

5: Adjustment Rules

5.1. The Place and Role of Adjustment

It should be possible for the phonology to process the word which is derived as the output of a WFR. However, such is not always the case. Rather, in certain instances the output of a WFR must undergo adjustment before the rules of the phonology may apply. This adjustment is performed by a class of rules which change the segmental shape of designated morphemes in the immediate environment of other designated morphemes. These rules are morphological, but in a different sense from the one we have used so far.

Up to now we have been concerned with morphology as a syntactic matter: how words are built up. But the word *morphological* is also part of the vocabulary of phonology. Traditionally, there are two different kinds of phonological alternations. First there are the alternations whose conditioning factors are totally phonetic (phonological). These alternations are the province of phonemics (with, in the American tradition, other additional strictures such as biuniqueness; cf. Chomsky (1964)). Alternations which are at least partly conditioned by other factors are subsumed under the rubric of morphophonemics. This would include alternations which are restricted to certain syntactic classes, those which have lexical exceptions or are entirely lexical (governed by individual words), and those which are morphologically governed, either in that they take place only in certain (classes of) morphemes, or in that they take place only in the environment of certain (classes of) morphemes.

As we noted in chapter 1, one of the major differences between generative phonology and earlier frameworks is that the former does not distinguish between phonemic and morphophonemic alternations (cf. Halle (1962)). Within generative phonology in its most general form, each morpheme (and phoneme) has a single underlying phonological form. The phonology is then an ordered set of rules which converts this underlying form into a surface phonetic form. This set includes rules of all the types mentioned, and rules of any one type may be interspersed with rules of other types.

Our adjustment rules comprise a small class of those which were previously termed morphophonemic, namely those which are restricted to specific morphemes and take place only in the environment of specific morphemes. The claim of this chapter is that these rules may be isolated from the rest of the phonology and ordered before it.

The goal of this chapter is then twofold: both to establish the reality of the class of phenomena which have been grouped under the head of adjustment, and to show how adjust-

ment interacts with the conception of Word Formation Rule which was elaborated in the last chapter.

We will distinguish two sorts of adjustment rules: *truncation* and *allomorphy*. A truncation rule deletes a designated stem-final morpheme before a designated suffix. A rule of allomorphy adjusts the shape of a designated morpheme or class of morphemes in the immediate environment of another designated morpheme or morpheme class. I will attempt to provide independent justification for each type.

5.2. Truncation Rules

A truncation rule deletes a morpheme which is internal to an affix, in the following general manner:

$$(1) \quad [[\text{root} + \text{A}]_X + \text{B}]_Y$$

$$\quad \quad \quad 1 \quad 2 \quad 3 \quad \rightarrow \quad 1 \quad \phi \quad 3$$

where X and Y are major lexical categories

All the rules of truncation which I have found in English apply exactly like the above schema; that is, they apply before suffixes, and only with + boundary affixes. I know of no general reason which would explain this, and the restrictions may well be accidental as far as I am concerned, and as far as our theory predicts.

5.2.1. +ee

Truncation rules are necessary within our theory simply because without them we often find cases of regularly derived words, semantically transparent, formed with affixes which we know to be alive and regular in their operation, which on the surface do not appear to have been derived from words. I will give an example. Consider the English suffix +*ee*, which was discussed briefly above. As Siegel (1971) notes, this suffix regularly attaches to verbs which are both transitive and take animate objects,¹ as with *presentee*, *employee*, and *payee*. Thus Siegel states the following rule of +*ee* Attachment:

$$(2) \quad +ee \text{ Attachment}$$

$$\quad \quad \quad [[]_V \quad ee]_N$$

$$\quad \quad \quad +\text{transitive}$$

$$\quad \quad \quad +\text{animate object}$$

Siegel notes, however, that there are a number of nouns in +*ee* which do not conform to the rule as stated. These are paired with, and presumably derived in some way from, verbs of the form *Xate*:

$$(3) \quad \begin{array}{ll} \text{nominate} & \text{nominee} \\ \text{evacuate} & \text{evacuee} \end{array}$$

Here the suffix +*ee* does not appear attached to any verb, but rather to the root of that verb, which can be obtained by deleting its last morpheme. Within a word-based theory of mor-

¹+*ee* used to attach to verbs which took animate indirect objects as well. This condition is now obsolete, though the forms still exist. Exceptions to the general case are *escapee*, *refugee*, *devotee*, *absentee*, *standee*.

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phology, such an attachment is impossible. Words of this sort would therefore seem to constitute very strong counterevidence to our theory, for though we know that *+ee* is a legitimate affix and that it is attached by a WFR, in this case the base is not a legitimate entity.

This problem is easily circumvented. All we need to do is to invoke a truncation rule of the form of (1), which operates after the WFR of (2). *+ee* will then attach to *Xate*, giving *Xate+ee*, which is legitimate in our theory, and subsequently *ate* will be removed from between *X* and *+ee*, giving us the form *Xee*² that is the input to the phonology. But simply invoking a rule of the form of (1) is not enough. We must show that it does something else than save our theory.

How do we handle a word like *evacuee* without a rule of truncation? Siegel's solution is to modify (2) as follows:

- (4) *+ee Attachment (revised)*
- a. as (2)
 - b. $[[\]_X ee]_N$
 where there exists Y_V
 +transitive
 +animate object
 such that $[Y]_V = [[\]_X \]_V$

There are several disadvantages to this solution which the previous one, utilizing (2) and truncation (1), does not have. In the following discussion of their relative merits, we will call the solution of (4) A and the other B.

I. B allows us to state the WFR as one rule. A forces us to bifurcate the WFR itself. Formally, (4a) and (4b) are two distinct and unrelated rules. If we want to establish some connection between them stating that we are dealing with the same affix, then we must invent some new mechanism (the nature of which I cannot really speculate on) to express this relatedness between rules. Our theory is of course built on a very strict "one affix, one rule" basis, permits only solutions of the form of B, and therefore avoids the extra mechanism. Apart from formal matters, there is the problem that (4a) fails to operate just in the places where (4b) operates. **Evacuatee* and **nominatee* are evidence of this disjunction. Within A we need an independent restriction on (4a) to the effect that it does not operate in the places where (4b) does. Of course no such restriction is needed within B. This will always be the case. Solutions of the B type will always entail a disjunction of surface types, which solutions of type A will always be forced to state independently and ad hoc.

II. A utilizes a labeled bracket $[\]_X$ in (4b). The label on this bracket has no significance external to the rule (4b). We must resort to it arbitrarily, in order to express the fact that *Xee* is an analyzable entity. Within B, there is no recourse to be had to arbitrary brackets. To the extent that we wish to rid any theory of arbitrary brackets, B is the more highly principled solution, for descriptions of this type *never* entail the use of other than syntactically motivated bracketing.

²The word *dedicatee* is an exception to the rule. We might trace its exceptionality to the fact that because of English spelling the *c* of *dedicee* would undergo the *k* → *s* rule, giving the surface form [dedisi:].

III. The condition on (4b) is strange. It says that we may have one word if there exists another from which it is not, strictly, derived. We have seen instances in which we may *not* have a given word if there exists another, and these were attributed to the blocking rule of the lexicon, which is a convention on slot-filling. However, the case at hand, which is positive rather than negative, can have nothing to do with the blocking rule. In fact, the only examples of such constraints as that on (4b) arise in cases where we could alternatively use a solution of the form B, which uses truncation, instead of the condition. Since truncation has more uses than the mere encoding of this constraint, and accommodates it incidentally and necessarily, a solution which uses truncation is to be preferred.

We see then that solution B enjoys several advantages over solution A. Solution A has only the merit of not necessitating a truncation rule. However, since it is the truncation rule itself which is the source of the advantages of B, we must suspect this latter advantage. Note that the desirable qualities of truncation exist completely apart from our theory of WFRs.

5.2.2. +ant

The advantages of I, II, and III, which a solution using truncation enjoys over one which does not, are very general ones. They will be evident in all cases. This next case, which is little more complex, shows us another sort of advantage of B over A, which will not always be evident.

A class of words closely related to those in *+ee* is that of nouns ending in the suffix *+ant*, such as *lubricant* and *complainant*. *+ant* can be said to be in some sense the active equivalent (not quite) of *+ee*. Words in this suffix fall initially into two classes: those which have some morphologically related verb (*complainant/complain, lubricant/lubricate*), and those whose roots are not free words (or cannot be related by truncation to free words) (*merchant, penchant, pedant*). We will disregard the second group, which is not interesting for our purposes, and concentrate on the first, those with related verbs. This class is further subdivided into two classes:

- (a) Those items whose related verb is of the form *X+ate*, such as *officiant* and *negociant*.
- (b) Those whose related verb is unsuffixed, such as *descendant* and *complainant*.

