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## Prolegomena to a Theory of Word Formation\*

Speakers of a language normally possess knowledge not only about the words of the language but also about the composition and structure of the words. Thus, for instance, speakers of English know that the words in (1a) are words in their language, whereas those in (1b) are not.

- (1) a. dog think write love antidisestablishmentarianism
- b. švan pensare katav mile Donaudampfschiffahrtsgesellschaft

They also know that an adjective such as (2a)

- (2) a. trans-form-at-ion-al

is composed of the morphemes shown and that these five morphemes cannot be concatenated in most other orders; i.e. sequences such as (2b) are not possible in English.

- (2) b. ion-trans-al-at-form
- al-form-at-ion-trans

Analogous facts can be readily adduced from any other language.

A grammar is the formal representation of what a speaker must know about his language, and it must, therefore, reflect in some fashion facts like those above, among others. Hence the assumption has been made quite generally that a grammar must include a list of morphemes as well as rules of word formation or morphology. The character of these rules and their relationship to other parts of the grammar, in particular, to the rules of syntax and of phonology, has been studied only to a very limited extent. It is these questions that occupy my attention in what follows, and while I am not in a position to claim that I have succeeded in achieving a breakthrough in this area, I hope that I have developed enough of a structure to facilitate discussion and to attract others into research on this topic.

It is all but self-evident that in the list of morphemes the different items cannot be represented just as sequences of (phonetic) segments, but that they must be provided

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also with some grammatical information. For example, the entry for the English morpheme *write* must contain the information that it is a verbal root, that it is a member of the “non-Latinate” portion of the list (it is by virtue of this fact that it is allowed by the rules of word formation to combine with certain affixes and not with others), that it is among the small class of verb stems that undergo the so-called “strong” conjugation, etc. Moreover, the list must include not only verbal, nominal, and adjectival roots but also affixes of various sorts.

The rules of word formation would then tell us among other things how the morphemes are to be arranged in sequences to form actual words (allowing (2a) above and ruling out (2b)), and it is to be expected that among them there might be rules of considerable complexity. The nature of this type of rule will be investigated in greater detail at a later point in this paper. At this point I am mainly concerned with the fact that not all properties of words can readily be accounted for with such simple rules. Particular difficulties arise in connection with the treatment of idiosyncratic characteristics of individual words, that is, of characteristics that a given word shares with few other words or even with none. Here are some examples illustrating the idiosyncratic behavior of words I have in mind.

- (3) a. approval recital proposal transmittal reversal
- b. arrival refusal rehearsal acquittal renewal carousal betrayal withdrawal denial survival betrothal

An examination of the individual meanings of the nouns listed in (3) shows that in spite of many common features, there are also a great many differences among them. Thus, while most of the nouns in (3) have the meaning ‘the act of V-ing’ and (if transitive) also ‘the fact of being V-ed’, this formula does not hold in all cases. For example, *recital* commonly refers to a concert by a soloist, or *transmittal* is used to refer to the transfer of official documents or information, but not of other things that are quite normally said to be transmitted.

Idiosyncratic behavior of individual words can be found also in other domains, e.g. phonology. As an example, consider the English nouns formed from adjectives by adding the suffix *-ity*:

- (4) serene [sərīn] serenity [sərénitiy]; obscene obscenity; sincere sincerity; severe severity; profane profanity; divine divinity

As can be seen from (4), nouns of this type are normally subject to the Trisyllabic Shortening Rule (cf. Chomsky and Halle 1968, 181). The nouns *entirety*, *nicety*, *obesity*, and *probity* differ from all other nouns formed with this suffix in not being subject to the Trisyllabic Shortening Rule.

A third type of idiosyncrasy of words can be seen by comparing the deverbal nominals formed with *-al* with those formed by adding the suffix *-at-ion* or *-ion* as *transformation* and *decision*. While the restrictions on nominals in *-al* are quite different

from those in *-at-ion*, there is a number of verbal stems from which both types of nominal can be derived; for example, the nominals listed in (5a) are formed from the same stems as those in (3a).

