semantically compositional. Recent work has revived the truism that every word has its own idiosyncratic traits, some of which can be very erratic and elusive. (We are speaking here of derivational words; this waywardness does not extend to inflection.) If it is true of words that they are minimally meaningful, then what about the morpheme? Does it have no status at all, or can we define it other than semantically? The point of this section is to show that the latter question can be answered in the affirmative. Specifically, we will isolate a class of morphemes, show that there is no way in which the members of this class can be said to have any meaning at all, and then demonstrate that there are phonological criteria which allow us to isolate occurrences of these meaningless morphemes. The importance of this demonstration is two-fold. First, it shows us that any theory of "minimally meaningful element" is misguided. Second, it shows that despite this fact, it is still possible to construct a theory in which the morpheme plays a central role.

2.1.1. Minimal Signs

In order to understand what is at stake here, we must first have a better understanding of what is meant by *minimal meaningful element*. This entails a short review of de Saussure's concept of the *minimal sign*. The sign is one of the most basic concepts of linguistics, and the literature on the subject is vast. Nor is the definition of the sign a closed matter. I will adopt in this discussion what I think is an orthodox view, where orthodox does not, of course, mean totally uncontroversial.[1]

The minimal meaningful unit of a language is the basic, minimal, Saussurean sign (cf. de Saussure (1949)). The sign is an arbitrary union of the semantic and the phonetic. So the sign *dog* has a meaning and a sound; one cannot exist without the other; they are arbitrarily united. Arbitrarily, because there is nothing in the sound which dictates its meaning, and vice versa, except social convention. The sound may change and the meaning remain, or the meaning may change and the sound remain.

Out of the minimal signs we can construct composite signs. These signs are not arbitrary. Their meanings may be predicted from their structure and the minimal signs out of which they are constructed. Sentences are composite signs.

It is sometimes argued that there are different degrees of arbitrariness. A sign like *dog* is completely arbitrary. However, there are other signs whose sounds, we feel, have some intrinsic connections with their meanings. Onomatopoetic words, and those which involve phonetic symbolism (cf. Marchand (1969, 398 ff.)), like *slurp* and *quack*, are said to be partially *motivated* (nonarbitrary) because of this intrinsic connection. The class of partially motivated signs also includes composite items whose meanings can be partially, but not completely, derived from the meanings of their parts. Thus a sign which formally consists of the signs $a + b$, but whose meaning must be represented as $A + B + C$, that is, the meanings of a and b plus something else specific in addition, is sometimes said to be partially motivated. I will hold with de Saussure, and against Bally (1940) and Marchand (1969), that only fully motivated signs are to be counted as nonminimal, that partial motivation is not significant. Thus, any sign which is at all arbitrary is considered to be part of the basic inventory of signs.[2] Most of what follows is devoted to deciding what sorts of elements form this basic inventory.

2.1.2. Words

That there are minimal signs which are polymorphemic was first stressed as an important fact, at least within the framework of generative grammar, by Chomsky (1970). Chomsky noted that

[1] Readers may be interested in these controversies. Two good starting points are Spang-Hanssen (1954) and Koerner (1972).

[2] "Fully motivated" must not be confused with "fully meaningful". As Culicover (1972) has shown, some signs are inherently unspecified in such a way as to cause any utterance containing them to be highly, perhaps infinitely, ambiguous. The sentence *One more can of beer, and I'm leaving* (Culicover (1972)) is an instance of such an ambiguous entity. "What about that can of beer?" we ask. "Anything," is the reply. The point is that the meaning of the entire sentence is somehow partially unspecified. It is probable that all linguistic entities are not fully meaningful in this sense; all sentences are ambiguous, hence the poetic function. Instances such as these, however, differ fundamentally from those where two items a and b are concatenated and the concatenation does not mean '$a + b$ + infinite ambiguity' but rather '$a + b + c$', i.e. instances where some specific isolable constant part of the meaning of a concatenation cannot be derived from that of its parts. It is in these latter cases that motivation or arbitrariness is relevant.

much of derivational morphology is semantically irregular and should not be handled in the syntax. Out of this remark there developed two hypotheses. The *strong lexicalist hypothesis* of Jackendoff (1972) excludes all morphological phenomena from the syntax. This means that the syntax cannot relate *some* and *any*, or *ever* and *never*, and that inflection, if it is referred to in the syntax, must be handled by some sort of filter. The version of the *lexicalist hypothesis* which is more widely accepted than this one, but which to my knowledge has never been explicitly formulated in print, is that derivational morphology is never dealt with in the syntax, although inflection is, along with other such "morphological" matters as *Do* Support, Affix Hopping, Clitic Rules, i.e. all of "grammatical morphology". This seems to be the position of, for example, Chomsky (1973).[3] This latter hypothesis, which I will assume, does not say that derivational processes are always irregular and that their semantics is always noncompositional. Nor does it exclude from the domain of the syntax only irregular derivational phenomena as Chomsky (1970) says one might do. It says rather that derivational phenomena are always separate from the syntax, regardless of their regularity. Postal (1969) presents very convincing evidence for this hypothesis.[4] Translated into a Saussurean framework, the hypothesis says that for the purposes of syntax, the word (sans infection)[5] is the minimal sign.[6] This hypothesis says nothing about intraword phenomena and relations; they may or may not be regular. Of course the main reason for the adoption of the hypothesis in the first place was semantic irregularity, and we must develop a theory of derivational morphology which allows for, and hopefully even predicts and accounts for, this observed irregularity.

I will now present evidence that the word is a minimal sign, not merely for the purposes of the syntax. To do this, I will show that below the level of the word we encounter morphemes which, while they must be assumed to be real linguistic elements, have no meaning

[3] For example, it is stated that the factors into which a string may be analyzed by a transformation may include "morphological material". As far as I can tell, this means inflectional and other "grammatical" material.

[4] In the work cited, Postal also provides arguments against the lexicalist point of view. The latter arguments are not convincing to me. Similar arguments by Corum (1973) are discussed by Browne (1974).

[5] In general, throughout the rest of this work, *word* should be taken to mean 'word sans inflection' or *lexeme* in the sense of Matthews (1974).

[6] One might think that the idiom, a unit which has long mystified linguists, is an arbitrary sign which occurs at a higher syntactic level than that of the word. However, idioms differ from words in the following curious manner. An idiom is generally ambiguous between its literal (sometimes nonsensical) sense and its arbitrary "idiomatic" sense. If John kicked the bucket, he either kicked some previously specified bucket or he died. Complex words do not enjoy such a consistent ambiguity between constructible and arbitrary senses. Take the word *recital*. If we were to attempt to construct its meaning out of that of its parts, as we did for the literal interpretation of *John kicked the bucket*, we might arrive at something like 'the act(ion) of reciting' as an interpretation. But this word has, for me, no such interpretation. It has only an arbitrary sense, that of 'public performance, generally of music, generally by one person'.

The ambiguous nature of idioms makes them especially attractive material for punsters. The following examples from Milligan, Secombe, and Sellers (1956) are characteristic of the genre:

(i) Convict Eccles fell into a bucket of wet cement and looks like becoming a hardened criminal.

(ii) Q. How do you repel boarders?
A. Stop changing the bed linen.

Interplay between the literal and arbitrary sense of morphologically complex words, in contrast, is rarely found outside of Alexandrian poetry and the writings of Aldous Huxley.

which can be assigned independently of each of the individual words in which they occur. This demonstration is not a novelty. The most extended and formalized argument that I know of in favor of the point I am making is in Hervey and Mulder (1973).

2.1.3. Morphemes

2.1.3.1. Cranberry Morphs. There is in English a class of *hapax legomena*, morphemes which only occur in one English word. They are often called *cranberry morphs*. Consider the following list:

(1) cranberry boysenberry huckleberry

Since the words in our list are all names of berries, we may isolate this last unit as a meaningful morpheme. We are left with the items in (2):

(2) #cran# #boysen# #huckle#

None of these items occurs either independently or in any other words than those in (1). There is thus no noncircular way of assigning meanings to the morphemes in (2). Their meanings are intimately connected with those of the individual words in which they occur. As Hervey and Mulder note (1973, 45), "... a sign is only analyzable into two or more constituents in a grammar, if *each* of these constituents can be identified *as a sign*." Of course, one can ignore problems of circularity and assign a meaning to the item in question. It is then merely an accident that this fully meaningful item occurs only in one word. However, there are cases in which such a simple solution is not possible.