There is only one exception to this bifurcation: *deodorant*, which is related to the verb *deodorize*. Class (a) is of course morphologically unique, marked by the final morpheme *+ate*. It is the one morphological type which is especially productive with the suffix *+ant*. (Thirty-two of the 95 items in Walker (1936) which are in classes (a) or (b) are in class (a), a very high number for a single morphological class.) It is also semantically coherent, as expected by our general association of productivity and coherence.

Now, there are two ways to state the *+ant* rule, corresponding exactly to the two ways we had to state the *+ee* rule. We will again refer to the solutions as A and B, where B refers to the solution which utilizes a rule of truncation, and where A uses two WFRs instead (one for the (a) cases, and one for the (b) cases). All the arguments I, II, and III of section 5.2.1 apply in this case, in favor of the B (WFR plus truncation) solution. In addition, however, we have

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to encode the productivity fact, something which did not arise in the case of *+ee*. Within the B solution, the productivity of class (a) (*X+ate* base) is no problem, for the WFR precedes the truncation rule, which happens to remove the relevant environment for the statement of the productivity. In solution A, however, words of the form *X+ate* only show up in a condition on a WFR (. . . where there exists a word of the form *X+ate*. . .) as in (4b). We have correlated productivity with the morphology of the base; moreover, we have found a simple way to express this fact within a theory which uses word-based WFRs, and we see now, crucially, truncation rules. Without truncation rules, this whole system falls apart, for what we take to be the defining morpheme of the productive class of bases never appears in a WFR itself, but only in an ancillary condition on one.

There is additional evidence here in favor of the truncation solution, evidence in the form of exceptions. From *inflate* and *dilate* we expect to have the words **inflant* and **dilant*, instead of which we get *inflatant* and *dilatant*, seemingly contrary to the truncation rule. However, these exceptions can be easily explained. There is a constraint in English against nonsyllabic roots. If *+ate* were a suffix with the two verbs in question, then they would have the following morphological forms:

(5) in=fl+ate di=l+ate

This gives us the roots **/fl/* and **/l/*, which we know on independent grounds to be impossible. Therefore, (5) is the wrong representation for the verbs, and it must rather be (6):

(6) in=flate di=late

But then *-ate* is not a morpheme, for it has no boundary; that is, it is not *+ate*. Therefore, truncation, which is defined as applying only to morphemes, will not apply here.

It is important to note that these exceptions are not isolated. The same thing happens with the truncation of *+ate* before *+able*.³ Normally, *+ate* truncates here as in (7):

(7) relegate relegable
penetrate penetrable
consecrate consecrable

However, with the verbs of (6) this is impossible:

(8) inflate *inflable inflatable
dilate *dilable dilatatable

Because all truncation is restricted to morphemes, there is no need to note these exceptions in any way within a theory incorporating rules of truncation. However, within a theory which does not have truncation rules, some other means must be found to encode this generality. Within A, the only way is to put a restriction on the conditions on rules of the form (4b). Since this restriction is completely ad hoc within theory A, we are led to prefer the theory which utilizes truncation, for in that theory we need no unprincipled restriction at all.⁴

³ Truncation takes place only before *+able* and not before *#able*. Cf. chapter 6 for further discussion.

⁴ I am arguing ahead of myself here. As defined, Truncation intrinsically follows all WFRs.

5.2.3. Comparative +er

For those who are beginning to suspect some intimate connection between truncation and the suffix +ate, I provide this last and most striking case, which has to do with the adverbial suffix *ly* and the comparative suffix +er.

Except in a few suppletive cases, the comparative of adjectives may be formed in two distinct ways:

- (a) The suffix +er is attached to the adjective, as *big/bigger, small/smaller*.
- (b) The independent word *more* is placed in front of the adjective, as in *more interesting*.

The choice between (a) and (b) is determined phonologically. Monosyllables, and disyllables ending in *y*, take (a) (*stupider* and **apter* are exceptions); all others take (b). Some disyllables in *y*, namely those which can be analyzed as *X+ly*, take either (a) or (b). The following table illustrates the various restrictions:

(9) <i>adj</i>	<i>more adj</i>	<i>adj-er</i>
big	*more big	bigger
fast	*more fast	faster
happy	?more happy	happier
silly	more silly	sillier
lovely	more lovely	lovelier
sprightly	more sprightly	sprightlier
comely	more comely	comelier
perverse	more perverse	??perverser
flagrant	more flagrant	*flagranter
pompous	more pompous	*pomposer

Turning to adverbs, we observe that monosyllables take +er:

- (10) He ran fast/faster/*more fast today.
- (11) He ran slow/slower/*more slow yesterday.

Most disyllabic and longer words take *more*:

- (12) He did it skilfully/*skilfullier/more skilfully.

Disyllables of the form $C_0VC_0A+ly_{Adv}$, that is, those formed from adjectives by the regular adverb rule, are odd:

- (13) a. I am strongly inclined to believe it.
b. I am more strongly inclined to believe it.
c. I am stronger inclined to believe it.
- (14) a. He ran quickly (*quick).
b. He ran more quickly.
c. He ran quicker.

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- (15) a. He spoke softly (*soft).
 b. He spoke more softly.
 c. He spoke softer.

The (a) and (b) forms in each of the paradigms are expected; the (c) forms are not. If *+er* were attached to disyllabic adverbs ending in *y*, as it is to such adjectives (cf. (9)), then we would expect the forms **stronglier*, **quicklier*, **softlier*, which are not only nonoccurring, but also impossible. The simplest and most elegant solution to the problem is to formulate a truncation rule which operates only on the class of adverbs in question.

- (16) *Adverb +er Truncation:*

$$\begin{array}{cccc}
 C_0 VC_0 +ly+er_{Adv} & & & \\
 1 & 2 & 3 & \rightarrow \\
 1 & \phi & 3 &
 \end{array}$$

By using the truncation rule (16), which is ordered after WFRs like all truncations, we allow ourselves to state exactly the same conditions on the distribution of *+er* and *more* for adverbs and adjectives. The only difference between the two classes is the operation of rule (16) in the former, though not in the latter.

No other solution is unproblematic. If deletion (truncation) applies before the WFR, more or less as in an A solution, the conditions for *+er* attachment are met (monosyllables); but, in order to permit the derivation of the (b) forms as well, we must somehow make the deletion optional. We then cannot capture the parallel between the present instance of being allowed to form two comparatives, and the corresponding instances in (9). This is the *+ant* problem in another guise. In addition, if we delete before the comparative rule applies, what is the category of the item we form the comparative from? If from *softly* we go through *soft* to *softer*, is this *soft* an adjective, as it should be if the *ly* rule is to have any validity? But, if it is an adjective, then do we form the comparative of an adverb in these cases from an adjective? And, if it isn't an adjective, then what is it? -- for it is clearly not an adverb. This is the problem of the label (II) of section 5.2.1 in another guise.

We see then that not only does the solution which incorporates a truncation rule avoid all the difficulties which are attendant on other solutions in the case at hand, it also allows us to express a generalization of some interest and to collapse the comparative-forming rules for adjectives and adverbs.

Alan Prince has pointed out to me that substantially the same situation holds for superlatives as for comparatives, and that we might wish to extend the truncation solution to those forms as well, in which case truncation of *ly* would take place before a class of morphemes rather than before a single morpheme.

He has also noted that the truncation is restricted syntactically. Only the *more* form occurs before an adjective:

- (17) more deeply philosophical
 *deeper philosophical
 more frankly phony
 *franker phony

Since I have not looked at conditions on truncation rules, I cannot really comment on the import of this case. It is an open question at present whether comparative formation itself is a syntactic or derivational phenomenon. If it is syntactic, then it does not strike me as odd that the specification of the form of the comparative should depend on the syntactic environment of the compared adverb. But this must await further investigation.

5.2.4. *TruncaWFRs*

One simple way to avoid truncation altogether is to build truncation processes into WFRs. This is at first not implausible. As we have seen, it seems likely that for languages like Hebrew at least, WFRs must be powerful enough so that they can not only add phonological material, but also replace one piece of phonological material with another (replacing vowel patterns). If WFRs need to do this anyway, then we must question the necessity of truncation rules. We could, for instance, have *+ant* simply replace *+ate*, and *ruminat*e would become *ruminant* in one step.

The answer to this suggestion lies in the “one suffix, one rule” ethic. If we allow a WFR to do the work of a truncation rule in this or any other case, we will need a separate WFR for each morphological subclass of the base where truncation operates. In this case we need two *+ant* rules, one which truncates, and one which does not. We then run into the problem of how to relate the rules, a problem which, as noted above, truncation avoids by its very essence.