- (5) a. approbation recitation proposition transmission reversion

On the other hand, the nominals in (5b) do not have counterparts in *-al*:

- (5) b. derivation description conversion confusion permission observation obligation omission accusation

Moreover, the nouns in (3b) lack counterparts in *-at-ion*; i.e. the language lacks words such as those in (6).

- (6) a. \*derival \*describal \*conversal \*confusal \*permittal \*observal  
\*accusal (but cf. Jespersen, MEG 6.22.22)
- b. \*arrivation \*refusation \*refusion \*rehearsion \*acquitation

Once again it appears somewhat forced to incorporate this information in the morpheme list or in the word formation rules. But if it is not to be incorporated there, then one must immediately ask how this information is to be reflected in a grammar.

I propose that idiosyncrasies of the type just illustrated be listed in a special filter through which the words have to pass after they have been generated by the word formation rules. The special information given in the filter under each entry is then added to the representation of the word. In the case of semantic idiosyncrasies such as those exemplified by the special meaning of nouns like *recital* and *transmittal* the filter would supply the appropriate indications about their semantics. In the case of phonological idiosyncrasies like those exhibited by nouns like *obesity*, the filter would supply the information that the noun in question is not subject to the Trisyllabic Shortening Rule, or, more formally, would supply the noun with the feature [–Trisyllabic Shortening Rule]. Finally, “gaps” in the dictionary like those illustrated in (6) and (7) would be accounted for by providing the “missing” words with the rule feature [–Lexical Insertion]. In other words, the fact that English lacks the nouns *\*derival* and *\*arrivation* would be reflected in the grammar by marking these words, which would be generated by the word formation rules, as not being subject to lexical insertion and therefore incapable of appearing in any actual sentence of the language, in spite of the fact that they are neither semantically nor syntactically or phonologically anomalous.<sup>1</sup>

<sup>1</sup> The proposal just sketched might be modified somewhat as regards the treatment of words formed by rules that traditionally have been called “nonproductive”. One might propose that all words formed by non-productive rules are marked by these rules as [–Lexical Insertion]. The smaller subset of actually occurring words formed by such rules would then be listed in the filter with the feature [+Lexical Insertion]. That is, the nouns formed with the suffix *-al* would all be generated with the feature [–Lexical Insertion]; the relatively small number of actually occurring nouns of this type, like those listed in (3a), will appear in the filter marked [+Lexical Insertion]. In other words, it is assumed that words generated by a productive process are all actually occurring and that only exceptionally may a word of this type be ruled out of the language. On the other hand, words generated by a nonproductive rule are assumed not to be occurring except under special circumstances. In this fashion we might capture the difference between productive and nonproductive formations.

In other words, I am proposing that the list of morphemes together with the rules of word formation define the set of *potential* words of the language. It is the filter and the information that is contained therein which turn this larger set into the smaller subset of *actual* words. This set of actually occurring words will be called the *dictionary of the language*.

The examples discussed above have been chosen from the domain that traditionally has been called *derivational morphology*. As far as I can tell, facts that traditionally have been treated under the separate heading of *inflectional morphology* must be handled in completely parallel fashion to those discussed above. I know of no reason why the list of morphemes should not include also the *inflectional affixes* or *desinences*, or why the rules of word formation should not also include rules for positioning the inflectional affixes appropriately or for handling such other inflectional phenomena as reduplication, stem Ablaut, etc.

It is important in this connection to realize that the three types of exceptional behavior that have been handled above by means of the filter are not restricted to word derivation but are found also in the inflection. Thus, one finds that particular case forms of particular words idiosyncratically possess meanings that are in general not those of either the base or the case. For instance, in Russian the instrumental case of certain nouns designating times of the year and of the day has special adverbial force that is not possessed by other nouns in the instrumental case. In particular, *letom* may mean 'in summer', *nočju* 'at night', *zimoj* 'in winter'. However, *avgustom* may not mean 'in the month of August', or *obedom* may not mean 'at dinner (or noon) time'.