2.1.3.2. Other Berries. As noted above, it is possible to assign a meaning to items such as *#cran#*, simply because they do occur only in one word. With other names of berries, however, this simple device will not work. Consider the following list:

(3) strawberry blueberry
blackberry gooseberry

By removing *berry* again, we can isolate the morphemes in (4):

(4) #straw# #blue#
#black# #goose#

As opposed to the items in (2), these occur elsewhere than as parts of the names of berries; in fact, they occur as independent words. However, when they do appear as independent words, they have meanings which bear no relation to the meanings they might be assigned in (4). For example, one might think that a blackberry is black. However, not all black berries are blackberries, and furthermore, many blackberries are green or red (a fact also noted by Hervey and Mulder). There is therefore no way to assign a meaning to the item *black* which will be valid both when it occurs as an independent word and when it occurs in the word *blackberry*. The same holds for *blueberry*. The connection between geese and gooseberries or between straw and strawberries is not very apparent. The problem here is that we cannot resort to the simple ruse

of assigning the items in (4) constant meanings, for they do occur elsewhere than in the words in (3), but with meanings which are totally incompatible with those we would like to assign to them on the basis of the meaning of the corresponding word in (3).

It is possible to get around this problem of a morpheme having different meanings in different words without entirely giving up the claim that morphemes are meaningful. The basic tack is to give morphemes underdetermined meanings, with contextually determed allo-meanings. This is essentially the solution which Chomsky (1970) adopts. In order to handle idiosyncratic semantic differences in verb-noun pairs like *refuse-refusal*, he says that "the lexical entry may specify that semantic features are in part dependent on the choice of one or another of these categorial features" (noun or verb) (1970, 190). To the extent that these dependencies are regular and syntactically motivated, there is virtue in such a device, or a similar redundancy convention, but to the extent that they are idiosyncratic, which many of them are, the device merely serves to obscure the truth, that it is the words which are idiosyncratic. Though this system may allow us to preserve the idea that morphemes are meaningful, it is only at the level of the individual word that these meanings can be fully specified.

In the particular case with which we are dealing, the device of underspecification and contextual filling leads to a particularly unsatisfying result. Since, as noted, some blackberries are red, and since something cannot be both black and red at the same time, the two allo-meanings of *#black#* will be contradictory and will share almost no semantic features (color?). Allowing a device which permits such a situation is very dangerous; it essentially gives homophony as the only criterion for deciding whether two things are instances of the same meaningful entity.[7]

One might also go entirely the opposite route. Thus one could claim that the various instances of *#black#* are completely unrelated, each a different morpheme. This rids us of the problem of morphemes with underspecified meanings, though we are still left with the circularity problem; is it the word or the morpheme which specifies the meaning? The next set of data bears on this theory.

2.1.3.3. Prefix=Stem (latinate). The last two sets of data consisted of what are traditionally called "partially motivated" forms. There was one element, *berry*, whose meaning was relatively constant, and another, which in a sense told us what sort of berry we were dealing with, but which never occurred, or never occurred with the same sense, outside of the particular word with which we were dealing. This next set of data differs from these in having no fixed element.

The data set consists of the latinate verbs with bound stems and prefixes which are always stressed on the stem. In the system of SPE this class is marked phonologically by the presence of a special boundary, =, between the prefix and the stem. Examples of such verbs are *refuse*, *convene*, and *inject*. I will not discuss verbs such as *suffer*, *proffer*, or *differ*, which diverge in their stress patterns from other prefixed verbs with bound stems, and for which no = boundary is posited. Nor will I discuss verbs such as *re#fuse* ('fuse again'), in which there is a # boundary

[7] There is a basic dissimilarity between this device and the one I alluded to in footnote (1). There underspecification resulted in infinite ambiguity (infiniguity?), which is not the case here.

in the system of SPE. For this class (x = y) it is possible to demonstrate that neither the prefix nor the stem has any fixed meaning.

First the stem. Consider the verbs in (5):

(5)

X=fer	*X=mit*	*X=sume*	*X=ceive*	*X=duce*
refer	remit	resume	receive	reduce
defer	demit		deceive	deduce
prefer		presume		
infer				induce
confer	commit	consume	conceive	conduce
transfer	transmit			transduce
	submit	subsume		
	admit	assume		adduce
	permit		perceive	

Let us presume for the moment that the prefixes in (5) have constant meanings, much as the *berry* of (1) and (3). Is it possible to extract any common meanings, however minimal, from the different occurrences of each stem? At first glance, if we merely compare pairs of verbs, one might be tempted to think so. *Confer* and *transfer* might appear to share something, similarly *remit* and *submit*, *conceive* and *perceive*, *assume* and *presume*, *induce* and *deduce*. However, if we attempt to extend our hypotheses beyond these select pairs by extracting the common sense from each and assigning it to the other verbs in the particular stem, the result is nonsense. What even vague sense does *prefer* share with *confer* and *transfer*? or *commit* with *remit* and *submit*? or *receive* with *conceive* and *perceive*? or *consume* with *presume* and *assume*? or *reduce* with *induce* and *deduce*? None. There is no meaning which can be assigned to any of these stems and combined with the presumably constant meanings of the prefixes in a consistent way to produce the meanings of all the verbs in that stem. Each stem occurs in different verbs, but never with the same sense. Rather, the sense is determined by the individual verb.

As suggested above, one might attempt to reduce the whole problem to cranberries (with, of course, the accompanying problems of that class) by calling each occurrence of a given stem a different morpheme. This system denies any linguistic reality to the stems and replaces each of them by a list of homophones, each having its own meaning and each occurring with only one, perhaps even two, prefixes. In such a system one would not have, for instance, a stem *mit* which occurred in all the relevant words in (9); rather, one would have many homophonous stems, mit_1, mit_2, ... mit_n. This system would be fine if these stems had nothing at all in common. The problem is that all occurrences of the stem *mit* do share a common feature which is not predictable from any general phonological properties of the sequence [mit]. As will be carefully documented in chapter 5, all instances of the latinate stem *mit* exhibit the same phonologically arbitrary variant (allomorph) before the suffixes *+ion*, *+ory*, *+or*, *+ive*, *+able*. The details of the relevant argument are given in chapter 5. For the moment we can look at the following paradigm:

(6)			
	permit	permission	permissive
	remit	remission	remissory
	excrete	excretion	excretive
	assert	assertion	assertive
	digest	digestion	digestive
	prohibit	prohibition	prohibitive

The last column reveals the difference between verbs of the form *X=mit* and other verbs with final *t* before the suffixes in question. *Mit* always takes the form *mis* here, and the change of *t* to *s* in this environment is confined to this one stem. There are no exceptions to this rule either way.

This regularity, or the factors which condition it, cannot be phonological, but must be stated on another linguistic level, the level of the stem or morpheme. Proof of this assertion is the fact that other instances of the phonological sequence [mit], which are not instances of the latinate stem *mit*, do not show up as [mis] in the relevant environment. So we find *vomit/vomitory*. In the word *vomit*, there is no reason to presume that we are dealing with a prefix *vo* and a stem *mit*; in fact, there is good reason to believe that we are not: *vo* never shows up as a prefix elsewhere, and the stress pattern gives us no evidence of a boundary, or at least of the sort of boundary for which there could be evidence. The alternation in question is therefore restricted to the latinate stem *mit*. This means that all the items which in the theory in question were mere homophones, $mit_1, \ldots mit_n$, must be at some level instances of the same thing. Otherwise there is no way to express the fact that all occurrences of *mit* exhibit the same allomorphy. There is good evidence that the level at which the rule embodying the facts in question must be stated is that of the morpheme. First of all it can be shown that a feature such as [+*latinate*], which governs among other things what sorts of affixes can be attached to a word, is a property of morphemes. Second, the sort of rule that changes *t* to *s* in the relevant environment here is a rule which applies to a morpheme and not to any other linguistic level, lower or higher. *Mit* is therefore a morpheme, though it has no meaning. Nor is *mit* the only case. As we shall see in chapter 5, there are many stems which undergo rules of allomorphy.

It appears, then, that there is something fundamentally wrong with the theory of many homophonous *mits*, for there is good evidence that we are indeed dealing with one morpheme. This turns us back to the allo-meaning theory, with its problems of underspecified meanings and circularity, or to the theory that morphemes are not minimal signs. The allo-meaning theory had some plausibility with reference to the preceding sets of data (*cranberry, blackberry,* etc.), mainly because, as noted, we always had one constant element with a relatively perspicuous meaning, and we could as a result attribute the residue of the meaning of each word to the problematic morpheme. However, when we look at the prefixes, we find that (just as with the stems) there is no constant meaning which can be attributed to any of them. How, then, are we to segment the meaning of the individual words in a principled manner?

Consider the following list:

(7)

re=X	*con=X*	*in=X*	*de=X*
repel	compel	impel	
remit	commit		demit
refer	confer	infer	defer
resume	consume		
receive	conceive		deceive
reduce	conduce	induce	deduce

Though it is more likely that one could attribute more commonality of meaning to occurrences of some of these prefixes than one could to any of the stems, there is no general meaning which can be assigned to any of them. Thus one might try to assign to *re* a meaning 'back', and a large number of the verbs of the form *re=X* have something to do with 'back' (cf. Williams (1973)). What about *receive*, though? Or consider *reduce* in the following sentence:

(8) The government reduced the size of the quart from 32 to 31 ounces, in an effort to stop inflation.

Since the quart never was less than 32 ounces, there is no way in which 'back' can be involved in the meaning of *reduce* here.