The “one suffix, one rule” ethic is the same as the unitary base hypothesis. Truncation rules serve the same function as does the separate statement of morphological conditions on the base. We are trying to extract a central core for each rule, which will be uniform and will not vary with morphology. The various peripheral devices are then called upon to adjust this ideal situation to the vagaries of reality. This is the prime motivation behind the separation of the various types of rules. Of course, mere esthetic motivation is not sufficient; we must have empirical confirmation of the merit of our system. This I have tried to provide.

5.2.5. *Truncation and Phonology*

Though truncation as a process does not resemble greatly any phonological rule type that I am aware of, one must still ask what the relationship is between the two, as we did with WFRs. As far as I can tell, truncation rules, like WFRs, never have to be ordered among phonological rules. All the cases I have found, which involve + boundary affixes, can be ordered before all phonological rules. Some Russian examples are discussed below, in one of which a truncation rule interacts with the phonology. There, we seem to be dealing with a # boundary affix, which triggers truncation of the last morpheme of the base, but not until the cyclic rules have been applied to the base. If this is indeed what is going on in this case, we can correlate the place of the truncation rule in the phonology with the boundary of the affix before which truncation takes place. The ordering of truncation rules with respect to the phonology would then exactly correspond to that of WFRs, which, as we noted, is a function of boundaries. The problem is that in order to establish the validity of the Russian example, a much greater knowledge of Russian phonology is needed than I have at present. Even in the light of the Russian case, it is clearly possible to claim that truncation is not a phonological process, in the same way we

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claimed that WFRs were not phonological, while at the same time maintaining that truncation rules are not WFRs. Truncation rules will now be intrinsically ordered after WFRs, and will enjoy (probably, though the evidence is scanty) the same ordering with respect to the phonology that these latter do.

5.2.6. Russian Truncation

The truncation mechanism proposed above is not novel. Though I know of no explicit mention of such a mechanism within the scant modern work on English morphology, there is at least one very thorough discussion of truncation in the literature. This is an article in Russian by A. V. Isačenko (1972), whose title translates as “The Role of Truncation in Russian Word Formation”.

Many of the truncation phenomena which Isačenko discusses are strikingly similar to those I have found in English (as indeed the case should be if there is any real significance to the device). Because of this coincidence, and because Isačenko’s work may not be readily accessible to the reader of this monograph, I give below a brief summary, with comments, of the relevant examples.

Isačenko discusses various truncation rules which prevent surface suffix doubling. For example:⁵

$$\{ov\}_1 + \{ov\}_2 \rightarrow \{ov\}_2 : \left\{ \begin{array}{l} (suvor+ov) + (ov+, \#c) \\ (roz+ov) + (ov+at) \end{array} \right\} \rightarrow \begin{array}{l} suvórovec \\ rozovátyj \text{ (} yj \text{ is an inflectional ending.)} \end{array}$$

Structurally, this rule is very similar to an English rule discussed below:

(18) Truncation

$$\begin{array}{cccc} X+ate_V + At+ivn_N & & & \\ 1 & 2 & 3 & 4 \\ 1 & \phi & 3 & 4 \end{array}$$

First, $X+ov$, like $X+ate$, need not be semantically decomposable; that is, X need not occur as a free stem. Second, it is the first occurrence of the suffix which deletes.

A second rule of double suffix truncation involves the suffix $\#sk$, by which *leningrádskij* is derived from *leningrád*. When a stem is of the form $X+sk$, as in *tómsk*, truncation takes place: *tómskij*/**tómsskij*. It is important to note in connection with this rule that not all Xsk roots allow truncation. So, for example, we find *básk*/*báskskij*, not *básk*/**báskij*. From data such as these, Isačenko concludes that only morphemes truncate and that *bask* is monomorphemic. It has already been seen, in the case of the exceptional behavior of forms such as *inflate/inflatant*/**inflant*, that the same holds of English truncation rules: only morphemes truncate.

Isačenko stresses the importance of semantic evidence. Often one form is based on another not only formally, but semantically as well. Within a word-based theory, truncation rules allow us to express these semantic regularities. Isačenko gives two particularly elegant

⁵ The transcription and notation are Isačenko’s in all the Russian examples cited below. In particular, $\#$ stands for the vowel(s) commonly termed *yer*; it is not a boundary.

examples of the use of truncation to capture semantic facts. These examples also involve phonological evidence of a type which I have not found for any English truncation rule, but which further search will hopefully reveal.

The first case has to do with truncation of the adjective suffix #*n* in deadjectival verbs, whose semantics may be roughly described as V = 'make (self) adj.' For example:

(19) oburžuázit, 'make bourgeois' vs. buržuáznyj 'bourgeois'

Unless we derive the verb from the adjective, and subsequently truncate the #*n* before the verbalizer (*it*, or *et*.), we cannot express the semantic facts in a simple manner. In many cases the adjective in question is related to a noun, from which one might wish to derive the verb; no truncation rule would be necessary if this were done, since the noun consists of the bare stem, without the adjective marker #*n*. Isačenko shows that in several instances such a derivation is phonologically impossible.

For example, the adjective *sekrétnyj* 'secret' is formed from the noun *sekrét* 'secret'. One might be tempted to derive the verb *zasekrétit*, directly from the noun, obviating the truncation rule. However, in a case like *cyngótnyj*_{Adj}/*cyngá*_N 'scurvy_{Adj/N}', the verb (*cyngótet*, 'become ill with scurvy') cannot be derived phonologically from the noun. This is evidence for using the truncation rule in all cases.

The second such case has to do with verbs with the following form:

(20) o+bez+N + verbalizer (obezumet.)

Such verbs are traditionally derived from the phrase *bez N* 'without N' and are semantically characterized as V = 'make Nless'; thus *bez umá* 'without a mind', *obezúmet*, 'make mindless'. Isačenko argues that such a derivation is incorrect, and that the verb is derived rather from the adjective *bez+N+#n* (here *bezúmnnyj*), the #*n* adjective ending being truncated in the same way as in the case discussed above. Isačenko presents three pieces of phonological evidence to support his contention. These can be extracted from the following paradigm:

(21)	<i>bez N</i> 'without N'	<i>bez+N+#n</i> _A 'Nless'	<i>o+bez+N+verbalizer</i> _V 'make Nless'
a.	<i>bez umá</i> 'mind'	<i>bezúmnnyj</i>	<i>obezúmet</i> ,
b.	<i>bez lóšadi</i> 'horse'	<i>bezlošádnnyj</i>	<i>obezlošádet</i> ,
c.	<i>bez vredá</i> 'harm'	<i>bezvrednnyj</i>	<i>obezvredít</i> ,
d.	<i>bez vody</i> 'water'	<i>bezvódnnyj</i>	<i>obezvódit</i> ,
e.	<i>bez zemli</i> 'land'	<i>bezzemél,nyj</i>	<i>obezzemélit</i> ,
f.	<i>bez nadéždy</i> 'hope'	<i>beznad,óžnnyj</i>	<i>obeznad,óžit</i> ,

(I) The first piece of evidence is of the same sort as the last case. In (21f), the vowel *e* of the noun corresponds to *o* of the adjective. The verb has the same vowel as the adjective, and thus must be derived from it, for phonological reasons.

(II) Second, the place of the stress, which is unpredictable on the noun, is constant on the adjective (pre-desinential). The verb has the same stress as the adjective. Since the stress of verbs with the verbalizing suffixes *i* and *e* is not usually predictable, one must derive the verb from the adjective.

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(III) Finally, in (21e) there is a complex phonological connection between the noun and the adjective. This is because of the presence of *yers* (represented by #) in the stem /zem#1,/ and the suffix /#n/. # vocalizes before a syllable containing another #, otherwise it drops.⁶ So /bez+zem#1,+#n+yj/→/bezzemel,nj/. (The first # vocalizes and the second deletes.) The second *yer* provides the crucial environment for the vocalization, and vocalization must precede deletion. In the corresponding noun, since there is only one #, the vocalization rule cannot apply, and this #, which was vocalized in the corresponding adjective, is deleted: *zempl,a*. However, in the verb, which like the noun should have only one underlying # (that of the root), this # is unaccountably vocalized. Unaccountably, that is, unless we derive the verb from the adjective. The # of the adjective suffix will cause the # of the root to vocalize, and the suffix will be deleted via the familiar truncation rule. The derivation of the verb is given below:

(22) <i>Input 1</i>	bez+zem#1,+#n _A	
	e	# Vocalization
	é	Stress
	φ	# Deletion
<i>Output 1</i>	bezzemél, +n _A	
	o+ <i>output 1</i> + it,	WFR
	obezzemél, + it,	Truncation

There is no other plausible way to produce the correct surface reflex of the # in the verb. An example such as this provides the strongest sort of evidence possible for the existence of truncation rules. As I have already noted, I have not been able to find such strong evidence in English, but the similarity of the English truncation rules to those which are posited for Russian, as well as the existence of this evidence for the Russian rules, provides indirect support for the positing of the truncation mechanism as a general one and thus provides support for a word-based theory of morphology. We see that this is so because, as I have stressed, it is only in this type of theory that the truncation mechanism is necessary, and it is only in this theory that truncation rules must follow Word Formation Rules.