The second type of idiosyncratic behavior which I proposed to handle with the help of the exception filter was phonological irregularity of the kind illustrated in (4). Parallels to this type of exceptional behavior are found also within paradigms; i.e. some forms in a paradigm are subject to a given phonological rule, others are not. An interesting illustration of this is provided by the accentuation of Russian nouns, which I have recently had occasion to study in some detail (see Halle 1972). As discussed there, a considerable number of Russian nouns must be entered in the dictionary without stress marked on any of their vowels. Such words will then be subject either to the Oxytone rule, which places stress on the last syllable, or to the Circumflex rule, which stresses the initial syllable. It can be shown that the Oxytone rule must be ordered towards the beginning of the phonological rules, whereas the Circumflex rule must be ordered towards the end of the phonology. Moreover, in paradigms in which one or more forms are subject to the Circumflex rule, the remaining form will be subject to the Oxytone rule, but not vice versa. Finally, no form is subject to both stress rules; words in this class are either Oxytone or Circumflex. These somewhat elaborate facts can be handled straightforwardly by marking words subject to the Circumflex rule with the rule feature [-Oxytone].

To see this more clearly, consider the feminine nouns of Russian that are stressless.

As shown in (7) we find in this class at least three distinct types of accent pattern. The first, illustrated in (7a), has stress on the desinence in all case forms; the second, illustrated in (7b), has initial stress (Circumflex) in the nominative plural and desinential stress elsewhere; the third group, illustrated in (7c), has initial stress (Circumflex) in the nominative plural and accusative singular, and desinential stress elsewhere.

(7)	<i>Nom. sg.</i>	<i>Inst. sg.</i>	<i>Acc. sg.</i>	<i>Nom. pl.</i>	<i>Dat. pl.</i>
a.	kočerga	kočergoj	kočergu	kočergi	kočergam
	gospoža	gospožoj	gospožu	gospoži	gospožam
b.	skovoroda	skovorodoj	skovorodu	skovorody	skovorodam
	arba	arboj	arbū	arbý	arbam
c.	boroda	borodoj	borodu	borody	borodam
	golova	golovoj	golovu	golovy	golovam

The facts illustrated in (7) will be accounted for in the following fashion. The three types of noun forms under discussion will be entered in the morpheme list without stress and none of the word formation rules will supply stress to them. This will be sufficient to obtain the correct output for the nouns of type (7a). In the case of the other two types of noun it will be necessary to provide the information that some of their case forms are [–Oxytone], so that the Circumflex rule can apply to them. In the light of the discussion above, this can be done quite straightforwardly by listing in the filter the appropriate words, e.g. the accusative singular *golovu* and the nominative plural *skovorody* as [–Oxytone]. In sum, the rules of word formation will generate the inflected forms in the fashion to be expected; in most cases these will pass through the filter without further effects. In the nominative plural and accusative singular forms under discussion, however, the filter will supply a special marker indicating that the words in question are to be treated in a special manner by the phonology. But this implies that each of the case forms will appear as a special entry in the dictionary.<sup>2</sup>

Finally, paralleling the “accidental gaps” in derivation illustrated in (6) above one finds various kinds of defective paradigms in the inflection. For instance, in Russian there are about 100 verbs (all, incidentally, belonging to the so-called “second conjugation”) which lack first person singular forms of the nonpast tense. Russian grammar books frequently note that such forms as (8) “do not exist”, or “are not used”, or “are avoided”.

- (8) \*lažu ‘I climb’
- \*pobežu (or \*pobeždu) ‘I conquer’
- \*deržu ‘I talk rudely’
- \*muču ‘I stir up’
- \*erunžu ‘I behave foolishly’

<sup>2</sup> A consequence of the treatment proposed here is that the absence of the fourth type of accentual pattern (initial stress in the accusative singular only) will be regarded as a pure accident and not as a special subregularity of the language which must be captured in the grammar. There are about a dozen nouns that have the stress pattern of (7c). I know of no other interesting features that these nouns share in common.

