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Rule Ordering, Rule Application and the Organization of Grammars

One of the focuses of interest in generative phonology is the question of rule ordering. We may roughly distinguish three theories:

(i) the theory of extrinsic ordering: for each pair of rules, an ordering relation is defined by the grammar; the ordering relations are transitive (Chomsky and Halle 1968).

(ii) the theory of intrinsic ordering: the ordering relations between rules are predicted by general principles (Koutsoudas, Sanders and Noll 1974).

(iii) the theory of local ordering: rules apply in their natural order, unless this is overruled by an *absolute* ordering restriction; if there is no natural order, a *contingent* ordering restriction must be formulated. Ordering relations are not transitive (Anderson 1974 b).

In my opinion, the implications for rule ordering of the organizational structure of grammars have been neglected too much in the discussions on this subject. In this paper, I will show how certain assumptions about the organization of grammars predict ordering relations between rules. I will do this by making use of data from Dutch, and by means of a reanalysis of the data concerning rule ordering provided in Anderson (1975), an extended and revised version of Anderson (1974 a). The assumptions I will make concern (i) the distinction between sentence-phonology and word-phonology, and (ii) the internal organization of the word grammar of a language.

The grammar of a language can be considered to consist of two parts, a sentence grammar and a word grammar. The sentence grammar defines the notion 'possible sentence of language L' and the word grammar defines the notion 'possible word of language L'. Therefore, the word grammar contains:

(i) a list of the simplex words of language L and of all those complex words that have at least one idiosyncratic property and are felt to belong to the permanent vocabulary of the language community. This list can be called the 'lexicon' or the 'lexical core' of a language.

(ii) word formation rules which function as redundancy rules with respect to existing complex words, and also create new complex words.

(iii) phonotactic rules (mainly syllabification rules)¹.

¹ Note, however, that the syllabification rules of the word grammar must perhaps also be permitted to apply in the phonological component, because the application of certain rules in the phonological component, e. g. rules that delete or insert vowels, may necessitate resyllabification.

(iv) those phonological rules, purely phonological or morpholexical, that obligatorily apply within the domain of the word².

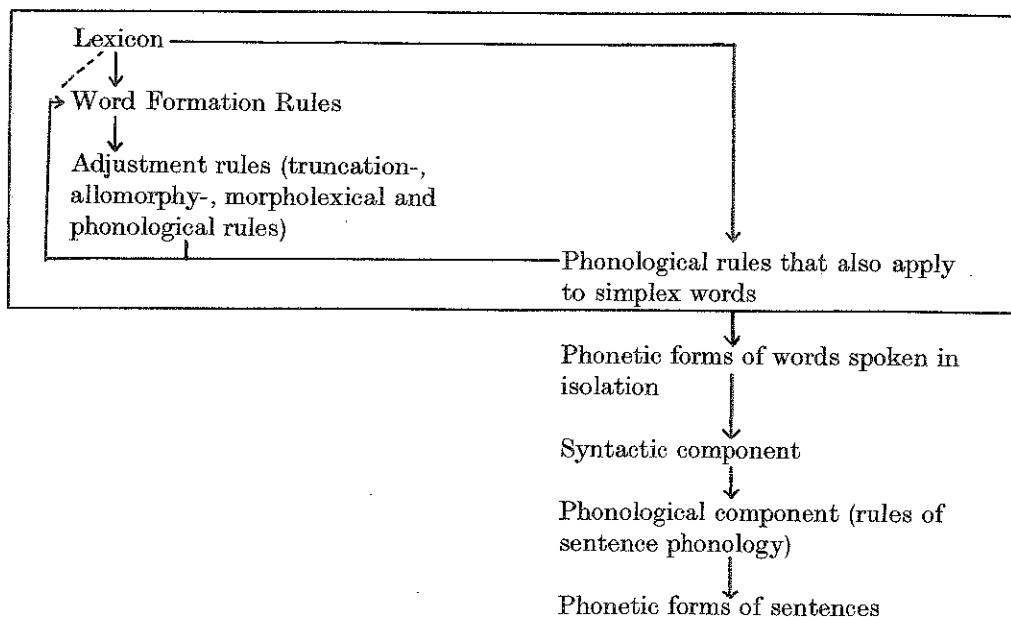
The implication of this conception of the word grammar is that the phonological component of a grammar contains the following types of phonological rules:

(i) rules that apply to domains larger than a word; e.g. sandhi rules and prosodic rules.