5.2.7. German *ge-* Deletion

Not all rules which delete specified morphemes are rules of truncation. In order to be a rule of truncation, a rule must have an entirely morphological environment. A rule which deletes a specific morpheme, but in a phonological environment, is not a rule of truncation. An expected consequence of this differentiation is that the latter sort of rule can be ordered among the rules of the phonology, for it is a phonological rule. We will give an example: the rule which deletes the prefix *ge-* in German past participles. We will discuss this rule as formulated by Kiparsky (1966).

⁶I have glossed over the problem of the # vowel. Isačenko notes that this vowel must be deleted before the truncation rule applies. Such an ordering is not possible within a theory which sharply separates truncation rules from the phonology. The whole depends on the reality of the # vowel. Its existence is supported by Halle (1973b) but not by the general theory of Kiparsky (1973), for # is a forbidden abstract segment. If we accept Kiparsky's position, then the rule deleting # is no longer a problem, for it cannot exist.

In German, past participles normally have the prefix *ge-*, when the first syllable of the participle is stressed. Otherwise *ge-* does not appear. However, there is a class of exceptions to this simple generalization. Consider the following two sets of participles, both of which are verbs in the inseparable prefix *miss-*:

- (23) a. *missfällen*, *missbräucht*, *missbilligt*
 b. *missverstanden*, *missgestaltet*, *missinterpretiert*

According to our simple statement of the distribution of *ge-*, it should show up on the participles in (23b), since the stress in these cases falls on the first syllable. Kiparsky solves this problem by a judicious ordering of independently motivated rules. He notes that the prefix *miss-* is itself stressed only before an unstressed stem syllable, as in (23b), in which case the stress on the stem itself is reduced by general convention. If we hypothesize that the absence of *ge-* in (23b) is determined before the stressing of *miss-*, i.e. between the rule that gives the stem stress and the rule which stresses *miss-*, then we can preserve the generalization that *ge-* does not appear before unstressed initial syllables, since the *miss-* in the items in (23b) is not stressed until after the *ge-* distribution is established.

Note that if we posit a rule of *ge-* Deletion, a rule which deletes a specified morpheme, then this rule is ordered between two phonological rules: the rule which stresses the stem and the rule which stresses *miss-* before an unstressed stem syllable. If *ge-* Deletion were a rule of truncation, then this ordering would constitute a counterexample to our general claim that rules of truncation cannot be ordered among phonological rules. However, consider the condition under which *ge-* deletes: before an unstressed syllable. This is not a morphological condition, but rather a phonological one. Therefore, *ge-* Deletion is not a rule of truncation and hence is no counterexample to our general claim.

I have adduced this example because I wish to make it clear what the extent of the ordering claim is with regard to truncation rules. As we have formulated the notion, not all rules which contain morphological information are rules of truncation or allomorphy. Only those rules which delete specific morphemes in the context of other specific morphemes are truncation rules. I am claiming that these specific rules are ordered before all the rules of the phonology. I am making no claims with regard to other rules which may be similar to these in certain respects. The ordering of a rule such as *ge-* Deletion is not predicted in any way by the theory of truncation rules being presented here.

5.3. Allomorphy Rules

A rule which effects a phonological change, but which only applies to certain morphemes in the immediate environment of certain other morphemes, we will call a rule of allomorphy. We will claim that such rules are external to the phonology in the same way that truncation rules and WFRs are.

An important restriction on the power of rules of allomorphy is that they cannot introduce segments which are not otherwise motivated as underlying phonological segments of the language. This of course makes them very different from rules of the phonology. It also places

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a rather strong constraint on a powerful device. Unconstrained rules of allomorphy are the most powerful means of expressing phonological alternations available. They are capable of encoding all types of behavior, exceptional and regular, and do not differentiate between the various types. The ordering of allomorphy rules before the rules of the phonology, strict limitations on the environment in which these rules may operate, and the restriction to underlying phonological segments, greatly constrain this otherwise omnipotent device.

Allomorphy rules are different from truncation rules in that the former look like phonological rules, while the latter do not. Our first task is thus to isolate allomorphy rules from phonological rules. The major claim to be made in that regard is that rules which have the formal property of being restricted to certain designated morphemes, in the immediate environment of certain other designated morphemes, are always outside (previous to) the phonology. We then see that, in their restriction at least, allomorphy rules are the same as truncation rules, and that they have the same ordering properties with respect to the rest of the grammar. We therefore group them together as rules of morphological adjustment.

In accord with the order of tasks, we will first provide a relatively detailed account of certain problems which arise if we attempt to give a detailed analysis of English nouns of the form *Xion*. We will show how these problems can be solved by positing a class of rules of allomorphy. Then we will see how these rules fit into our general theory of word formation and morphology.

5.3.1. *ion*

This section is a detailed study of the English suffix *+Ation* and its variants, and of the variation it conditions. We will refer to the suffix as *ion*, but this is merely for typographical convenience. The basic form of the suffix we will suppose to be *+Ation*; this is the form inserted by the WFR of *ion*.

The suffix is very widespread and productive. Walker (1936) lists about 2,000 words ending in it, comprising a total of approximately 4% of the words listed in that dictionary. In its active use as a WFR, *ion* is a deverbal abstract action nominal suffix, with both active and passive senses (*fascinate/fascination, relegate/relegation*). The semantics and syntax of the suffix are very interesting; however, we will not concern ourselves with these here. We will include in our study nominals whose stems are not free words (*compunction/*compunct, salvation/*salve* (on this reading)). We will also include the very few *ion* nominals whose bases are adjectives or nouns instead of verbs (*contrition/contrite, ideation/idea*).

Note that not all instances of orthographic *-ion* are to be taken as instances of the suffix *ion*. This includes all forms in which the *i* is syllabic (*dandelion, accordion, ganglion*), as well as words like *onion, companion, and million*, which can probably be excluded on semantic grounds. The exclusion of these latter forms is not crucial to our argument, however. According to our theory of WFRs, they can be analyzed as words with the same status as a word like *possible*, and they probably are so analyzed by the majority of people, though their etymology shows them to be otherwise derived.

The regular phonology of the suffix is dealt with very convincingly in SPE. There it is

given the underlying phonological form $(+At)iVn$, where V stands for an indeterminable lax vowel that we will represent by o . $+ion$ must be bisyllabic because of stress behavior, namely the placement of primary stress on the syllable preceding it (*prohibition* (SPE, 87)), and the operation of trisyllabic laxing on the immediately preceding vowel (*decide/decision* (SPE, 182)). A later rule changes i to y (SPE, 225–227). Further rules of spirantization and palatalization yield the correct output.

5.3.1.1. *Allomorphs of +Ation*. As many people have noticed, the suffix $+A\textit{tion}$ has several different forms, as shown in (24):

(24)	realize	realization	*realizion	*realization
	educate	*education	education	*education
	repeat	*repetition	*repetition	repetition
	commune	*communion	communion	*communion
	resume	*resumption	resumption	*resumption
	resolve	*resolution	*resolution	resolution
			*resolvion	

From (24) it is easy to conclude that ion has at least four, and possibly five, forms:

(25) $+A\textit{tion}$, $+it\textit{ion}$, $+ut\textit{ion}$, $+i\textit{on}$, $+t\textit{ion}$

The distribution of the forms of (25) is complex, but I will describe it thoroughly and show both that it is morphologically governed and that it is determined before the operation of the phonology.

5.3.1.2. $+A\textit{tion}$. This is the unrestricted variant. There are no conditions on its attachment, except that it is not affixed in cases where the conditions of attachment of the other variants are met. Again I must stress the importance of this disjunction, for it shows that we are dealing with variants of the same thing, and not with five different affixes and a blocking rule.

The following chart demonstrates attachment of $+A\textit{tion}$ to stems ending in various segments and clusters. It appears to be unrestricted, except for the matter of coronal fricatives, discussed in 4.3.4.1.