Now, since we know from (7) that *re=* has no fixed meaning, and we know from (5) that *duce* has no fixed meaning, how are we to segment the meaning of *reduce* into two parts, one associated with *re=* and the other with *duce*, in a principled manner? We can't. The word *principled* is important here. A priori, any word can be split in two and each part given a meaning. I can divide *apple* into *a* and *pl*, and give each of them part of the meaning of the whole word. However, we prefer to reject this solution, for by allowing such an analysis we would reduce the predictive power of a theory to zero, as noted above. It is unfalsifiable. Thus the fact that the allo-meaning theory must be made so strong in these cases that its empirical validity is reduced to zero forces us to fall back on the only position left to us: there are morphemes which have no meaning. The hypothesis that morphemes are the "minimal meaningful elements of language" cannot be maintained even in any of its most contorted variants. In many cases this role of the minimal sign must be moved one level up, to the level of the word. The sign gravitates to the word.

Note that we have not abandoned the concept of the morpheme. It still remains, but not always as a sign.

2.1.3.4. A Similar Class. The same argument as was made in 2.1.3.3 can be made for the following set of data, which comprises a much smaller though more striking set of prefixed verbs:

(9)

understand/stood	undertake/took
withstand/stood	
	partake/took

There is no way to relate the putative meanings of *stand* in its two occurrences, nor those of *take*. Nor can the meaning of *stand*, in *understand* at least, be related to any of the multifarious meanings of the free verb *stand*. Similarly for the prefixes *under*, *with*, and *par*. How-

ever, in the case of the stems, we must be able to encode the fact that they always show the same variant in the past tense form. Nor is there any way in which this variant can be viewed as phonologically conditioned. It must be conditioned by some abstract property which is common to all occurrences of the meaningless entity *stand* or *take*.

2.1.3.5. Defining the Morpheme. The morpheme is traditionally defined as the minimal sign: an arbitrary constant union of sound and meaning. This definition must be adjusted to include such morphemes as *mit*, which have no constant meaning. Now, *mit* is clearly a constant phonetic string (at the level of the input to the phonology). It is also arbitrarily linked to something. However, it is linked not to a meaning but to a phonological rule, the rule which changes *t* to *s* before *+ion*, *+ive*, *+ory*, and *+or*, only in the morpheme *mit* (cf. *vomitory*, **vomissory*). The original definition of the morpheme has three aspects: constant form, arbitrary link, constant meaning. In order to include *mit* in the class of morphemes, we need only broaden the third, that of constant meaning, to include a phonological operation as well. This broadened definition will allow us to include *stand* and *take* also.[8] The rule to which they are arbitrarily linked spells out the past tense.[9]

That I include a meaning and a phonological rule in the same class of entities, and speak of mere broadening in doing so, may strike some as odd. But I only wish to point, perhaps a little dramatically, to what is essential about a morpheme: not that it mean, but rather merely that we be able to recognize it. A morpheme is a phonetic string which can be connected to a linguistic entity outside that string. What is important is not its meaning, but its arbitrariness. This is close to the position of Harris (1951).

2.1.4. Trouble with Words?

2.1.4.1. Cranberry Words. There are words which, like cranberry morphs, concatenate only with specific words and not with syntactic classes. For example, the noun *headway* occurs only as the direct object of the verb *make*, just as *cran* occurs only in *cranberry*. However, there is a difference in the manner of concatenation. On the phonological and syntactic surface, *cran* can only appear in one specific place, directly before *berry*. However, *headway* does not necessarily appear directly after *make* on the surface. Rather, it is the head of its underlying object NP, and as such it may be modified and even moved about:

(10) We haven't made much headway lately.

(11) Are we making any sort of headway here?

(12) There isn't much headway being made.

(13) The only headway we were making was illusory.[10]

[8] Not all instances of the phonological string *stand* are instances of the morpheme *stand*. This can be seen from such examples as *grandstanded*.

[9] According to Harris (1951) the ablaut rule itself is a morpheme, an allomorph of the past tense morpheme usually spelled out as *ed*.

[10] Within an orthodox analysis of relative clauses *headway* is never, strictly speaking, the object of *make* in this sentence (cf. Vergnaud (1974)).

Because it occurs in these different environments, we can isolate other properties of *headway* than the fact that it is an arbitrary phonological string. It is a noun. It is not a count noun (**headways*). It is not animate (. . . *headway* . . . *it*). Thus we can say things about *headway* which are not dependent on *make*, and which have something to do with its meaning. This is not true of *cran*, and it is the complete interdependence of *cran* and *berry* which forces us to conclude that in the strictest sense the former cannot be meaningful.[11] The point is that because *cran* is completely isolated from the syntax by its occurrence inside only the one word, there is no way in which it can have syntactic (and hence semantic) properties of its own. Because it is a noun and the head of a syntactic phrase, *headway* is not so insulated. As the head of a phrase it must, perforce, have syntactic properties, some of which may be related to meaning properties.

2.1.4.2. The Numerous Verbs Stand. I have argued that the various instances of *stand* in (9) could not be related to one another semantically, though they must be regarded as instances of the same entity because of their shared irregularity (*stand/stood*). It seems possible to argue exactly the same point from the various occurrences of *stand* as an independent verb. Many of the uses of the verb *stand* cannot be related semantically, and yet the same irregular past form always appears. Consider the following sentences:

(14) We stood there for a while.

(15) We stood the chairs in a corner.

(16) I stood it as long as I could, and then left.

Though one might conceivably attempt to relate the verbs of (14) and (15) in some manner, perhaps even systematically, I cannot see how either of these two could be related to the verb in (16). However, though the meaning of this verb cannot be systematically related to the others, its form is. Therefore, extending the argument of 2.1.3.4 to this class, one might wish to say that the word *stand* is a unit, but it has no meaning. There is no difference between morphemes and words.

With regard to meaning, the same sorts of arguments hold here as we observed in 2.1.4.1. The various verbs in the above sentences have different subcategorizations, and from subcategorization we can go to meaning. Therefore the individual verbs are not meaningless or indeterminable as to their meaning. They each comprise a separate entry in the lexicon.

The problem is accounting for a property which they share and which has nothing to do with their meanings. This is the common irregularity of their past tense forms. It is here that our expanded definition of the morpheme comes into play. By this new definition, all occurrences of the string *stand* which alternate systematically with *stood* in the past tense are instances of the same *morpheme*. This means that the various verbs *stand* of (14)–(16) are all instances of a single morpheme, the same morpheme which occurs in *understand* and *withstand*. However, they are not instances of the same sign, for, as we have seen, a morpheme need not be a sign at all.

[11] The problem of idioms intersects with this one.

This distinction allows us to represent both the sameness and the difference of the items in question. The notions *morpheme* and *sign*, as defined, are not really notions of the same sort. Two words can be instances of the same morpheme. In addition, freeing the morpheme from the requirement that it be meaningful, which we have found to be necessary, allows us to use it to account for phenomena which, in other theories, could not be related (no prevalent theory which I am aware of is capable of encoding formal similarities of this arbitrary sort among words unless they are accompanied by semantic similarities). The numerous verbs *stand* thus present no problem for our revised view of the morpheme; rather, they can be much more satisfactorily accommodated than they had been previously.

2.1.5. A Historical Note on Inflection

It should not be terribly surprising that morphemes are not the "minimal meaningful elements" they have been purported to be. This conception of a morpheme is very intimately tied in with certain structuralist assumptions. It is, in part at least, a consequence of a simple view of the relationship between sound and meaning and the mappings which express this relation.

When dealing with inflection, this type of system is especially difficult to justify. Even very early, attempts by Hockett (1947) and Bloch (1947) to apply to real data the definition of a morpheme as a one-to-one mapping between meaning and sound led to very bizarre and counterintuitive results (cf. Nida (1948) for criticism of the two works cited above). Harris (1948) discusses the problems that a paradigmatic set of data presents for a theory in which the morpheme is the basic meaningful element. Chomsky (1965) made essentially the same point as Harris twenty years later, when he introduced the complex symbol and syntactic feature as a way of treating paradigmatic and crossclassified phenomena. In a system like Chomsky's, the traditional concept of a morpheme as a one-to-one mapping between form and meaning is nullified. Chomsky makes this point explicitly and argues for the virtue of his system over the old one with regard to the treatment of inflection (1965, 170-174).

Thus, rejecting the morpheme as a basis for a theory of derivational morphology, at least in its definition as a minimally meaningful unit, is not the radical step one might think it to be. As a basis for accounting for inflectional phenomena, it has long been under attack. We must now develop a theory of morphology which does not crucially depend on the morpheme as a basic meaning-bearing element.

2.2. Word Formation

The goal of this section is to sketch out the underpinnings of a theory of morphology. In view of the preceding section, we will assume that such a theory must not include the premise that morphemes are necessarily meaningful.