The most recent scholarly grammar of Russian (Švedova 1970, §988) remarks that no ready explanation for these gaps has been offered. Thus, it has been suggested that the first three forms cited above are avoided because they are homophonous with 1. sg. forms of other verbs. There are, however, other verbs in the language where the identical homophony has not resulted in any gaps (cf. *vožu* 'I lead' or 'I cart'). Equally unconvincing is the suggestion sometimes made with regard to the last two verbs cited in (8). It is said that these 1. sg. forms are "difficult to pronounce" or "unusual". But as is noted in the Švedova grammar note, since the language has 1. sg. forms exhibiting precisely the same behavior (e.g., *vonžu* 'I thrust ( a knife)' or *šuču* 'I joke') this hardly is a plausible explanation. It would appear, therefore, that we are faced here with an "accidental gap" in the dictionary. In view of what has been said above, the natural way to handle these facts is to mark such forms as those in (8) as being [ – Lexical Insertion]. In other words, just like the forms in (6), those in (8) are incapable of appearing in any well-formed sentence of the language in spite of the fact that they exhibit no semantic, syntactic, morphological, or phonological abnormality.

At this point it might be useful to review briefly the proposal that has been made above. To aid in this review I have prepared a block diagram of the proposal in Figure 1. I have suggested that morphology consists of three distinct components: a list of morphemes, rules of word formation, and a filter containing the idiosyncratic properties of words. The list of morphemes and the rules of word formation together

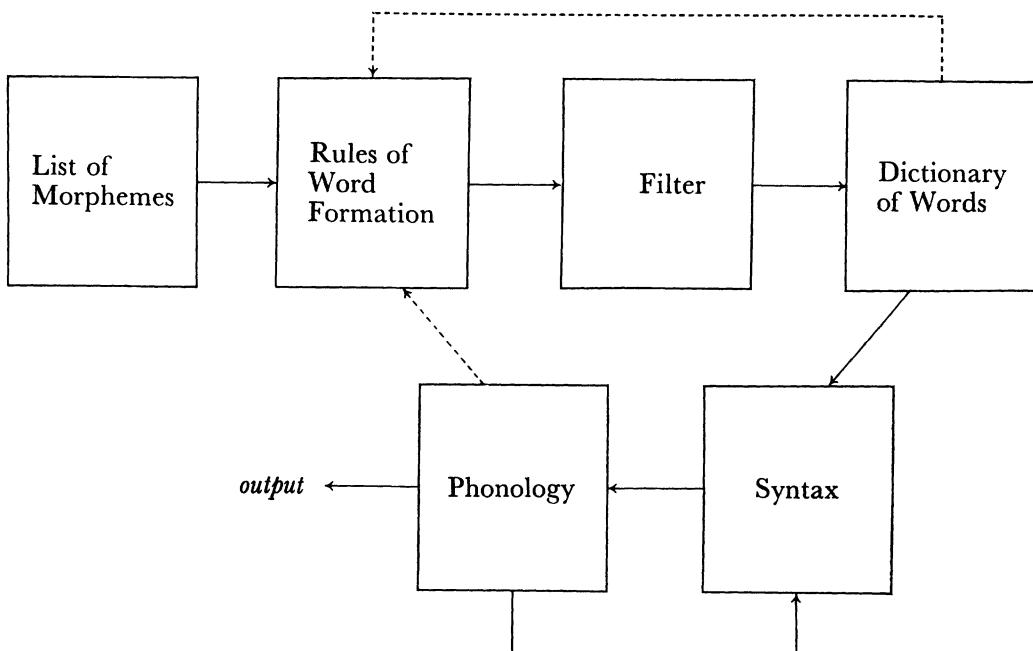


Figure 1

define the *potential* words of the language. The set of *actual* words is obtained from that of the potential words by applying to the latter the modifications indicated in the filter. One can think of the morphology, then, as producing a long list of words; it is this list that is designated by the term *dictionary*. I should like to propose further that the lexical insertion transformations be thought of as selecting items from the dictionary and as entering these in appropriate slots in structures representing the underlying constituent structure of particular sentences. It is to these underlying representations that the syntactic transformations apply in the by now familiar fashion and generate what has been called the *surface structure*. I shall assume that the large body of phonological rules—rules like the overwhelming majority of those discussed in *The Sound Pattern of English* or other works of generative phonology—apply to the surface structure, and I shall disregard here the refinement that is necessitated by the fact that at least some phonological rules apply as part of the transformational cycle of syntax; cf. Bresnan (1971) and (1972).