(ii) optional rules that apply within the domain of the word. These rules may be referred to as the rules of sentence-phonology³. There are, apart from their optionality, other reasons why the rules (ii) must be located in the phonological component, although they apply within the domain of the word. Firstly, the phonological properties of neighbouring words sometimes increase the probability of application of a style-dependent word-internal rule, although they do not *condition* the application of that rule (cf. Labov 1972). Secondly, the application of a style-dependent rule in a word may necessitate the application of another style-dependent rule in another word in the same sentence or phrase (cf. Kučera 1973). This is explained by the fact that one cannot change from one style to another within one phrase or sentence (Hooper 1976).

We now turn our attention to the internal structure of a word grammar. The following organization seems to be plausible:

WORD GRAMMAR



² Of course, unproductive word formation rules and unproductive phonological rules play no part in the definition of 'possible word of language L'.

³ The distinction between sentence phonology and word phonology is a traditional one. It can be found in e.g. the *Projet de terminologie standardisée* of the Prague Linguistic Circle

This organizational structure expresses the fact that both words from the lexicon and the outputs of Word Formation Rules (WFRs) can function as inputs for a WFR (cf. also Roeper and Siegel 1978). For instance, we can derive the word *olieachtigheid* 'oil-like-ness' directly from *olie* 'oil' by applying more than one WFR: *olie* → *olieachtig* 'oil-like' → *olieachtigheid*. *Olieachtig*, the intermediate step in the derivation, is completely regular, and therefore not stored in the lexicon. The dotted line to the lexicon indicates that complex words can be stored in the lexicon, once they have become idiosyncratic. But this is a diachronic relation between the lexicon and the word formation component, and therefore, the line is dotted⁴.

The application of a WFR creates a new word structure that may have to undergo certain adjustments. The adjustments are evoked by the application of the WFR. A derived word structure may be modified by:

- (i) truncation rules, which delete a specified morpheme in the environment of other specified morphemes (Aronoff 1976);
- (ii) morpholexical rules, whose environments involve essential reference to the identity of specific morphemes, lexical items or classes of morphemes (Anderson 1975);
- (iii) phonological rules, whose environments involve reference only to the phonological composition of the string, to boundary elements, and perhaps to major lexical class (Anderson 1975).

A subcategory of the morpholexical rules are the allomorphy rules, which apply to specified morphemes in the environment of other specified morphemes (Aronoff 1976).

Thus, the organization of the word grammar expresses the fact that certain phonological processes are evoked by the application of a WFR, a fact that is also stressed by Linell (1979). This is not to claim, however, that every obligatory phonological rule that applies within the domain of the word, forms part of the word formation cycle. The word formation cycle may abstract from the effect of certain automatic phonological rules, for instance, for Dutch, from the effect of the rule of final devoicing of obstruents:

(*Travaux du Cercle Linguistique de Prague* IV, 309—23) *phonologie du mot* versus *phonologie de la phrase*; it is also defended by Van Wijk (1939) who uses the words *woordphonologie* and *zinsphonologie*. The integration of this distinction in the theoretical framework of generative grammar has already been argued for by Van Marle (1978). The (weaker) hypothesis that at least certain phonological rules belong to the lexicon can be found in Aronoff (1976) and Booij (1977). — It should be stressed that the distinction between sentence phonology and word phonology is still a research program, but a very promising one for the many languages in which the word is a relatively autonomous entity (cf. Van Wijk 1939: 132). It remains to be seen whether it holds for every language, because there are also languages in which the distinction between word and sentence is not easy to make.

⁴ This word grammar will also generate impossible complex words, unless further conditions are imposed. For instance, in Dutch, non-native suffixes can only be attached in a position adjacent to a non-native morpheme (cf. Booij 1977). Furthermore, some affixes are so-called 'closing morphemes', that is, they block further derivation. These restrictions may be expressed by output conditions or conditions on the application of rules.