2.2.1. Possible and Actual Words

Just as the simplest goal of a syntax is the enumeration of the class of possible sentences of a language, so the simplest task of a morphology, the least we demand of it, is the enumeration

of the class of possible words of a language. The greatest difference between the syntax and morphology with respect to this enumeration is that in derivational morphology there is a distinction to be made between the classes of possible words and actual words.[12]

This difference has long been recognized. Early critics of generative grammar (Zimmer (1964), Schachter (1962)) pointed out that there are many words which a grammar can generate in a language which, accidentally and unsystematically, never appear. This very pervasive phenomenon, they point out, cannot be handled in a morpheme-based grammar which does not posit an independent level of words, distinct from higher syntactic entities, as prelexicalist grammars indeed did not. Of the few substantial works on morphology within generative grammar, two have contained proposals, essentially the same in their content, designed to deal with exactly this distinction between possible and actual. Botha (1968) and Halle (1973a) have suggested that, in addition to the list of morphemes of a language and the rules of morphology, which concatenate these morphemes into possible words, there must exist a list of actual words, a dictionary, which they see as a sort of filter on the output of the morphology. Within a morpheme-based theory of morphology such as theirs, there are then two lexicons: a list of morphemes and their meanings which, together with the morphology, defines the class of possible words of a language; and a word lexicon. The actual words are a subset of the possible.

But words are peculiar, not only in that not all of those that should exist actually do, but also in that those which do exist do not always mean what they are supposed to mean, or even look like what they are supposed to look like. Words, once formed, persist and change; they take on idiosyncrasies, with the result that they are soon no longer generable by a simple algorithm of any generality. The word gravitates toward the sign. The actual words of a language, the members of the set of dictionary entries, are as a result not a subset of the items which are generated by a regular morphology, one which generates words and their meanings out of meaningful morphemes.

This is the basic trouble with morphemes. Because words, though they may be formed by regular rules, persist and change once they are in the lexicon, the morphemes out of which words seem to have been formed, and into which they seem to be analyzable, do not have constant meanings and in some cases have no meaning at all. It is this persistence which forces us to adopt a lexicalist hypothesis.

Halle noticed this problem and suggested that the dictionary should contain not only the actual words, but also that the idiosyncrasies of each word, if there are any, be listed there as well. These idiosyncrasies would include the phonological and syntactic exception features which a word might have, as well as its semantic and syntactic peculiarities, i.e. those semantic and syntactic properties not provided by the general rules of the morphology. A problem which immediately arises, even in this less rigid framework, in which it is at least tacitly admitted that arbitrary meanings can be assigned at the word level, is that there are words

[12] In the realm of phonotactics there exist words which are, in a certain sense, impossible. Thus, though the initial cluster *sf* is systematically banned from English words, in the sense that it could not be accepted in newly coined nonsense words, it does occur in a fair number of Greek borrowings: *sphere, sphinx, sphincter*, etc. We do not want to say that *sf* is a possible initial cluster in English, yet it exists in actual words. Similar facts are true, to a lesser extent, in morphology.

which are so idiosyncratic that their meanings are totally divorced from what is expected by the general rule. In Halle's system, a word can mean more than it is expected to mean, but it is difficult to see how it could mean something completely different from what its predicted meaning is without severely damaging the rules of the system or weakening it to the point that its predictive powers are obliterated. For example, the word *transmission*, which according to the general rules of the morphology should be an abstract nominal meaning something like 'the action of transmitting', means nothing of the sort when it refers to a car's transmission. It does not just mean more than it is supposed to. In a system such as Halle's, in which a word is provided with a meaning by general rules and this meaning can be expanded upon, words like this are very problematic.

The important thing we do learn from Halle's work is that there will always be a large number of words in a language which, because of their irregularities, must be entered in a lexicon. Since we are attempting to enumerate the class of possible words of a language, this lexicon already takes care of a large part of our task.

However, the list of words which a speaker has at his command at a given moment is not closed. The speaker always has the capacity to make up new words, which he can then add to his repertoire. It thus remains the task of a morphology to tell us what sort of new words a speaker can form. Note that we have suggested that the gross irregularities which words in the dictionary often exhibit are due to their persistence, to the mere fact that they are listed. It seems reasonable to assume that such gross irregularities are not characteristic of the new words which a speaker makes up; simply because they have not existed long, these words have not had any opportunity to become fixed in some idiosyncrasy. We will assume, then, that there are regular and interesting rules for making up new words, and we will turn now to the task of describing these rules.

Of course, we do not ask of a good theory of morphology merely that it perform this one task. Though they are idiosyncratic, the words in the dictionary do exhibit regularities; they do have structure. Morphemes, even though they may not be what they have been purported to be, are recognizable. Nor does a speaker make up all the new words he encounters. He hears words he has never heard before, recognizes them as words of his language, if they are, and has intuitions about their meaning and structure. A good theory of morphology should tell us something about these matters as well, and to the extent that they seem to be related to one another and to the mechanism for making up new words, the theory we present should express this relationship.

2.2.2. Types of New Words

We must determine what sorts of new words can be coined. The restriction here is very clear and pervasive. The only classes of words to which new words can be added by coining are the major lexical categories: noun (N), adjective (Adj), verb (V), adverb (Adv). New coinings may not be added to the various "grammatical" categories: pronoun, determiner, quantifier, conjunction, preposition, particle, modal, auxiliary, etc. This fact can be related to the distinction

between inflectional and derivational morphology, but I will not try to go into details of that relationship here.[13]

Nice confirmation of the restriction of new coinings to major lexical categories is provided by the opening lines of Lewis Carroll's "Jabberwocky", which are repeated below (the italics are mine):

'Twas *brillig*, and the *slithy toves*
Did *gyre* and *gimble* in the *wabe*:
All *mimsy* were the *borogoves*,
And the *mome raths outgrabe*.

All the words which are members of major lexical categories have been italicized. All other words are "grammatical". If we accept Humpty Dumpty's analysis, then all of the italicized words, and none of the others, are new coinages. This accords perfectly with the claim being made here.

2.2.3. What are New Words Coined From?

2.2.3.1. Oddities. The italicized words in the verse of "Jabberwocky" above are all rather unusual coinages. Those whose basis is not completely opaque are *blendings* (cf. Marchand (1969, 451-454)) or, as Carroll calls them, *portmanteau words*, formed by merging parts of words into a word which meets the phonotactic restrictions of the language. More transparent examples are *smog*, from *smoke* and *fog*, and *chunnel*, from *channel* and *tunnel*.

A related type of coining is that of *letter words* and *syllable words*, collectively known as *acronyms*. Examples are *NATO*, *radar*, and *futhorc*. This type is almost unknown in the languages of the world and was uncommon in our own before this century. It is even possible that the modern use of it can be traced back to that of the Hebrew scholarly tradition, where the names of sages were abbreviated by means of such a device (*rashi* = *ra*bbi *sh*lomo *b*en *yi*ḥaq; *rambam* = *ra*bbi *m*oshe *b*en *m*aimon). It does, in any case, presuppose an alphabet. At present it is most common in the official languages of the major imperialist powers. The device is, in short, very unusual and certainly not a universal fact of language.

These two devices form words which have no recognizable internal structure or constituents. This makes them opaque, and hence uncommon. The logic of the *hence* is that when we hear a word whose meaning we do not have any clues to, unless this word denotes an important

[13] Note that the latter, grammatical, categories, are not closed. They may acquire new members, but by a sort of drift. So it has often been noted that a word like *near* is an adjective on its way to becoming a preposition. In other languages, prepositions can sometimes be traced back to nominal forms. Nor does drift affect only nonlexical categories. The noun *fun* is on its way to becoming an adjective:

(i) That's no/not fun.

The reverse course is being traversed by *good*:

(ii) That's not/no good.

A complete theory of language must account for this sort of thing; however, because it is a phenomenon involving existing words and the changes they go through, I think we can safely exclude it from the domain of morphology as here defined (though see Ullmann (1962) for observations on lexical drift).

thing, we will have difficulty retaining it.[14]

2.2.3.2. Words from Morphemes. Another type of device which is also uncommon consists of the stringing together of morphemes with, of course, appropriate restrictions on what morphemes go where: suffixes at the end, prefixes at the beginning, etc. This type of coining accords with the sort of morphology we are accustomed to believing in.

An example of such a coining is the word *transmote* (brought to my attention by Bob Fiengo), which has the structure $[\text{trans=mote}]_V$ and consists of the morphemes *trans* as in *transmit* and *mote* as in *emote*, in the latinate prefix stem pattern discussed in 2.1. The etymology of the word is curious. Officials of the Johnson administration needed a verb which would mean 'transfer from one position to another', but would have neither negative nor laudatory connotations. *Transfer* is slightly negative, and *demote* and *promote* both imply a change in rank; hence *transmote*, with the *trans* of *transfer* and the *mote* of the other two.