A few words must be said here about a problem which arises with regard to the lexical insertion transformations. I proposed above that the lexical insertion transformations have access only to words in the dictionary and, moreover, that the dictionary contains only (and all) fully inflected forms of the language. This proposal might appear to run into a difficulty, for the case which a given noun takes in a sentence is normally determined by its position in surface structure, whereas lexical insertion takes place at a much earlier stage in the derivation. This difficulty, however, is not insurmountable. One might propose that instead of inserting a single item, the lexical insertion transformations insert partial or entire paradigms, i.e. certain or all inflected forms of a given “word”. A perfectly general convention can then eliminate all but the one inflected form that fits syntactically into the configuration in which the word is found in surface structure. There are, of course, other equally plausible ways of surmounting this difficulty. However, since I am concerned only to show that the difficulty is not one of principle, I shall not explore here any of the other alternatives.

I do not find it surprising that the lexical insertion transformations characteristically affect paradigms rather than single dictionary entries. It is well known that paradigm pressure plays a potent role in the evolution of languages. For example it is because of paradigm pressure that Russian has lost the consonantal alternations *k* ~ *č* ~ *c* in the nominal inflections. In fact, paradigm pressure provides a very plausible explanation for the “accidental gaps” in the Russian conjugations illustrated in (8) above. If paradigms can influence the evolution of language then there is every reason to expect that paradigms must appear as entities in their own right somewhere in a grammar. If my proposal is correct one such place would be the dictionary, from which the lexical insertion transformations draw items for insertion into a sentence. Note, incidentally, that if this is correct then the dictionary must be organized into paradigms in some way and it would then no longer be equivalent to the logical product of the morpheme list, the word formation rules, and the exception filter.

I now turn to an examination of the character of the word formation rules. It is hardly to be doubted that languages have words which consist of linear strings of morphemes without internal structure, e.g. (9).

- (9) serendip + i + ty vac + ant tot + al bro + ther hand + some  
be + lieve

I shall assume that words of this type have the structure shown below by virtue of the existence of word formation rules that express this fact, perhaps in the manner of templates such as those in (10):

- (10) [STEM + *i* + *ty*]<sub>N</sub> [STEM + *ant*]<sub>A</sub> [STEM + *al*]<sub>A</sub> [STEM + *ther*]<sub>N</sub>  
[STEM + *some*]<sub>A</sub> [*be* + STEM]<sub>V</sub>

Presumably the stems in the list of morphemes will be appropriately marked so that a given stem will be substitutable only in certain frames and not in others.

It is important to observe that the rules responsible for the formation of such words as those in (9) will not only assign to each word the appropriate lexical category (e.g. tell us that *serendipity* is a noun whereas *handsome* is an adjective), but they must also provide as much of the semantic and syntactic information concerning the word as is general and shared by other words produced by the rule (the remaining information, being idiosyncratic, will be provided by special entries in the exception filter). In particular, the word formation rule must include some information about the subcategorizational and selectional restrictions to which the words are subject.

Of a somewhat more complex structure than those above are words that are derived from other words. Thus, in English we have nouns derived from verbs as in *arrival*, *refusal*, or *condensation*; nouns derived from adjectives as in *profanity*, *obesity*; verbs derived from adjectives as in *darken*, *stiffen*, *blacken*; or adjectives from verbs as in *explanatory*, *anticipatory*, *obligatory*, etc. To capture such facts as these we would presumably have to have word formation rules of a form such as

- (11) [VERB + al]<sub>N</sub> [ADJ(+i) + ty]<sub>N</sub> [ADJ + en]<sub>V</sub> [N + ish]<sub>A</sub>

Word formation rules define, in part, the content of the dictionary. However, in order for rules of the type illustrated in (11) to operate properly, they must have access to the dictionary, for it is only there that such crucial information as that *arrive* is a verb of English will be found. In other words, it must be presumed that word formation rules not only have available the information contained within the string on which they are to operate, but also have access to the content of another component of the grammar. This is an important formal difference between word formation rules and the more familiar phonological rules.