(1) [-son] → [-voice] / _____ \$

Compare, for instance, the phonetic forms of *held* 'hero', *helden* 'heroes' and *heldin* 'heroine': [hɛlt], [hɛldən] and [hɛldɪn] respectively. It is clear from these examples that the effect of rule (1) is not present in the phonetic forms of the derived words, and therefore, rule (1) has to apply outside the word formation cycle. But this is what we expect, since rule (1) also applies to simplex words, and therefore does not belong to the word formation cycle.

The position that truncation- and allomorphy-rules belong to the word formation cycle was also defended by Carrier (1979). As she correctly points out, the consequence of this claim is that truncation- and allomorphy-rules function as redundancy rules with respect to the complex words that are stored in the lexicon⁵.

An example of a purely phonological rule that belongs to the word formation cycle is the rule of schwa-deletion of Dutch:

(2) ə → ∅ / _____ [+syll]

This rule applies to every derived word structure that contains a schwa followed by vowel, unless these two segments are separated by the strong morphological boundary # that blocks the application of rules, unless it is mentioned in the context. A few examples are (the word-final *e* indicates a schwa)⁶:

synode + aal	→ synodaal	ambassade + eur	→ ambassadeur
code + eer	→ codeer	stupidie + iteit	→ stupiditeit
Rome + ein	→ Romein	ballade + esk	→ balladesk
muze + iek	→ muziek	elite + air	→ elitair
mode + ieus	→ modieus	rancune + eus	→ rancuneus

Dutch also has an allomorphy rule that changes the suffix *-eur* [œr] to [ris] before the feminine suffix *-e*, e.g. (cf. Schultink 1978):

conducteur + e	→ conductrice	'female conductor'
directeur + e	→ directrice	'female director'
aviateur + e	→ aviatrice	'female aviator'

⁵ It must be stressed that this conception of the word grammar is not 'upside-down phonology' (Leben and Robinson 1977). All rules are formulated as generative rules, with all relevant conditions specified, but those that belong to the word formation cycle can also function as redundancy rules.

⁶ The process of schwa-deletion does not apply to prefixes containing a schwa, e.g. *beamen* [bɛamən] 'to agree', nor does it apply to complex words with the suffix *-achtig*, e.g. *zijdeachtig* [zɛɪdɛəxtɛx] 'silk-like'. But this does not imply that schwa-deletion is no purely phonological rule. For both types of complex word there is an independent argument to associate the strong morphological boundary # with the affix, as is shown in Booij (1977). This argument is that in these complex words a syllable boundary always coincides with the morphological boundary, which cannot be predicted by the syllabification rules without reference to a grammatical boundary. Without the # we would get wrong syllabifications such as [rɔdɔxtɛx] in stead of the correct [rɔtɔxtɛx] for *rood-achtig* 'reddish', or [vɛrɔsɛn] instead of the correct [vɛrɔsɛn] for *ver-assen* 'to cremate'.

So the relevant allomorphy rule is:

$$(3) \quad \text{ør} \rightarrow \text{ris} / \left[\begin{array}{l} - \text{son} \\ - \text{cont} \\ + \text{cor} \end{array} \right] \text{ ——— } + \begin{array}{l} \text{ə} \\ [+ \text{fem.}] \end{array}$$

These two rules interact in the derivation of *ambassadrice* 'female ambassador'. The important thing to note here is that rule (2), the phonological rule, has to apply before the allomorphy rule (3). This seems to be remarkable, since "it is certainly the case that, ceteris paribus a morpholexical rule will generally precede a phonological one" (Anderson 1975: 43). This is indeed to be expected when a morpholexical and a phonological rule interact within one application of the word formation cycle, but in the case of *ambassadrice* two applications of the word formation cycle are involved:

stem	[αmbasadə] _N
1 st WF-cycle, suffixation	[[αmbasadə] _N + ør] _N
rule (2)	∅
2 nd WF-cycle, suffixation	[[[αmbasadə] _N + ør] _N + ə] _N
rule (3)	ris
phonetic form	[αmbasadrise]

That is, we can still claim that the normal applicational order is (i) morpholexical rules, (ii) phonological rules. But this ordering principle is relevant only when a morpholexical rule and a phonological rule really interact, i. e. apply on the same cycle⁷.

Let us now have a fresh look at the cases that Anderson (1975) presents as counterexamples to the claim that morpholexical rules always precede phonological rules.