What is important to note about *transmote* is that despite its seeming structure its meaning is not completely clear until explicated. Only when it is compared with *transfer*, *demote*, and *promote* is it possible even to begin to make an intelligent guess at its sense. The word thus resembles a blending like *chunnel* (*channel tunnel*), which is derived from other words, but not at all transparently. The lack of semantic transparency should not be surprising to anyone who has read the section on meaning and morphemes in 2.1. There I took pains to show that exactly these classes of prefixes and stems have no meaning. They are not signs. Since the parts have no independent meaning, the meaning of the whole is unclear. It follows from this, by the short argument given above, that the sort of word formation of which *transmote* is a product will be as sporadic as blending. In fact, I think we can reasonably claim that the two devices are really one: take two words, stick them together, and chop out the middle.

2.2.3.3. Word-based Morphology. I have dealt rather hastily with several types of word-formation processes which I claim are really one. The main characteristic of this type of word formation is the fact that the meaning of a word formed by such a process can never be derived regularly. By a simplistic argument, I have also connected this characteristic with lack of productivity. I will not discuss these opaque processes any further.

It remains to establish what sorts of word-formation processes can be productive. This brings us to the main thesis of this work (and many previous ones):

> *Hypothesis*
> All regular word-formation processes are word-based. A new word is formed by applying a regular rule to a single already existing word. Both the new word and the existing one are members of major lexical categories.

Any theory of which this hypothesis is a basic tenet we will call a theory of *word-based morphology*. In the rest of this work, I will try to develop a relatively detailed version of such a theory.

[14] Words which denote important things tend to be monomorphemic.

2.2.3.4. Word Formation Rules. The regular rules referred to above will be termed *Word Formation Rules* (*WFR*). Such a rule specifies a set of words on which it can operate. This set, or any member of this set, we will term the *base* of that rule. Every WFR specifies a unique phonological operation which is performed on the base.[15] Every WFR also specifies a syntactic label and subcategorization for the resulting word, as well as a semantic reading for it, which is a function of the reading of the base. Chapter 4 will be devoted to a more detailed discussion of the general form and characteristics of WFRs.

It is a fact that almost all new words are produced by WFRs. I will give only one example: from the adjective *communal* I form the verb *communalize*, by the WFR of *#ize* attachment. I know what this word means, since I know what its base means, and the rule is regular. *X#ize* can be paraphrased roughly as 'make X'. It is quite a different case from *transmote*. From *communalize*, in turn, I form the abstract action nominal *communalization*, by the WFR of *+Ation* attachment. This word too is transparent in its meaning.

Note that WFRs do not operate on anything less than a word, i.e. on morphemes. As demonstrated, not all morphemes are meaningful. Since regular rules can only derive meaningful words from meaningful bases, it follows of course that meaningless morphemes cannot serve as bases for any such rules. But I have not specified meaningfulness as a criterion for serving as the base of a WFR. If there are meaningful morphemes, and I have not argued that such entities never exist, the theory as formulated does not permit them to serve as the base of any WFR. This is of course an empirical claim. In 2.2.5 I will discuss a class of words which do not seem to be derived from existing ones. Such a class would be counterevidence to the claim being made here, if indeed one could show that these words were so derived. In this particular case, there is good evidence that the base of the rules is a class of existing words.

One important peculiarity of the conception of the rules of word formation I am outlining here is that I do not view these rules as applying every time the speaker of a language speaks. They are rules for making up new words which may be added to the speaker's lexicon. We can think of them as once-only rules. They are thus very different from the rules of the syntax and the phonology which must apply in the derivation of every sentence. This has been pointed out by other people in other contexts (e.g. Halle (1973a)); however, it has normally been stated as an observation and not as a basic tenet of a theory of morphology.

2.2.3.5. Assumptions about the Lexicon. The rules of word formation are rules for generating words which may be stored in the dictionary of a language. The rules are a part of the grammar of that language. I assume that these rules are completely separate from the syntactic and phonological rules of the grammar. Thus when a WFR specifies a phonological operation, this operation is not merely indicated by the WFR in the form of some rule feature and then performed as a rule of the phonology. Rather, the phonological operation is part of the WFR itself.[16] The same position with regard to syntactic and semantic phenomena is a basic tenet of

[15] This operation usually consists of the addition of some affix. It can, however, be null, and it may be more subtle. The matter is discussed at some length in chapter 4.

[16] It may be that this claim has to be weakened in certain cases, specifically in the case of reduplication rules (cf. the discussion of reduplication rules in Tagalog in Carrier (1975)).

the extended standard theory of syntax, one of the central claims of which is that lexical insertion, at the level of the major lexical category, precedes all syntactic rules (cf. Postal (1969)).

A consequence of these assumptions is that each word may be entered in the dictionary as a fully specified separate item. It is possible, and not unusual, to conceive of a system in which all redundancies are removed from the entries and then somehow filled back in by general rule. Such an approach was long accepted in phonology, but because of certain difficulties associated with the particular notation being used (allowing features to be specified + or −, or given no specification) brought to light by Stanley (1967), this manner of dealing with redundancies was replaced by a system in which all phonological features were completely specified in the lexical entry for each word (or morpheme). Such a system is accepted and even presupposed by most leading contemporary phonologists (SPE, chapter 9; Kiparsky (1973)). There is good reason for not factoring out syntactic and semantic redundancies either. This will be discussed later, in the context of a method for dealing with morphological regularities in the dictionary.

I will assume, then, that each word in the dictionary is an independent item, fully specified. Dictionary entries are not dependent on one another, or on rules. Each one is a complete sign in itself.

2.2.4. Evidence for the Proposal

The theory proposed here is essentially based on an observation: new words are by and large formed from old ones by recognizable rules. This theory also has the advantage of ridding us of the central problem of a morpheme-based theory of morphology (though at present it does so at some expense, by removing from consideration all matters pertaining to words already in the dictionary).[17]

However, a good theory does more than avoid problems. It also helps us to understand and account for things which hitherto were inexplicable. I would now like to discuss two matters which the theory so far outlined helps us to understand: the phonological cycle and irregular back-formations.

2.2.4.1. The Phonological Cycle. The phonological cycle is a much talked about subject. Some suspect the validity of the entire concept, and many have criticized what they have felt to be unmotivated uses of the device. Cyclic phonological rules are dependent for their operation on labeled bracketings. They apply first to maximal strings which contain no labeled brackets, after which innermost brackets are erased (or equally, disregarded); then they apply to the next maximal string which contains no brackets; and so on (cf. SPE, chapter 2). The most principled objections to the cycle have been directed against the arbitrary and high-handed manner in which these labeled bracketings are sometimes determined.

[17] The theory is not specifically designed to avoid the problem of meaningless morphemes. As stressed above, words are formed from words, not "meaningful elements".

In an important article, Brame (1974) has attempted to answer these objections by proposing a general constraint on such bracketing. The basis for Brame's constraint is the observation that the string constituting the domain of every application of the cycle of rules "shows up elsewhere as an independent phonetic word sequence" (1974, 55).[18]

Brame's constraint is a formulation of his observation. Before stating the constraint, we need a definition (from Brame (1974, 56)):

Definition

Two strings in phonological representations are said to be *equipotent* if they are identical and at least one of the two is not represented as a proper substring in phonetic representations.

Brame proposes a *Natural Bracketing Hypothesis* (1974, 56):

For a substring ψ to be bracketed, it must be equipotent to a string σ.

Translated into simpler terms, and clearing up some ambiguities in the definition of equipotency (a proper substring of what? probably of a string bounded by ##...##), Brame's hypothesis says that only a string whose surface reflex shows up elsewhere as an independent word can be bracketed. There is a slight problem with this hypothesis. One wants to avoid bracketings like the following: [[fil]ter]. Yet such a bracketing meets the conditions which the hypothesis imposes: *fil* occurs elsewhere as an independent word. In order to avoid the possibility of this bracketing, Brame suggests that we adopt instead the following strong version of the above hypothesis (1974, 58):

Strong Natural Bracketing Hypothesis

For a substring ψ of a string ϕ to be bracketed, ψ must be equipotent to a string σ, and the meaning of ϕ must be a compositional function of the meaning of σ and $\phi - \psi$ (ϕ minus ψ).

This rules out the bracketing [[fil]ter].

The latter hypothesis, Brame notes, may be too strong,[19] but it is interesting.

[18] The phrase is ambiguous. An underlying phonological string of the form $x + y$ can be said to have a surface representation of the form XY, which will not always be identical to $x + y$. We will take the sense of Brame's observation to be that we may cycle on underlying x only if surface X is an independently occurring word. Another possible sense is that we may cycle on X just in case there is an independently occurring surface word of the form x, rather than of the form X, i.e. identical to the underlying rather than the surface form. It is difficult to tell which sense Brame intended.

[19] Brame lists some problematic forms from Maltese which, though they must be derived cyclically in his system, at least intuitively do not meet the strong hypothesis. *u* is the plural subject in the following forms:

nišorbu 'we drink'
titilfu 'you pl. drink'

In Brame's system they must be derived from the following:

[[ni+šrob]+u]
[[ti+tlif]+u]

There is a cycle on *u*.