That the content of the dictionary affects the formation of words is hardly to be doubted. Thus the existence of *arrival* and *confusion* is one reason why English lacks \**arrivation* and \**confusal*. However, it must immediately be noted that this cannot be

the whole explanation, for doublets such as *recital* and *recitation*, *transmittal* and *transmission* do exist side by side.

Like the word formation rules in (10), the rules exemplified in (11) will have to provide information about general syntactic and semantic properties of the words generated. In this connection the question immediately arises how a grammar is to reflect the fact that a derived word quite commonly shares semantic and syntactic properties with the word from which it is derived (with its source word). It must be noted that the sharing of common properties is normally far from complete; as documented most recently by Chomsky (1972), there are numerous asymmetries as well as apparent and real irregularities in this domain, all of which must be properly treated by an acceptable theory of language. I review briefly the most important types of case that appear to arise here.

The most typical situation is one in which the derived words have special syntactic and semantic properties different from those of their source words. Thus, for example, by adding the suffix *-hood* to nouns designating human beings, nouns are produced that designate a state or quality such as *boyhood*, *priesthood*, etc. At the very least the word formation rules will have to supply the information that unlike their source words, the nouns derived with this suffix are abstract. The word formation rule might, in this case, assign to the derived nouns the feature [+Abstract].

Somewhat more intricate are the cases where words of one lexical category are derived from words of another category; e.g. the noun *refusal* from the verb *refuse*. Cases of this sort might be handled along the lines of the Base Structure Hypothesis suggested by Chomsky (1972), which impresses me as the most plausible means yet proposed for capturing the obvious linguistic universal that each lexical category has characteristic syntactic and semantic properties of its own.

Related to the preceding, but requiring some further machinery in the rules of word formation, are those cases where the same selectional restrictions apply in one subcategorization frame in the source word, and in another subcategorization frame in the derived word. For example, verbs derived from adjectives with the suffix *-en* can take as their objects those nouns of which the source adjectives can function as predicates. It is necessary, therefore, that the word formation rule be capable of treating selectional restrictions independently of the subcategorization frames in which these restrictions are embedded. In view of my very rudimentary understanding of what is involved here, I am not in a position to make useful concrete proposals about how this might be implemented. I trust, however, that the nature of the problem is clear from the brief remarks above.

As has been noted repeatedly above, word formation rules function in such a way as to involve a large number of exceptions and idiosyncrasies of all sorts. These will be handled with the help of the exception filter in the manner sketched above.

Returning once again to the rules illustrated in (11), it is necessary to observe that in spite of the nested constituent structure of the words generated by the rules

illustrated it is not the case that phonological rules invariably apply to derived words of this sort in the familiar cyclic fashion. While some derived words have nested constituent structure at the stage where phonological rules apply, others do not. For example it has been argued in *The Sound Pattern of English* and elsewhere that words such as those in (12a) must be presumed to have internal constituent structure, whereas words such as those in (12b) must be presumed to be formed by a linear concatenation of morphemes.

- (12) a. exaltation relaxation elasticity obligatory declarative assimilatory generative
- b. consultation information

The reason for this differential treatment of what appear to be very similar words is obscure at present. I know, however, of no other plausible way of accounting for the differences in stress and reduction in the pretonic vowel than by postulating a difference in constituent structure.

Perhaps somewhat more perspicuous is the following example from Russian. We recall that in Russian a string of morphemes containing no stressed vowel will be subject to the Oxytone rule which assigns stress to the last syllable. To form diminutive nouns, Russian makes use of the rule

- (13) [N + *ək*]<sub>N</sub> where N represents a noun

Nouns formed by (13), like all nouns of Russian, are subject to a further rule which spells out the individual case form by adding a desinence to the suffix, i.e.