(26)	<i>Labial</i>	<i>Coronal</i>		<i>Velar</i>
	perturbation	cessation	deportation	evocation
	formation	degradation	manifestation	purgation
	exhumation	elicitation	consultation	prolongation
	usurpation	accusation	affectation	
		revelation	commendation	
		declaration	sensation	
		examination	indorsation	
		representation		

5.3.1.4. *The Marked Roots.* We will now turn to the other variants of the suffix, those that are restricted to certain morphological environments. The distribution of these restricted variants is governed by *linate* roots, of the sort discussed in section 2.1. These are true morphemes, with (as demonstrated at length in 2.1) no meaning. The form of the suffix is never determined by a specific word. It is never the case that one verb in a given root will allow one variant, and other verb in the same root a different variant. The form of the suffix is root governed, that is, morphologically governed. There are no exceptions to this. It is the first law of the root, originally discovered by the great Semitic grammarian ben-Moshe (ms) and called Ben-Moshe's First Law.

We will illustrate ben-Moshe's first law in (28) with the root *sume*. The variant of *ion* which appears after *sume* is *+tion*:

(28)	subsume	subsumption	*subsumation
	consume	consumption	*consumation
	resume	resumption	*resumation
	presume	presumption	*presumation
	consume	consumption	*consumation
	assume	assumption	*assumation

Note that the form *consummation*, as in Shakespeare, is not an exception. Rather it is derived from the base *consummate*, by truncation. Note also that there is nothing phonological at work, in the conditioning at least. The root *hume*, as in *exhume*, is not restricted, and its nominal is therefore *exhumation* and not *exhumption*. Similarly for *deplume/deplumation/*deplumption*.

We have noted that the restricted variants are root governed, but we have not noted what they are. Basically there are two. For roots ending in noncoronals (that is, labials and velars), the restricted form is *+tion*; *sume* is one example of a non-coronal-final root. Others are listed below:

(29)	duce	deduce	deduction
	scribe	prescribe	prescription
	ceive	conceive	conception
	deem	redeem	redemption
	sorb	absorb	absorption
	stroy	destroy	destruction

These exhaust, I think, the restrictive noncoronal roots. As we might expect, some of these are very productive morphological bases for the *ion* rule. For both *ceive* and *duce*, there exists a nominal for every verb, as documented in (30) below. One supposition which (30) dispels is that only the nonrestricted form of the affix, *+Ation*, can be productively attached. Such a supposition is actually counter to the entire theory of WFRs that we have proposed. If the variants of *ion* are indeed merely morphologically determined variants of one suffix, which they are, and if productivity is determined solely by the base of a WFR and not by the variants of the suffix, which are really not available for reference at the point of application of a WFR,

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then this supposition (that only the unrestricted variant can be productive), which crucially depends on the variants of the suffix to determine productivity, must be false. It is, as we see below:

(30)	receive	reception	deduce	deduction
	deceive	deception	reduce	reduction
	conceive	conception	seduce	seduction
	perceive	perception	induce	induction
	apperceive	apperception	conduce	conduction
			produce	production
			introduce	introduction
			reproduce	reproduction

The restrictive coronal roots are the most interesting and irregular class. The form of the affix after this class is not transparent. Many investigators (cf. Householder (1972), Schnitzer (1971)) have assumed it to be *+tion*, the same suffix that appears with the noncoronal roots. However, this cannot be the case; rather, the affix with this class must be *+ion*, as in SPE, for the following reasons.

First, pairs such as *rebel/rebellion* and *commune/communion* demand that we posit *+ion* at least after some liquids and nasals.

Second, as alternations like *decide/decision* and *revise/revision* argue, the vowel preceding *ion* must be laxed by the trisyllabic laxing rule. In such cases as *abrade/abrasion* and *rotate/rotation*, this vowel has further undergone a rule which tenses nonhigh vowels in the following environment (SPE, 181):

$$/ \text{---} C_i^1 \left[\begin{array}{l} \text{---low} \\ \text{---cons} \\ \text{---back} \\ \text{---stress} \end{array} \right] V$$

This rule also operates in alternations such as *Canada/Canadian* and *Abel/Abelian*. Crucially, there must be one and only one consonant after the affected vowel. If the suffix in *abrasion* is *+tion*, then the environment of the tensing rule is not met. There must, therefore, be a rule which deletes the *t* before the above rule applies. Since this *t*-rule has no other function and cannot be ordered after any phonological rule, the form of the suffix may as well be *+ion* after all coronals, exactly as we know it must be in *communion* and *rebellion*. Note also that the environment for the putative rule of *t*-Deletion cannot be stated phonologically, but rather must be stated in terms of certain coronal roots.

The root *vene* (*convene/convention*) shows an interesting conjunction of the matters just discussed in the two arguments above. One might be tempted to regard the alternation of this root as evidence that the suffix is *+tion* after at least some occurrences of *n*. However, if the suffix is *+tion*, then in most cases it must be deleted before the application of the tensing rule, as just shown. One would therefore have to mark *vene* as an exception to the deletion rule. The

alternative way to generate *vention* (instead of the *venion* that we expect if *+ion* is attached to *vene*) is via a rule of allomorphy. I will discuss this solution below.

The other variants of the suffix are *+ition* and *+ution*. Evidence for the first is the following:

(31)	add	addition
	vend	vendition
	define	definition
	<i>X</i> +pose	<i>X</i> +position
	compete	competition
	repeat	repetition
	imbibe	imbibition

The only trouble with positing another suffix in this case is esthetic. Note that previously, though we had two restricted suffixes, their environments were phonologically complementary. Because of this complementarity we might say that we have really only one restricted suffix, which attaches to verbs ending in restricted roots, and that the exact form of this suffix is subsequently determined by the phonology of the root. However, if we allow *+ition* to be a restricted suffix, we can no longer use this simple system. Roots must now not only be marked as restricted, but also for the particular restricted affix they take. We could avoid this by rather changing the form of the roots by adding *it* to them, and then having them take the appropriate restricted suffix (*+ion*). Though this latter solution is less complicated in terms of its repercussions, I see no empirical grounds for deciding between the two.

The following examples reveal the possibility that there is a suffix *+ution*:

(32)	revolve	revolution
	resolve	resolution
	dissolve	dissolution
	solve	solution

The two roots are peculiar. Both end in *lv*. One could simply mark them for the restricted suffix, which in this case will be *+tion* because *v* is not a coronal. Then, a rule could change *v* to *u/_ _t*, giving the correct output. Alternatively, we could posit a suffix *+ution* and drop the *v* instead of vocalizing it. The second solution gives us the same problems we found above with *+ition*, but again I know of no empirically relevant argument for one or the other solution.

We have established that the affix *ion* has at least three variants, an unrestricted variant *+Ation* and two restricted variants *+tion* and *+ion*, limited to bases ending in certain (not all) latinate roots. The choice between these two variants is governed by the last consonant of the root. *+tion* goes with noncoronal roots and *+ion* with coronal roots. The affixes *+ition* and *+ution* may also exist, though we will assume they do not. How are the variants assigned? By a rule of allomorphy. The rule is a little complex:

(33) Allomorphy of *ion*:

$$+Ation \rightarrow \left\{ \begin{array}{l} +ion \\ +tion \end{array} \right\} /X \left\{ \begin{array}{l} +cor \\ -cor \end{array} \right\}$$

where $X \alpha cor$ is one of a set of specified latinate roots

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Rule (33) is a rule of allomorphy because it applies to a designated morpheme *+Ation*, in the environment of a designated set of morphemes. To my knowledge, rule (33) follows no phonological rule of English. This point is crucial. It is claimed that all rules having the form of (33) precede all phonological rules, and are not phonological rules. This claim is easily falsifiable.

5.3.2. Root Allomorphy

More striking than the allomorphy of *ion* is the fact that many of the marked roots are susceptible to allomorphy before it. This fact was first noticed by ben-Moshe and is usually known as Ben-Moshe's Second Law, though it is not really a law.

It is perfectly plausible that after the application of rule (33) determining the proper allomorph of *ion*, a word will be put into the phonology without any further adjustment. This is not always so. Let us look at two pairs:

- | | |
|-------------|------------------------------------|
| (34) invert | inversion [inver [̥] zən] |
| insert | insertion [insər [̥] sən] |

In one case we get a [̥]z; in the same place in the other form, we find [̥]s. Both correspond to a word-final *t*. The only difference between the two pairs of (34) is that one has *v* where the other has *s*; or, stated in another way, the only difference is in their roots. No phonological rule of an orthodox type can be at work here. Note further that all *ion* nominals with roots in *vert* will show [̥]z, and that all *ion* nominals with roots in *sert* will show [̥]s. The only plausible solution to (34) is a rule of allomorphy in at least one of the cases, which changes the root's last consonant. The simplest rule is one which voices the *t* of *vert* to *d* before *ion*. After that, well-motivated phonological rules will grind out the correct forms of (34). Note that the allomorphy rule takes place before all the phonological rules, as claimed in general.