The question now naturally arises whether a constraint like that imposed by the Strong Hypothesis is a basic theoretical entity, or whether it falls out from more general principles. There obviously is some device which assigns these natural bracketings, and this device should have some other motivation than the mere fact that it assigns natural bracketings. Brame does not speculate on the nature of this device.

Within the theory of SPE, the input to the phonology is supplied by the syntax. The bracketing which defines the phonological cycle is basically that of the syntactic surface structure (with a few readjustments). Within that theory, therefore, there is independent justification for the bracketings in question. Within the lexicalist theory, however, the syntax does not extend below the level of the word and as a result cannot be called upon to generate any intraword bracketings. Since, in the earlier theory, the bracketing could be syntactically motivated, we expect that in the new theory whatever replaces the syntax at the level in question should assign the bracketing in question. This is of course the morphology.

Within the theory of morphology outlined above, a new word is always formed by performing some phonological operation on an already existing one. In most cases, the effect of this phonological operation will be the addition of some affix to the already existing word. This means, in effect, that the new word will contain the old. The meaning of the new word will also be a compositional function of the meaning of the word it contains. Since members of major lexical categories are always labeled (N, V, Adj, Adv), since all regular WFRs operate on such labeled words, and since there is no reason to assume that these labels are erased in the course of the application of a WFR, WFRs will, unless otherwise constrained, produce labeled bracketings in their output. It is clear that all the constraints imposed on intraword bracketings by the Natural Bracketing Hypothesis are direct consequences of this theory. In fact, given this theory, no other bracketing is possible. This is evidence of the highest order in favor of the central claims of the theory proposed.

Note that there is no reason to suppose that the sort of sporadic word formation discussed in 2.2.3.1 and 2.2.3.2 results in any kind of labeled bracketings. Thus a new word like *transmote* will not have a cyclic structure. Nor will such a word be bracketable according to Brame's hypothesis. As far as I know, words formed by such processes need never be treated in a cyclic fashion. This provides yet more evidence in favor of our theory, and in favor of the separation of word-formation devices into the two types.

Not all words have cyclic structure. There are sometimes even minimal pairs, the only difference between the members of which is the fact that one may be derived cyclically, the other not. Consider the following case, discussed by Brame. There are two words, *Prohibition* [proəbišən] and *prohibition* [prohibišən]: the first refers to a certain law or period in American history; the second is a deverbal action nominal. They are distinguished on the phonological surface by the fact that one has *h* followed by *i* where the other has *ə*. This difference can be accounted for if we give the two words the following underlying phonological forms:

spelling	*surface*	*underlying*
Prohibition	[proəbišən]	$[\text{pro=hibit+ion}]_N$
prohibition	[prohibišən]	$[[\text{pro=hibit+}]_V\text{+ion}]_N$

Thus the only difference between the two words is that one, and not the other, has cyclic structure. The superficial differences then fall out by regular rule. In the first word, a rule operates which elides *h* before an unstressed vowel, in this case *i*. Since it never receives stress, this *i* is later reduced to *ə* by the general rule of vowel reduction which operates on all unstressed lax vowels. In the second word, this same *i*, the one which follows *h*, will be stressed on the first cycle by the Primary Stress Rule as it would be in the verb (*prohibit*). Though the next vowel is stressed on the next cycle, and consequently receives the main stress by the Detail Rule (cf. Halle (1973c)),[20] there is still sufficient stress on the *i* following the *h* to prevent the application of the *h* elision rule (which only operates before an unstressed vowel), and also to prevent the *i* from being reduced. We see then that once the cyclic structure is imposed, all differences can be derived in a principled manner without recourse to exception features or special rules. There is in fact no other principled way to derive these two forms, and they provide powerful evidence for a theory which includes the notion of the cycle.

According to our theory of morphology, every new word, if it is derived by a regular rule, must have cyclic structure: that is, it must be bracketed internally. However, [proəbišən] has been shown not to have cyclic structure. This seems to be a problem for our theory. According to it, shouldn't all complex words be derived cyclically?

Remember that the rationale for discussing only literal word formation, i.e. coining, and not discussing the structure of words which were already in the dictionary, was the fact that the latter tend to be irregular, that is, to lose some of their appointed meaning and gain individual nuances. Such divergences from compositionality clearly do not take place in a linguistic vacuum, and it seems reasonable to suppose that they have structural correlates. Consider the two words under discussion. Clearly the first one, [proəbišən], is further in meaning from the verb *prohibit*. In fact, we would be hard pressed to find any systematic link between the two. The second noun, [prohibišən], is the derived action nominal of the verb, and its meaning is a compositional function of that of the verb. We have seen that this semantic difference is accompanied by a structural difference, in that [prohibišən] but not [proəbišən] has cyclic structure. In fact, in general, when we find two words which differ phonetically only in that one must be derived cyclically and the other not, the one which is not cyclically derived is always further in meaning from the base. This has been noted many times in the literature. We will therefore say that a word which has been in the dictionary long enough to diverge from compositionality, i.e. a word whose meaning is *no longer* derivable from that of its parts, may lose its cyclic structure. This is of course only a rough formulation. We have not said how far a word must diverge before it loses its structure, and it may be that loss of structure is an automatic consequence of loss of compositionality.

In addition, there may be other structural correlates of loss of compositionality (cf. for example the discussion of boundary strength in chapter 6). However, the statement does account for the fact that only the divergent word has no cyclic structure. It is of course an

[20] Within the system of Halle (1973c) the only rule which actually has the effect of subordinating stress is one which stresses a [1 stress]. The Detail Rule is such a rule. It stresses the last [1 stress] of a word, unless that stress falls on the last vowel, in which case it stresses the penult: last wins, unless it is last.

addition to our theory, which now says that though we may make up only words which are naturally bracketed, words may lose their bracketings as they go their own way. This does not seem to be a very serious addition, or to weaken our position much, and it allows us to encode very nicely the fact that only words whose meanings are not compositional will be susceptible to loss of structure, though it does not explain it. Other theories, though they allow for both cyclic and noncyclic structures, have trouble accounting for the semantic differences between the two sorts of structures in a principled way. To the extent that our present theory can accommodate the two in a principled and interesting way, it is superior.

In summary, I have shown how cyclic structures of the sort proposed by Brame arise naturally as a consequence of a theory of word-based morphology. I have also proposed a small addition to the theory which allows noncyclic structures under certain specific semantic conditions.

2.2.4.2. Irregular Back-formations. As Marchand (1969) stresses, back-formation is of diachronic relevance only. It consists of the extraction of a new word from an already existing word which appears to be bimorphemic. Within the theory just outlined it is thus just what its name says: a backwards application of a WFR. The most often quoted example of back-formation in English is the verb *peddle*, back-formed from the noun *peddler*. Historically, *peddler* is monomorphemic. However, since it is an occupational noun, and since such nouns are often formed from verbs with the suffix *--er*, the *er* became analyzed as an affix, and the stem subsequently came into use as a verb. More common in English is the borrowing of a latinate derived form, whose stem is subsequently retrieved by back-formation. Such a case is the verb *aggress*, which was back-formed from the noun *aggression*.

The fact that back-formations of any sort are possible but not necessary is easily handled in a theory in which all words in the dictionary are completely specified separate items. In other theories back-formations can be problematic. So, for example, if *aggression*, as a derived noun, is not listed in the dictionary as a completely specified form, then the form which presumably is referred to in completely specifying *aggression* at the point of lexical insertion, i.e. *aggress* must, for most speakers, be marked [*–Lexical Insertion*]. In a theory in which individual words are not independent, back-formation thus always results in a better system; in fact, the system which does not have the back-form is very bizarre. But if this is true, then why don't all speakers adopt the back-form as soon as they are exposed to it, which they do not? There are in addition problems with the notion [*–Lexical Insertion*] itself, which is so strong as to be almost vacuous. Thus the mere fact of back-formation seems to be more easily accommodated in a full-entry theory of some sort. This same point is made somewhat more forcefully by Jackendoff (1975).

However, there is real evidence that some back-forms cannot even be generated in any theory but one in which every word is a complete entry unto itself. This evidence comes from phonologically "irregular" back-forms. Consider such words as *self-destruct* and *cohese*, back-formed from *self-destruction* and *cohesion*. Within most theories, one expects the forms *self-destroy* and *cohere*, which presumably underlie the nominals and are merely marked [*–Lexical Insertion*]. The actual forms are thus impossible.