- (14) [N + *ək* + Desinence]<sub>N</sub>

Accordingly, the diminutive form of the noun *gorod* 'town' is in the dative plural

*gorod* + *ək* + am

Since *gorod* is an unstressed stem the Oxytone rule will apply here and we shall get as output

*gorod* + *ək* + am

It is obvious that the diminutive just generated is a noun and hence can by itself occupy the *N* position in (13). We find, therefore, in Russian the noun

*gorod* + *ək* + *ək* + am [gəradóčkam]

Curiously, here the stress is placed not on the desinence as might have been expected but on the first diminutive suffix. This result can be obtained with no difficulty if the Oxytone rule is allowed to apply cyclically and the string under discussion is supplied with the constituent structure:

[[*gorod* + *ək*]<sub>N</sub> + *ək* + am]<sub>N</sub>

It turns out that when *ək* is suffixed to a noun which itself is formed by suffixation, then the resulting noun has internal constituent structure; when *ək* is suffixed to a nonsuffixed noun the resulting word does not have constituent structure. This is still far from an adequate explanation, but it suggests a direction in which to explore further.

It has been noted above that rules of word formation must have access to the dictionary; i.e. that certain words presuppose the existence of other words. This fact would require that word formation rules be formal devices of considerable power. It would, however, seem that even this increase in power is not sufficient and that additional power is required by these rules. To see this, consider the formation of the inchoative verbs in English with the suffix *-en*. These deadjectival verbs have recently been studied by Siegel (1972) who has noted that they are subject to the phonetic condition that their base must be monosyllabic and end with an obstruent, which optionally may be preceded by a sonorant. It is for this reason that we have the verbs in (15a) but not those in (15b).

- (15) a. blacken whiten toughen dampen harden  
       b. \*dryen \*dimmen \*greenen \*laxen

It should be noted that the “words” in (15b) are phonetically well formed in English as shown by the existence of the words in (16).

- (16) lion women Keenan flaxen

The above phonetic condition, therefore, is limited to the particular verbs under discussion. The condition, however, appears to be a condition not on the string formed by the rule but rather on the string after the phonological rules have applied to it.

To see this, consider the verbs

- (17) soften fasten moisten

These verbs are clearly derived from the adjectives and would have in their underlying representation the form

- (18) soft + n fast + n moist + n

These strings, however, violate the constraint against obstruent sequence appearing before the inchoative suffix. It is, of course, immediately obvious that because of the phonological rule which deletes [t] in the environment s— $\left\{ \begin{matrix} 1 \\ n \end{matrix} \right\}$  these forms will appear in the output with a single obstruent, thus conforming to the condition above. But if this is indeed the correct reason for the well-formedness of *moisten* as contrasted with the ill-formedness of *laxen*, then it must be supposed that the rules of word formation have access not only to the dictionary but also the output of the phonology. In other

words, we are saying, in effect, that a word formation rule will produce acceptable words if the words formed by this rule conform to certain conditions when they have been acted upon by the rules of the phonological component. This is clearly quite unlike the more familiar rules of phonology which will or will not apply to a string depending only on the characteristics of the string in question.

To support further the need for word formation rules to have access to the output of the phonology I discuss below the formation of the present adverbial participle of certain Russian verbs. This form is composed of the verb stem which includes the root followed optionally by any number of derivational suffixes terminating with a so-called verbalizing suffix; a present tense marker, which is either *i* or *e*; and the present tense adverbial participle marker *n* (cf. Lightner 1965):

$$\text{Root} + (\text{suffix}) \dots (\text{verbalizing suffix}) + \begin{cases} i \\ e \end{cases} + n$$

Russian phonology includes a process termed "transitive softening" which consists in the replacement of labials by clusters of labial and palatalized liquid, and of other obstruents by palatals (*t, k* → *č*; *d, g*, *z* → *ž*; *s, x* → *š*). Thus we find alternations such as those in (19).

(19)	<i>past (fem. sg.)</i>	<i>present (3. sg.)</i>
	sypala	syplet 'pour'
	toptala	topčet 'stamp'
	dvigala	dvižet 'move'
	rezala	režet 'cut'
	pisala	pišet 'write'
	pekla	pečet 'bake'

The conditions under which "transitive softening" takes place are statable in purely phonological terms (cf. Lightner 1965), and these conditions would incidentally be satisfied by the strings underlying some present adverbial participles. We would, therefore, expect such adverbial participles as

(20)	*syplja	*topča	*dviža	*piša	*peča	*reža
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As a matter of fact, none of the words in (20) is actually used (cf. Švedova 1971, §1012) because there appears to be a very strong tendency in the language to avoid present adverbial participles of verbs that exhibit "transitive softening" in the present adverbial participle but not in certain other forms (e.g. past tense).<sup>3</sup> It should be stressed that the restriction against forms that have undergone "transitive softening" applies only in the present adverbial participle but not in other words derived from the same stem. Thus, the nouns in (21) are perfectly good Russian words, although each one of them is subject to "transitive softening".