There are other ways to produce the correct forms in (34). We could use an abstract segment *t*₁ which shows up as *t* everywhere except before *ion*. This sort of solution is undesirable on general grounds. We could use a rule feature, which triggers the relevant rule only when a word has the root *vert* and not when it has *sert*. But this latter solution necessitates two things; first, we are using a positive rule feature in the company of a minor rule, a rule which only applies to segments which are marked to undergo it; second, we must specify the order of this minor rule in the phonology. As it happens it is the first rule, or at least it follows no other rule. These two things are a coincidence. By using a rule of allomorphy, we are claiming that there is no coincidence, that all these things must fall together. We are simultaneously ridding our grammar of a minor rule/positive rule feature complex, a very suspect and powerful entity.

Again, let me stress that though a rule of allomorphy is formally a very powerful device, its power is highly limited by the restrictions on its use. The difference between the forms of (34) can be captured by an allomorphy rule only because of the coincidence of three features. One, the difference is morphologically governed in the strictest sense. Two, the difference can be marked prephonologically, and three, related to two, the difference can be represented by using otherwise motivated underlying segments of English. Only if these three conditions are met can we have recourse to a rule of allomorphy. The rival method of using a minor rule and positive rule feature is not so constrained, and by its very nature cannot be. Therefore the

allomorphy solution, because it can be used only in this narrowly restricted type of case, is empirically more adequate.

The utility of allomorphy in cases like (34) is demonstrated. It allows us to make sense of what was previously an exception. What we will now do is survey all the marked roots and show that there are many similar allomorphy rules at work, though none so obvious perhaps as this one.

One of the problems with investigating allomorphy before *ion* is that several rules of English segmental phonology are at work in this environment and prevent us from finding the underlying allomorphs in a simple fashion. This was true in (34), where spirantization intervened and forced us to speculate a *d* in *vert/___+ion*. An observation of Martin's (1972) allows us to circumvent this problem. Martin notes that words in all the suffixes *ion*, *-ive*, *-ory*, and *-or* are built on the same form of a given root. If this is true, and we can assume that it is, then we can look at the relevant *-ive* or *-ory* form, where the phonology has not wreaked much havoc, to find out the underlying shape of the *ion* form, and by comparing this with the word-final form, we can discover what allomorphy is at work, if any.

I will first look at coronal-final roots, since these form the majority of roots and exhibit the most allomorphy. The table on page 107 is exhaustive and shows all possible alternations in the relevant environments.

First, we will extract what generalities we can from the whole list. Note first that of the full consonants, only *s* and *t* occur before *+ive*. The absence of any voiced full consonants before this suffix can be easily captured by the following ad hoc rule:

(35) $C \rightarrow \text{--voice/___+ive}$

Note that there are no voiceless counterparts to *l* and *n*. If it applied to these segments, rule (35) would produce an impossible form. It is perhaps for this reason that there are no cases of *Xl+ive* or *Xn+ive*. *Rebellion* has *rebellious*, and *communion* has no corresponding adjective.

The second general fact to be noticed is that, except after *l* and *n*, *+ion* is preceded only by palatals: \check{s} , \check{z} , \check{c} . This is the result of palatalization, an apparently simple process (but see below and SPE (229-231)).

Another general fact to be noted is that the same form that shows up before *+ive* shows up before *+abl* in many instances. This will prove useful in one or two cases.

Looking at the alternations, we find only eight cases where the final consonant (cluster) of the bare verb is in a one-to-one correspondence (one way) with the consonant preceding *+ion* and *+ive* (disregarding (35) and palatalization). These are *Vs*, *Vz*, *st*, *kt*, *nt*, *nd*, *ns*, and *ls*. Except for *nd*, all these have exactly the same consonant before *+ive* as they do word-finally. This is the prime evidence for a phonological rule of palatalization /___+ion. The general correspondence is as in (36):

(36) z/\check{z} , t/\check{s} , s/\check{s} , $st/s\check{c}$

Though we would like to state this as one rule, because of its seeming generality, there are many phonological problems facing such an attempt, which I will not discuss here. Most of the

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TABLE OF MARKED CORONAL ALTERNATIONS

<i>Sample Verbs</i>	<i>Verb-Final C</i>	<i>/+ion</i>	<i>/+ive</i>
excrete, X+sert	t	\check{s}	t
X+mit (permit)	t	\check{s}	s
X+vert (convert)	t	\check{z}	s
digest	st	$\check{s}\check{c}$	st
connect	kt	$\check{k}\check{s}$	kt
decide, explode	d	\check{z}	s
X+cede (concede)	d	\check{s}	s
apprehend	nd	$\check{n}\check{s}$	ns
commune	n	n	
scan	n	$\check{n}\check{s}$	
convene, retain	n	$\check{n}\check{s}$	nt
prevent	nt	$\check{n}\check{s}$	nt
recense	ns	$\check{n}\check{s}$	
coerce	rs	$\check{r}\check{s}$	rs
disperse	rs	$\check{r}\check{z}/\check{r}\check{s}$	rs
submerge, asperge	$\check{r}\check{d}\check{z}$	$\check{r}\check{z}$	rs
adhere	r	\check{z}	s
recur	r	$\check{r}\check{z}$	rs
rebel	l	l	
X+pel (expel)	l	$\check{l}\check{s}$	ls
convulse	ls	$\check{l}\check{s}$	ls
revise	z	\check{z}	
percuss	s	\check{s}	s
admonish	\check{s}	\check{s}	t

relevant facts can be found in SPE (229–235). I will state two rules of palatalization.

(37) *Palatalization I*

$$t \rightarrow \check{c}/s_yV$$

(38) *Palatalization II*

$$\begin{bmatrix} +\text{cons} \\ -\text{voc} \end{bmatrix} \rightarrow \begin{bmatrix} -\text{ant} \\ +\text{strid} \end{bmatrix} / _yV$$

Turning to the one case where there is a one-to-one correspondence, but where a different consonant appears before *+ive* (and *+able*) than word-finally, we find the following:

$$(39) Xnd\# \quad Xn\check{s}n\# \quad Xnsiv\# \quad Xns\check{e}bl\#$$

This is true of all the roots in *-nd*:

- (40) fend defend
 hend apprehend, comprehend
 tend pretend, contend, extend
 pand expand
 scend ascend, descend, condescend

$\check{s}\check{a}n\#$ tells us that the nominal/adjective stem must be either *Xnt* or *Xns*. *nsiv\#* and *nsabl\#* tell us that it must be *Xns*. We may therefore posit the following rule of allomorphy:

$$(41) d \rightarrow s/n \begin{cases} +ive \\ +ion \\ +abl \end{cases}$$

A difference between this rule and the rule involved in the *vert/version* alternation, both of which we have called rules of allomorphy, is that this one applies to all roots of the form *Xnd*, whereas the latter applied to only one root. One might wish to claim that (41) is a phonological rule rather than a rule of allomorphy, despite its odd environment. But (41) only applies in marked roots. Consider the root *mend*, as in *commend*, *emend*, *amend*, and *recommend*. This is not a marked root. It has nominals in *+Aion*: *recommendation*, *commendation*, *emendation*. If (41) were a true phonological rule, it would apply to the *+abl* derivatives of *mend* stems. But it does not: *commendable*/**commensible*, *amendable*/**amensible*. Since it does not apply to all stems of the form *Xnd* but must rather be restricted to marked roots of that form, (41) is not a rule of the phonology but a rule of allomorphy. This is an important distinction. A rule of allomorphy applies to a designated class of morphemes, and this designation should not be phonological, but rather morphological. This is true of (41).

\check{s} -final stems are curious:

- (42) abolish abolition
 admonish admonition admonitive
 punish ?punition punitive

The fact that we find *t/_ _ +ive* shows that these stems have a nonfinal variant *Xt*. We therefore have a case in which roots show the same surface segment (\check{s}) in two environments, but where there is good evidence that these two segments must be derived from two distinct underlying segments, in different allomorphs.

t-final stems show the most varied alternations. As noted, we need an allomorphy rule for *vert*, and a glance at our table shows that the nonfinal allomorph must be *verz*, rather than the *verd* originally proposed. *mit* too is odd; it shows the form *mis* (*submissive*, *admissible*). Other *t*-final roots require no allomorphy. *t* remains before *+ive* and *+abl*: *assertive*, *transitive*, *excretive*.