To see how they are predicted within the theory outlined so far, we must first digress a little. We have already mentioned rules of allomorphy in connection with the status of the latinate stem *mit*, and they will be discussed in detail in chapter 5. For the moment we only need to know that the morph *struct* which occurs in *self-destruction* can be an allomorph of two morphemes, one which appears word-finally as *stroy* (*destroy/destruction*) and one which appears word-finally as *struct* (*construct/construction*). The "source" of *struct/ion* is thus opaque. It could be either *struct* or *stroy*. In a full-entry theory *self-destruction* is an entity unto itself, and when we back-form from it we essentially ask ourselves, "What word *might* this one have been formed from?" We don't know and must pick the most likely one. By a principle of least effort (identical to that used in determining underlying phonological forms where the choice is indeterminate, in the theory of SPE, chapter 9) when, in the course of our "reconstruction", we arrive at a choice which is arbitrary, we choose the form which is "closest" to the one we started out from. Thus, in this instance, we must choose *struct*, which is identical, rather than *stroy*, and we arrive at the word *self-destruct* as the most likely. Within any other system, since the "source" already "exists" though it doesn't occur, we need have no recourse to any "might have been" strategy; as a result we either make the wrong prediction or can make none at all. The point is that in the full entry theory we must have a "recovery" strategy, and the most sensible recovery strategy that arises in the words-from-words hypothesis gives us exactly the right results. Our theory thus pushes us to make two decisions, both of which are vindicated by the data.

It must be stressed that within no other theory are we forced to make the right choices. A theory which does not have fully specified entries, as noted, tells us nothing about this situation. A theory which, like that of Jackendoff, has fully specified separate entries, but which relates them by redundancy rules of an arbitrary form and does not contain the notion *allomorphy rule*, tells us nothing about the proper strategy. It is only when we claim that words are formed from words by rules, each of which performs a unitary phonological operation,[21] that the proper strategy is predicted.

The same account holds for *cohese*. Since *Vs* before *+ion* can be the reflex of *Vs* (*confuse/confusion, excise/excision*), *Vd* (*delude/delusion, pervade/pervasion, provide/provision*), or *V̆r* (*adhere/adhesion*), it is only by calling on the principle of least effort, and using the right strategy, that we predict *cohese*.

2.2.5. Counterevidence

Direct counterevidence to the theory that words are formed from words would be a case in which there are several words formed from the same stem, but in which the stem never shows up as a word itself. Of course, if there are only one or two such words, we might reasonably hypothesize that the nonoccurring stem has unaccountably dropped out of the language after having done its duty, or that like the case of *aggression/*aggress* we are dealing with a borrowing from a language which happens to have a similar morphology. However, when we find many

[21] I have not stressed the importance of this central claim. It means essentially that a rule cannot perform different operations on different stems.

stems which exhibit this peculiar phenomenon, and with the same affixes, we might reasonably hypothesize a regular rule deriving the various forms from the stems, and this would be an impossible rule in our theory. One such case is the common occurrence in English of the following paradigm:

(17)	*Xion*	*Xive/ory*	*Xor*	**X*
	incision	incisive	incisor	*incise
	gustation	gustatory		*gustate
	locomotion	locomotive	locomotor	*locomote
	malediction	maledictory		*maledict
	valediction	valedictory		*valedict
	illusion	illusory		*illude
	retribution	retributive/ory		*retribute
	emulsion	emulsive		*emulse
	revulsion	revulsive		*revulse/ *revél

The most obvious conclusion to be made from (17) is that the items *Xion*, *Xive*, *Xory*, and *Xor* are all formed from the stem **X*, which, in these cases, is not an independently occurring word. However, the conclusion is contrary to the basic claim of word-based morphology and must be false if the theory is to remain.

Because of the number of cases, it is not terribly convincing to claim that they are all accidental, arising from the loss of the stem as an independently occurring item at some time after the formation of all the derivatives. This sort of thing can happen sporadically, but why should it happen so many times involving this one paradigm? Furthermore, there is evidence that some of the derivatives, at least, entered the language at a time when the stem was not an independently occurring word. Such a case is not subject to the accidental gap explanation. It would appear, then, that at least some of the words listed above constitute direct counterexamples to our theory.

Happily, this is not quite true. For reasons which are completely extraneous to ours, Martin (1972) has argued that in the above paradigm the forms *Xive*, *Xory*, and *Xor* are based on the form *Xion*. Martin's strongest evidence is that one rarely finds any of the former group occurring with stems that do not also take *-ion*, though the reverse is not true; that is, the number of words of the form *Xion* far outnumbers the total number of words ending in all the other suffixes combined.[22] This distribution only makes sense if the forms *Xive*, *Xory*, and *Xor* are derived from the forms *Xion*.

Second, when *X* does occur as an independent verb and the semantics of *X* and *Xion* do not correspond exactly, the meaning of *Xive*, etc. always corresponds to that of *Xion*. Martin's example is the set *communicate*, *communication*, *communicative*. The verb has as one of its meanings 'to receive the sacrament of *Communion*'. The noun has no corresponding meaning, and neither does the adjective. A similar example is the set *induce*, *induction*, *inductive*. In one

[22] Exceptions listed by Martin (1972, 6) are the following:
Xive, **Xion*: conducive, divorcive, purposive, deducive, redressive, abusive, amusive, conflictive, combative, sportive, contrastive, appointive, effective, talkative, calmative, comparative, figurative.

of its senses, the noun denotes a type of reasoning. The adjective has a corresponding sense, but the verb does not. There are many more such sets. They can be nicely accounted for if the adjective is derived from the noun or vice versa. In light of the general distribution of the two forms, i.e. the fact that there are more nouns than adjectives, the noun seems the better choice. In any case, to choose the verb or the "stem" as the base is to give up any hope of accounting for these facts.

The third piece of evidence is historical. In all the cases Martin has been able to find documentation for in the *OED*, the *-ion* form entered the language before the *-ive* form. *Exploitation* is found earlier than *exploitative*, for example. We can only make sense of these data if the *-ive* form is derived from the *-ion* form. Furthermore, the derivation must be conceived of as the addition of a newly coined word to the dictionary, something which is possible only in the sort of theory outlined in this work.

Thus we find that the seeming counterevidence to our theory is rather evidence for it. We can explain the distribution, meaning, and history of the *Xive*, *Xory*, *Xor*, and *Xion* forms only by deriving the first three from the last in the manner described by our hypothesis of word-based word formation. Though admittedly no Devil's Advocate with regard to the matter at hand, I have not found any set of data similar to (17) but not susceptible to conversion. In any case, it is clear that there is a certain sort of data which would constitute counterevidence to the claim put forth by our theory. Merely being able to determine what such data would look like demonstrates that our theory has merit as a theory. Insofar as no such data has been brought forward, and insofar as the theory sheds some light on the material which does not contradict it, it has some empirical merit.

The examples discussed in this section show another thing as well. When we speak of a word formed from another word, the simplest case will be that in which the former actually contains the latter. So [[farm]er] contains [farm]. But this will not always be true. We have evidence that *aggressive* is formed from *aggression*, yet the former does not contain the latter, on the surface at least. One never finds words of the form **Xionive*. The notion "one word formed from another" must therefore be more abstract than mere surface concatenation. This should be kept in mind.

2.2.6. Word Structure

A major fault of the theory so far delineated is that it only deals with one of the areas which are considered to be the domain of morphology. We have restricted the discussion to word formation and have disregarded the structure of already existing words.

Almost all words have morphological structure. This fact can be ascertained from the fact that the phonology must have access to both bracketing and boundaries, both of which are morphological matters. Bracketing we have discussed, and boundaries are morphologically determined to the extent that they occur between morphemes, which they almost always do. Now, from what we have said so far, it is perfectly possible that only the words a speaker actually makes up on his own will have morphological structure, and that all the other words he knows (the great majority of which he presumably learns by hearing them) have no struc-

ture. Another possibility is that the rules which determine the morphological structure of the words which a speaker does not actually make up are completely other than, and different from, the rules used to make up new words, and that the two sorts of rules just happen to produce structures of the same sort. This is possible, but highly unlikely.

We have already argued that it is reasonable to separate the rules for making up new words from those for analyzing existing words, because of the general fact that already existing words tend to be peculiar, and resistant to any system which derives their properties by general rule. This fact precludes our accounting for the similarities between word formation and word analysis in the most obvious fashion, that is, by saying they are exactly the same thing. The two matters are the same, and yet different. It would be nice if the rules governing them also had this characteristic.

We have already seen that back-formation must be a sort of unraveling of WFRs and other morphological rules (rules of allomorphy); that is, that an individual back-formation can best be viewed as the answer to the question, "What word could this one have been formed from by a regular rule?" A similar account of word structure is perfectly plausible. It would also meet the same and yet different requirement. The difference is that while the rules as rules of word formation are rules for generating forms, the same rules of word analysis can be viewed as redundancy rules. They can be used to segment a word into morphological constituents, though the word may not be strictly generable from these constituents.

There is of course little novelty in the proposal that existing morphologically complex words should be "analyzed" rather than "synthesized". Nor, once we accept the analytic position, is the use of redundancy rules a striking suggestion. It is rather perhaps the first method that comes to mind and probably the only sort that can extract anything of interest from the detritus of linguistic and social history that a lexicon presents. An extensive defense of the use of redundancy rules in morphology can be found in Jackendoff (1975). I will not repeat his points here, many of which incidentally parallel some that have been made already in this work. In addition to Jackendoff, Halle (1973a) can best be interpreted as a system of redundancy rules which extract generalizations from a dictionary.