His first example is the well-known case from Tagalog mentioned by Bloomfield (1933) where a rule of nasalization (according to Anderson a phonological rule) has to apply before a morpholexical rule of reduplication. The nasalization rule makes the initial obstruent of a stem homorganic with the final nasal of a preceding prefix, and deletes that nasal. For instance, we get the following derivation of *pamumutul* 'a cutting in quantity':

stem	putul	'to cut'
prefixation	pang putul	'that used for cutting'
nasalization	pa mutul	
reduplication	pamumutul	'a cutting in quantity'

⁷ There is an alternative analysis possible here: one could claim that *fice* is *one* feminine suffix, that replaces the suffix *-eur*. Even if this analysis is the correct one, the case of *ambassadrice* remains interesting, because then a phonological rule (schwa-deletion) has to precede a word formation rule, since the suffix *fice* can only be attached adjacent to a dental plosive. Note, furthermore, that the order required here is the natural order, since the rule of schwa-deletion feeds the allomorphy rule.

Since reduplication is a way of deriving certain types of complex word, it is clear that the rule that actually performs the copying process is a morpholexical rule. Note now that the order nasalization — reduplication is not amazing at all in the framework outlined above, and nothing but the order that is predicted by the organization of the word grammar: nasalization applies on the first application of the word formation cycle, and reduplication on the second.

Essentially the same position is defended by Carrier (1979). She disputes, however, Anderson's claim that nasalization is a purely phonological rule. She points out that not every prefix ending in *-ŋ* undergoes nasalization and that not every stem undergoes the rule. The comparative prefix (*ka*)-*sing* and the verbal accidental/result prefix *mag-kang* are not affected by nasalization, and if a stem has a voiced obstruent as its first segment, it may remain unnasalized, as is shown by e.g. *mang-basah* 'read' and *mang-dukut* 'pickpocket' (*mang-* is the prefix that indicates that the subject is the topic). Hence we would be inclined to call the rule of nasalization a morpholexical rule. However, Carrier proposes a less strict definition of allomorphy rules than Aronoff's ("allomorphy rules are rules with a morphological context; the target may be purely phonological") in order to justify calling nasalization an allomorphy rule. The reason for this redefinition is that Carrier wants to admit allomorphy rules only in the word formation cycle. Apparently, she considers it too far-fetched to admit phonological rules that function as redundancy rules with respect to existing complex words. We saw, however, that in Dutch a purely phonological rule has to apply within the word formation cycle. We thus conclude that Carrier's redefinition is not necessary, and that, no matter whether nasalization in Tagalog is a purely phonological, a morpholexical or an allomorphy rule, the principle that morpholexical rules normally precede phonological rules, can be maintained, since nasalization and reduplication apply on different cycles.

One may wonder whether reduplication is a word formation rule or a morpholexical rule. Both Anderson and Carrier call it a morpholexical rule. Carrier supposes that the word formation rule adds a feature [+Red.] to its output forms, and that a rule of transformational format translates this feature into concrete sound segments. She gives two arguments in favour of this description:

- (i) it can now be maintained that the word formation rules themselves do not have transformational power;
- (ii) the same type of reduplication occurs in several word formation processes. If we formulated the reduplication process as part of the word formation rule, we would have to state the same copying process more than once, thereby missing a generalization.

The same arguments can be found in Booij (1979). In that paper, it is argued that in Quechua the same reduplication process is used in a number of word formation processes, and that consequently the reduplication process must be accounted for by a morpholexical rule that is conditioned by a grammatical feature [+reduplication].

A second example of Anderson's (1975) is Danish. Here, a phonological rule of vowel lengthening has to apply before a morpholexical rule of schwa-deletion that is conditioned by the feature [+imperative]. It is assumed that the imperative

form of a Danish verb is derived from its infinitive form by deleting the final schwa of the infinitive. This applicational order of the two rules is predicted by the organization of the word grammar as outlined above, since vowel lengthening applies on the infinitive cycle, but schwa-deletion on the imperative cycle. The phonetic form of *bad* 'bathe!' is derived as follows⁸:

stem	bað	'bath'
1 st WF-cycle, infinitive formation	+ə	
lengthening	æ:	
2 nd WF-cycle, imperative formation	∅	
stød-insertion	ʔ	
phonetic form	[bæ: ʔð]	