From *vert* we can turn to other cases of $r\check{s}/r\check{z}$:

- (43) coerce co $\check{a}r\check{s}\check{a}n$ co $\check{a}rsiv$
 disperse disp $\check{a}r\check{z}\check{a}n$ (? $\check{s}\check{a}n$)
 immerse imm $\check{a}r\check{s}\check{a}n$ (? $\check{z}\check{a}n$)

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emerge	emərʒən (*s̥ən)	
asperge/se	aspərʒən (*s̥ən)	
submerge	submərʒən (*s̥ən)	submərsəbl
deterge	detərʒən (*s̥ən)	detərsiv

It is clear that with stems in *Xerge* we always find *rʒ*. The *s* in *detersive* suggests a rule similar to that involving *nd*:

$$(44) \quad g \rightarrow z / _ \left\{ \begin{array}{l} +ion \\ +ive \\ +abl \end{array} \right.$$

Though the change is suspiciously natural, a rule of palatalization, the fact that it takes place before *+abl* should be sufficient evidence against its naturalness. Note also the back-forms *asperse* and *submerge* (*disperse* and *immerse* are also back-forms; *dispersion* is ME, *disperse* is dated 1450, *immersion* 1450, and *immerse* 1650). That these were back-formed in this way shows the opacity of (44).

The two roots in *r* are good examples of roots with their own allomorphs. One is *kur/kurz*, the other *hēr/hēz*.

Two *n*-final roots are of interest, *vene/vention* and *tain/tention*. We promised earlier to discuss the first. It should be clear by now that we derive *vention* by declaring the combinatory allomorph of *vene* to be *vent*. How does this compare with the rule which attaches *+tion*? As noted, the latter needs an exception feature, to make sure the *t* does not drop, as it presumably does elsewhere. By positing the allomorphy rule we rid ourselves not only of an exception feature, but also of the entire already suspect rule of *t*-Deletion to which *vene* is a supposed exception.

This rule of *t*-Deletion is put to use in one place in the phonological literature on the subject. Schnitzer (1971) attempts to derive *succession* from the underlying form *sub=kēd+rt+iVn*. He uses the *t* to devoice the *d*. However, there is no way for him to shorten the *ē*, and his final output is **suk=sēs+ion*. One could of course lax the *ē* before deleting the *t*, but this is not the general case (*excrētion*). We conclude that Schnitzer's use of *t*-Deletion is not valid, for it cannot lead to the proper output. In order to derive *succession*, SPE lists *cede* (*cēd*) as exempt from the tensing rule. *e* is thus shortened by Trisyllabic Shortening, and exceptionally not lengthened again. By using the device of root allomorphy, we can list *cede* as *cess* in the relevant environments. The double consonant will prevent the tensing rule from applying. Again we see that allomorphy can be a useful device for encoding an exception feature. Note that *successive* provides very strong support for our rule, for the SPE theory would derive **succetive*, as would Schnitzer's, if it worked. One allomorphy rule can be used to cover many irregularities, sometimes irregularities which cannot be encoded as rule features at all. Nor is allomorphy a more powerful device than that of rule features. Rule features interact with phonological rules in ways in which allomorphy rules, because they are prephonological, cannot. This makes rules of allomorphy quite restricted in some respects, as compared with rule features, which can refer to any stage in a phonological derivation.

Returning to *n*-final roots, we will look at the root *tain/tent* (*retain/retention*). The *t* is clearly allomorphic. However, more interestingly, we expect not *tain/tention*, but rather *tain/*tention*. SPE (202) accounts for this curiosity by having *tain* undergo the Short Vowel Shift rule. This is a very suspect rule. We will discuss its use in another case below and show that it is unmotivated. In fact, an inspection of all the items that this putatively general rule applies to reveals that it is a minor rule which affects only items positively specified to undergo it. Again we can use allomorphy to rid ourselves of such a rule.

d-final roots, except for *cede*, all show the same forms: *d/s/ž* (*decide/decisive/decision*). We can therefore posit a rule changing *d* to *z*. Again we must ask whether this is really a rule of allomorphy, or whether it is a phonological rule. Normally *d* does not appear before *y* (the reflex of the *i* of *+ion*) except here. In fact, the rule that changes *i* to *y* after coronals is blocked idiosyncratically by *d* in all other cases (*pavilion/enchiridion*). There is only one case where *d+y* arises, other than /___*+ion*, and that is in the word *cordial*, where it shows up as *dž*, presumably palatalized from *dz*. It appears, then, that this supposedly general palatalization of *d* is confined to the morphological environment in question. We can therefore account for it by a rule of allomorphy, as we would expect.

Marked noncoronals were listed in (29). They are not particularly interesting. The only real cases of allomorphy here are *stroy/struk* (*destroy/destruction*), which we noticed in chapter 2, and *ceive/cept* (*deceive/deception*).

This ends our discussion of root allomorphy. I would just like to stress the strength of Ben-Moshe's First Law here, the law of allomorphy. If a root takes a given shape in a given environment by a rule of allomorphy, then it takes that shape always. There are no lexical exceptions to rules of allomorphy, and they are a living part of a language.

5.3.2.1. *fy* and *ply*. Rule (27), as stated, is not a rule of allomorphy. This is because its environment is not totally morphological, for it is bounded on one side by #. There is a way to make the alternation expressed by (27) a morphologically conditioned one, namely to state not (27) but its reverse, a rule of *k*-insertion. I know of no deciding factor between the two.

It is of some note that a restricted form of the suffix sometimes shows up with verbs in *fy*. The only common word of this sort is *satisfaction*. Others are *putrefaction*, *liquefaction*, and *calefaction*; there are about ten all told. The form *fac* is derived in SPE by applying the rule of Short Vowel Shift to *fik*, after the *i* is shortened /___CC (kt). The same case of Short Vowel Shift, incidentally, accounts for the *sing/sang* alternation. As we have noted, the rule is dubious; in any case, all these words must be idiosyncratically marked to undergo it. The concomitant irregularity of the *fak* forms – that they take *+tion* instead of *+Ation* – was not noted in SPE. Since the only difference in derivation between the *fak* forms and the regular ones is the rule feature governing the application of Vowel Shortening, presumably the choice of the affix is governed by this rule feature as well. Either that, or it is not decided until the rule in question has applied, i.e. until we can tell *fik* from *fak*. Neither system is satisfying. In the one, a rule feature governs something other than its rule – a strange situation; in the other, the form of the affix is not chosen until a late stage in the phonological derivation – a singular case, for in all

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others the variant of the affix is determined at the underlying level.

A simpler solution is to derive *fak* by an allomorphy rule, conditioned by the preceding morpheme (*satis, putre, lique, cale, tume, tabe, lubri, labe*), as well as by the one following (+*Ation*). In its turn, *fak* determines the variant of *ion*, namely the restricted one. This solution entails that allomorphy rules be ordered. Note, however, that the ordering is from the inside out. Though we have no other evidence, we might claim that allomorphy rules are always so ordered, in which case the ordering, though extrinsic, would not be arbitrary. However, this is not exactly a central case, and to base a broad theory on it is not advisable.

5.3.3. Other Allomorphy

Though the foregoing account of rules of allomorphy is detailed, it is based on one English paradigm, that of the suffixed forms *X+Ation*. The reader is entitled to be skeptical about a vast system which is based on one example, or even, as in this case, one phenomenon, though the phenomenon is widespread. In order for my theory to be plausible, I must find other examples of its utility. This is not so simple. One must have a good idea of what the phonology of a language looks like before proposing rules of allomorphy.

One place in which rules of allomorphy surface is in the selection of theme vowels. Such vowels are uncommon in English; however, they do appear before certain affixes. The following data are in part from SPE (129-130):

(45)	professor	professorial
	manager	managerial
	president	presidential
	periphery	peripheral
	orient	oriental
	habit	habitual
	tempest	tempestuous
	industry	industrious, industrial
	Arab	Arabian
	excrement	excremental
	exponent	exponential
	calamity	calamitous

It is clear that there is often a difference between the unsuffixed and suffixed forms of the base. Sometimes *i* is inserted before *-al*, *-an*, or *-ous*, sometimes *u*, sometimes nothing. Sometimes we even find deletion of the final segment of the stem (*peripheral*). The conditions for these variations are not phonological: *periphery* contrasts with *industry*. Words ending in *ment* never have a vowel before *+al* (**departmential*), but other words ending in the same phonological sequence *-ent* sometimes do and sometimes don't (*parental/torrential, continental/exponential*). SPE stresses that whether an item takes *i* or *u* or nothing or itself loses a segment is a property of the item itself. This determination is morphological.