<sup>3</sup> This tendency might also be one of the reasons for the "gaps" in the paradigms cited in (8) above.

- (21) kaplja 'drop (of liquid)' vstreča 'meeting' gospoža 'lady' noša 'burden'  
sveča 'candle'

When examples of the sort just presented have been discussed the assumption has usually been made that rules of word formation are part of the phonology (cf. e.g. Chapin 1970) and the conclusion has, therefore, been drawn that phonological rules must be much more powerful devices than had heretofore been supposed. In particular, in past studies of generative phonology it has been assumed that the decision of whether a given rule should or should not be applied to a string depends solely on the composition of the string at the point in the derivation where the rule in question applies; it does not depend in any way on the shape of the string at a later or at an earlier point in the derivation. But as we have just seen, there are aspects of language that require the power of rules which have access to several stages in the derivation at once. It is obvious that, in general, one would not wish to replace less powerful by more powerful devices especially when it is known that the less powerful devices are capable of handling a very large part of the task at hand. Under such circumstances, it would be essential to attempt to limit as much as possible the domain in which the more powerful devices may be invoked. There seems to be a fairly natural way of achieving this, given the framework of grammar sketched above (cf. Figure 1) where the rules of word formation are distinct and separate from the rules of phonology. I would like to propose that the added power of having access to different stages in a derivation be available only to word formation rules, whereas the rules of phonology be restricted, as in the previous work, to information overtly present in the string at the point in the derivation at which the phonological rule applies.

The proposal just made amounts to saying that word formation is a fundamentally different process than phonology. In fact, it may well be useful to speak not of "rules of word formation" but rather, as has been suggested by Lakoff and others, of "derivational constraints that hold in word formation". In the case of word formation we are dealing with conditions that no string of morphemes can ever violate if it is to be admitted to the dictionary as a legitimate word of the language. While my own investigations of word formation in different languages are not extensive enough to allow me to place too much confidence in general impressions that I have gathered, nonetheless it seems to me significant that I have yet to come across any clear instances where word formation rules have to be ordered in that tightly constrained fashion that is constantly encountered in true phonological rules. Moreover, to the extent to which I have been able to investigate proposed instances of "derivational constraints", these could always be captured with the help of rules that could be ordered ahead of the bulk of the phonological rules. Hence it is likely that these "derivational constraints" could be incorporated into the word formation component. I should like to propose therefore that the word formation component differs from the phonology by having completely different principles of interaction among rules. Whereas in the phonology

this interaction is captured by means of the convention of linear order of rule application, the interaction among word formation constraints may require a different principle altogether; e.g. simultaneous application. Needless to say, at this point this must remain in the realm of pure speculation.

I have proposed above that the syntactic component has direct access to the dictionary; i.e. that the lexical insertion transformations take items from the dictionary rather than from the list of morphemes. Although the content of the dictionary is entirely determined by the content of the list of morphemes, the rule of word formation and the exception filter, there is no need to assume that these components are always fully involved in every speech act. Instead it is possible to suppose that a large part of the dictionary is stored in the speaker's permanent memory and that he needs to invoke the word formation component only when he hears an unfamiliar word or uses a word freely invented. While this is by no means an exceptional occurrence, its frequency is quite low. There is a fundamental difference between the use of words and the use of sentences. In general, one uses familiar words, words one has heard and used before, and one does not expect to use or encounter new words, whereas one rarely uses sentences that one has encountered before. From the viewpoint of performance one might say that the role played by the rules of syntax and phonology differs fundamentally from that played by the rules of word formation. The knowledge represented by the latter might be said to be more passive than that represented by the former. If this were indeed the case, it might serve to explain the striking differences that appear to exist with regard to ordering, principles of application, etc. between rules of word formation and those of other components of the grammar.

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