However, the problem with these and similar systems is that they put no external constraints on the notion *redundancy rule*. Within Jackendoff's system any two facts which coincide, however incidentally, can be reduced to one. No criteria are provided for what can constitute a valid generalization. The advantage which our system enjoys over this one is the fact that the redundancy rules are defined outside the realm in which they operate: the lexicon. It is only a WFR which can serve as a redundancy rule, and WFRs are rules by which new words are formed. This means that the only sorts of facts which can count as redundancies or generalizations in the analysis of existing words are those which enter into the formation of new ones. The scope of the notion *redundancy rule* is thus automatically reduced considerably, and to a point where it embodies an interesting claim.

The analysis of a word begins at its first articulation. We have a theory which tells us what the possible parts of words are and we apply it to individual words. The noun *communalization*, formed a few pages ago, is a simple case. We recognize the suffix *+Ation* which forms abstract

nouns from verbs (cf. chapter 5), the suffix *#ize* which forms verbs from adjectives, and the suffix *+al* which forms adjectives from nouns. The sum of these operations is the analysis $commune_N + al_A \#ize_V + Ation_N$. In this case each step of the analysis results in a base which is a member of a lexical category, and therefore may be labeled as such.

When the analysis does not give us a base which is a member of any lexical category, then it receives no label. We can contrast in this respect the words *baker* and *butcher*, which both may be analyzed as containing the deverbal agentive suffix *#er*. The former contains a verb (*bake*), while the latter does not ($*butch_V$). The two forms will therefore be analyzed as $bake_V \#er$ and *butch#er* respectively. Similar to *butcher* are $possible_A$ and $probable_A$, both of which contain the deverbal adjective suffix *+abl* (cf. chapter 6) and neither of which have verbal bases; they must therefore be analyzed as $poss + abl_A$ and $prob + abl_A$.

The analysis so far is divorced from any semantic considerations. In fact, with words like *probable* and *butcher*, there will be no semantics, for there is no base on which the semantic function may operate. We cannot ask whether the meaning of the whole is a function of the independently established meaning of its parts, because one of its parts has no independent meaning. This is as it should be. Clearly, there is a difference in the arbitrariness of *probable* and *bad*. The former contains a suffix which is a common marker of its lexical category; *+abl* reduces the arbitrariness of *probable*'s being an adjective. The latter contains no such redundant information. But this is as far as it goes. We know more about *probable* than about *bad*, but not much more.[23]

When a word does have a base, it is legitimate to ask about the semantic relationship between the two. Since morphology is not syntax, this relationship will seldom be one of neat compositionality. There will usually be some sort of divergence. Intuitively, this divergence is not between the derivative and the base, but rather between the actual meaning of the derivative and the meaning we expect it to have, given the independently occurring meaning of the base. So, for example, the divergence of *transmission* (of a car) consists in the fact that it does not mean 'action of transmitting'. The divergence is therefore not directly between *transmission*

[23] Note that to label *prob* as a verb and then mark it as (for some reason) nonoccurring would be to claim that *probable* has all and only the properties which *+abl* assigns. That claim is quickly shown to be false. A curious syntactic property of productively derived words, first noted by Ross (1974), is that they tend to be more limited in their subcategorizations than other words. In the case at hand, we find that when a verb allows either sentential *that* -clause or nominal objects, its *+abl* derivative allows only the nominal:

(i) We determined that the butler had done it.
(ii) We determined the exact nature of the substance.
(iii) The exact nature of the substance is not determinable.
(iv) *That the butler had done it was not determinable.
(v) *It was not determinable that the butler had done it.

If *possible* were indeed derived from $*poss_V$, we would expect to find a corresponding pattern of grammaticality, which we do not:

(vi) That the butler had done it was possible.
(vii) It was possible that the butler had done it.

The same is true of *probable*.

It is evident from this and similar examples that the analysis of words is not a synthetic procedure, but rather merely a method of extracting redundancies.

and *transmit*, but rather between the two senses of *transmission*. The expected sense of the derivative thus mediates between its actual sense and the actual sense of the base. This intuitive notion of divergence is the one most easily handled in our theory. Since the anlysis outlined so far concerns only the form of a word, we are now free to give this analyzed form a putative meaning by applying the compositional semantic functions of any affixes it may contain to the base. As an example consider the word *information*. Disregarding the semantics, we give it the analysis $inform_V + Ation_N$. We then give this form a meaning, approximately 'act(ion) of informing' or 'event or state of being informed'. We next compare this meaning with the meanings of *information* which we determine from its actual use in the language. As it happens, only one of these comes close, the one exemplified in the following sentence:

(18) The function of a public library is information.

In a fully developed theory of semantics, there will be some method for quantifying this divergence and perhaps even some notion of "possible divergence".[24] I will not provide such a theory or such a method, but merely wish to point out that the function to be computed and the elements on which it depends are all natural consequences of our theory of word analysis and, furthermore, make sense.

Note that a central claim of this approach to the analysis of existing words is that relatedness of form is prior to relatedness of meaning in morphology. There are cases in which we can define only formal relationships, as with *possible*, but in no case are we able to define only semantic relationships. Semantics is not irrelevant, but rather cannot be called into play until we have laid the formal foundation. Among other things, this means that synonymy is excluded from the purview of derivational morphology.

Our system of word analysis will handle the two different types of berries discussed in 2.1. A word like *cranberry* will be treated in a fashion exactly parallel to *possible*. Thus, in our system, we can account for what we know about a partially motivated form without having it collapse with completely motivated ones. Since we know what *berry* is likely to mean, we have some idea as to a possible meaning for *cranberry*. However, since *cran* occurs nowhere in our system of rules and words, we have no way even to guess at the complete meaning of the entire word. *Blueberry* can be segmented into otherwise occurring parts. However, there are very few parts of the meaning of *blueberry* that are not attributable to the berry compound form and that are shared with other meanings of *blue*. *Blueberry* will thus be very distant from *blue*, which I think is the correct view of the mannner and closeness of the relation between the two. Note that we do not run into any problems with regard to *blue* as a partially meaningful element in *blueberry*. We are concerned with the meaning of the entire word. The fact that *blue* occurs as an independent word is of interest and demands that we compare that word with *blueberry*, but not with the morpheme *blue* which is part of that word. This is not a sophistic point.[25]

[24] Vergnaud (1973) develops in some detail one general type of system by which such a quantification may be accomplished. Ullman (1962) provides a traditional and enlightening account of the problems involved.

[25] For more on the treatment of partially motivated forms within a system like the one proposed, see Jackendoff (1975).

Viewing word analysis as a backwards sort of word formation thus has virtues apart from its nice compatibility with our system. It allows us to account for what we know from general principles and to separate this from what is either not included in or counter to such general principles.

I will not dwell any further on existing words. Except for the few points mentioned here, the rules for analyzing words are essentially degenerate versions of the rules for forming new ones. One might wish to speculate on the nature of the degeneration, but in order to be able to do so we must first gain some knowledge of the nature of the healthy specimens. Chapter 4 represents a few first steps in this direction.

3: Productivity

We turn in this chapter to a discussion of the notion of *productivity*. The turning will seem abrupt to some, for up to this point the matter has hardly been mentioned. Yet productivity is one of the central mysteries of derivational morphology. It is the root of the strange and persistent fact that, though many things are possible in morphology, some are more possible than others.

The term *productivity* is widely used in studies of derivational morphology, and there is obviously some intuition behind the usage, but most of the discussion of it is rather vague. Indeed, mere mention of the subject seems to be taken by many as an open invitation to anecdotalism. In what is perhaps a reaction to tradition, I have attempted to restrict my own discussion to very specific properties, properties which seem to characteristically distinguish productive from nonproductive WFRs. The discussion will be imbedded in a comparison of the two English nominal affixes *#ness* and *+ity* in one particular morphological environment: when they are attached to adjectives of the form *Xous*. The framework of the analysis will be that of chapter 2. In fact, the entire method of the present chapter presupposes that of the last: much of what will be said simply makes little or no sense in other systems. Therefore, any credit which this discussion of productivity may enjoy must redound to its predecessor. First, however, some preliminaries.

3.1. Preliminaries

It is sometimes claimed that productivity is a matter which never enters into the study of syntax. This is not quite true. Compare the two rules Dative Movement and Passive. Observe, in the case of the former, that the predicates which permit it, while members of a more or less well-defined semantic class, are not all the members of that class, but rather some reasonably arbitrary selection of them. On the other hand, while there are some transitive verbs which do not allow Passive, the exceptions seem to be principled. One would appear to be justified, therefore, in saying that Passive is more productive than Dative Movement.[1] Of course, in syntax there are certain types of operations which are immune to questions of productivity. Such rules as Subject-Auxiliary Inversion, which are not optional in any sense of the term, cannot ever be thought of in terms of productivity. In contrast, WFRs are always optional.

[1] A more detailed discussion of this question is presented in Oehrle (1975).