In SPE, this variation is handled by assigning to each stem a stem vowel, which is dropped

word-finally but shows up before suffixes. *Professor* will be entered in the lexicon as /pro=fes+Or+i/, *habit* as /hæbit+u/. The authors do not discuss forms like *peripheral*, which is presumably derived by a minor rule.

A problem for this analysis is the nominal suffix +y, which occurs in such words as *presidency*. According to the above analysis, the underlying form of *presidency* must be /president+i+y/. However, the y is normally vocalized to i by the following rule (SPE, 130):

y → i/C ___ boundary

This rule operates in such words as *industry*. Note that the presence of the stem vowel i in *president+i+y* will block this rule. Either there is no stem vowel before y in the first place, or it is deleted by a new rule:

(46) i → φ / ___ +y

The stem vowel thus shows up before some suffixes and not before others. It does not show up word-finally. In order to generate the data correctly, the SPE analysis of the forms in our paradigm needs three phonological rules in addition to the stem vowels. One rule deletes the stem vowel finally, another deletes it before +y, and a third deletes y in *peripheral*. These are all phonological rules. They are all, as far as I know, preceded by no other rule of the phonology.

The allomorphy solution to the paradigm is transparent. Before the suffixes in question, certain allomorphic changes take place. This step is equivalent to the marking of stem vowels in the lexicon, which is needed in any solution. Now, however, no more is necessary. We have simply incorporated the three questionable rules into the allomorphy rules, a step which simultaneously rids us of them and accounts for their ordering properties.

I think there is no question as to which is the better solution. They are both descriptively adequate; however, the SPE system is ad hoc, while the allomorphy solution, within a theory which includes rules of allomorphy, is the only possible one. It is also the correct one.

5.3.4. Allomorphy and Other Parts of a Grammar

The central import of allomorphy rules is for the phonology. By using these rules, which, it must be emphasized, are highly restricted, we are making predictions about the range of material that can be covered by rules of the phonology and about the ordering of certain "irregular" processes. It is also important to note that because rules of allomorphy are not phonological rules per se, they are not subject to many of the naturalness constraints that govern the latter. In theory, a rule of allomorphy could change *m* to *t*, something we do not expect from a rule of the phonology.

The intuition behind the positing of rules of allomorphy is quite widespread. People have felt that rules referring to morphological categories, morphologically governed rules, are ordered earlier in the system of the phonology than phonologically governed rules. Lightner (1972) argues that there is a class of minor rules characterized by the facts that (a) they always apply before all major rules, and (b) their environment always contains a reference to some morphological category. It is clear, however, that (b) is not a sufficient condition for (a). The English *k* → *s* spirantization, which is governed by the morphological feature *linate*, is a rule

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of the phonology and cannot be ordered before all major rules. Allomorphy rules are finer than Lightner's rules. $k \rightarrow s$ is not a rule of allomorphy as defined, for it is governed not by a morpheme but by a morphological feature. For a rule to be a rule of allomorphy, it is a necessary and sufficient condition that it be totally morphological, in the sense defined: it applies to a morpheme, or other than phonologically designated set of morphemes, in the immediate environment of a designated morpheme or set of morphemes. This is a much narrower definition than Lightner's. Unlike Lightner's minor rules, rules of allomorphy are defined on morphemes and not segments. Also, we have narrowed somewhat our version of Lightner's (b), which would falsely include umlaut rules under the category of minor rules.

By narrowing the scope of our definition, we are of course narrowing the scope of our claim. We are not claiming that all morphologically and lexically governed rules are early rules of the phonology. We are not denying the validity of the English main stress rule, because of its baroque complexity. Phonological rules may be as baroque as they wish to be, but rules of allomorphy, as defined, will *always* precede the rules of the phonology.

A particularly fine example of a rule which, though morphologically governed, is not a rule of allomorphy and hence may be ordered among the rules of the phonology, comes from Masoretic and was pointed out to me by Alan Prince. Consider the following pairs:

- (47) a. ka:tabti 'I wrote' ktabtihu: 'I wrote it'
 b. ka:tabt 'you (fem. sg.) wrote' ktabtihu: 'you wrote it'

The problem is that, though the suffixed forms are identical, the unsuffixed forms differ. A relatively detailed study of Masoretic phonology reveals that the underlying forms of (47a and b) must be identical (*katab+ti*), and that *i* is deleted word finally (in second person singular feminine perfect forms *only*) at a relatively late point in the phonology, the *i* serving to block several otherwise well-motivated phonological rules which would apply to a form **katab+t*. We will formulate the rule as follows:

- (48) $i \rightarrow \phi/t \text{ ___ } \#/2.f.sg. \text{ perf.}$

As we noted, this must be a relatively late rule of the phonology. It is a minor rule in Lightner's sense and hence should not be ordered so late in his theory. However, (48) is not a rule of allomorphy. This is because of the presence of the # boundary as the immediate environment. The morphological category, though it is crucial to the rule, is not sufficient to make (48) a rule of allomorphy. Therefore (48) may be a phonological rule in our theory; in fact, it must be, and hence it may be ordered at any point in the phonology.

Note that the reverse of (48) would insert *i* in suffixed forms of the second person feminine singular perfect and would be a rule of allomorphy. It is significant that (48), and not its reverse, is the correct rule, for in our theory the latter, as a rule of allomorphy, could not ever be ordered at such a late point in the phonology – or anywhere in the phonology, for that matter. For those who doubt fine points, I should point out that Masoretic phonology is one of the best studied of all linguistic systems, and that the formulation of the rule in question as (48) and not its reverse has been established and accepted for centuries (cf. Gesenius (1962)).

Note the similarity between this and the German Truncation rule discussed above.

Though it applied to a designated morpheme *ge-*, this latter rule had a phonological environment; hence it was not a rule of truncation as defined and could not be ordered among the rules of the phonology. The general similarity between rules of allomorphy and rules of truncation should be apparent by now. Both types are defined on morphemes, in the environment of morphemes. The only difference is that one deletes morphemes, while the other adjusts their shapes.

Rules of allomorphy stand in exactly the same relation to WFRs as rules of truncation. Their necessity within our system of word formation is brought about by the same separation of all matters concerning the morphology of the base of a WFR from the WFR itself. In the case of rules of allomorphy, the morphology of the base both itself varies with certain affixes, and causes variation in affixes which have been introduced by phonologically constant operations. Whether both are true of truncation rules as well is not clear from the examples we have. If truncation in the forms *X+At+Ation* applies to the second *At*, which is part of the affix, and not to the first, then we have an instance of a truncation rule which applies to an affix. As noted above, however, the exact formulation of this rule is not clear.

6: Exempla

This last chapter is almost an addendum. It essentially contains no theory, but rather studies done within the theory outlined in this monograph. These studies are further characterized by the fact that they could not have been done without the underpinnings that the framework provides, and should thus serve as harbingers. The first section is purely exemplary, consisting of two cases in which distributional evidence is used to resolve a morphological quandary. Some theory does creep into the second half of the chapter; it comprises an analysis of the English suffix *-able*, making essential reference to the notions of allomorphy and truncation, but its more ulterior concern is the nature of the boundaries + and #.

6.1. Distributional Arguments

One point on which the theory of this work differs from most contemporary concepts of morphology is the claim that morphology is word-based: new words are formed from already existing ones, rather than being mere concatenations of morphemes. Now one of the more curious properties of this word-based theory is the way in which distribution can be used to test hypotheses set forth within it. Distributional evidence can be used because of the role which the lexicon plays within the theory: if one word is formed from another, then it will generally be the case that both words will be in the lexicon; the base at least will always appear there, though the derivative need not (cf. chapter 3). Therefore, if we hypothesize that a class of words X is derived from another class of words Y , then for every x_i in X there should be listed a corresponding y_i in Y , but not vice versa (unless the rule is fully productive, in which case X will not be listed anyway). There may be incidental gaps, due to the vagaries of history, but Y should by and large include X .

We will give a simple example of how this distributional test works. Consider the class of English nouns of the form $X\#ness$ (*redness, callousness, receptiveness...*). It is generally assumed that this class is derived from the class of adjectives, and there are various grounds for the assumption. For one, X is always an adjective. Second, there is the stress pattern of $X\#ness$, which demands that we posit a boundary (in this case a word boundary) before the phonological sequence [nes]. Third, there is the semantic coherence of the class of nominals, all of which carry meanings containing those of the adjectives. All of these facts are most plausibly accounted for by deriving the nouns from the adjectives they contain. We will look at the distributional evidence and see whether it is in accord with this rather strongly supported