A third example of a case in which a phonological rule precedes a morpholexical rule is, according to Anderson, found in the grammar of Abkhaz, a Northwest Caucasian language. There is a rule in Abkhaz by which the verb-initial prefix /y/ is lost just in case the NP with which the verb agrees immediately precedes the verb in surface structure. But before this morpholexical rule applies, a phonological rule of vowel epenthesis, which inserts a vowel after the first of three consonants, must apply. For instance, we get the following derivation of the phonetic form of 'they give it to him':

underlying form	y rtot
vowel epenthesis	ə
stress	´
y-loss	∅
phonetic form	[´rtot]

Again, this is the order to be expected, if we take the organization of a grammar into account: the rule of /y/-loss is syntactically conditioned, and therefore belongs to the phonological component: it is a rule of sentence phonology. Consequently, this rule applies after the phonological rule of vowel epenthesis that belongs to the word grammar⁹.

The fourth and final example of a derivation in which a morpholexical rule has to precede a phonological rule, concerns Luiseño, where, according to Anderson, a phonological rule of spirantization has to be ordered before a reduplication rule in order to prevent the spirantization rule from applying to certain reduplicated forms. Anderson assumes the following rules for Luiseño:

- (i) Vowel syncope (a phonological rule):
 $V \rightarrow \emptyset / \acute{V}C \text{ --- } CV$

⁸ However, Prof. Basbøll has informed me that he holds the opinion that lengthening is not a purely phonological rule, but morphologically conditioned.

⁹ Anderson remarks that it is not clear yet whether the stress rule is purely phonological or partly morpholexical. Therefore, we leave this rule out of discussion here.

- (ii) Spirantization (a phonological rule)
 $\check{c} \rightarrow \check{s} / _ \{ \# , [-cont] \}$
- (iii) Reduplication I (derives intensive verbs from verbs)
 Reduplication II (derives de-intensive adjectives from verbs)
 (Both rules imply copying of the complete stem)

When we apply Reduplication I to a stem, everything goes fine, e. g.:

stem	čikwi-	'to be sad'
Red. I	čikwi-čikwi	'to suffer'
vowel syncope	∅	
spirantization	š	
phonetic form	[čikwiškwi]	

Note that vowel syncope and spirantization have to apply in this order, i. e. in a feeding order. But after Reduplication II spirantization should not apply, because otherwise a wrong phonetic form is derived:

stem	čara 'to tear'	
Red. II	čara-čara 'torn'	
syncope	∅	
spirantization	š	
phonetic form	*[čarašra]	instead of the correct [čaračra]

Anderson's solution is to order spirantization before Reduplication II, since in this way spirantization cannot apply. Note that this is possible in a theory of local ordering only, where no transitivity of ordering is assumed since otherwise the following deduction could be made: vowel syncope precedes spirantization, spirantization precedes Reduplication, so vowel syncope precedes Reduplication II. This deduction conflicts with the derivation that is necessary to produce the correct form [čaračra].

There is a crucial difference between this and the Tagalog case. In Tagalog we had to ensure that the effect of a phonological rule is copied by the reduplication rule. Here, the application of a reduplication rule implies the blocking of a spirantization rule. Therefore, we cannot predict this ordering by means of the organization of the word grammar. However, Anderson's solution is not very satisfactory either, because he is forced to assume two morpholexical rules that perform the same phonological operation, the copying of a stem. This is a serious drawback of his analysis. Therefore, we would prefer another solution, for instance that Reduplication II adds a negative exception feature for spirantization to its outputs.

But even if Anderson were right in his analysis of Luiseño, the point I want to make remains: in many cases the ordering of rules is predicted by the organizations of grammars, and in many cases where a phonological rule precedes a morpholexical rule, this is no complication of the grammar at all. I do not want to commit myself here to the claim that extrinsic ordering statements can be made completely

superfluous — although that would be nice — but it is clear that the number of language-specific ordering statements can be considerably reduced in this way.

Assumptions about the organization of word grammars also affect the theory of rule application. In the second part of this paper, I will argue that the cyclic application of stress rules is not an independent principle, but follows from the organization of the word grammar.

The essential claim embodied in the cyclic application of stress rules is 'once stressed, always stressed'. This appears to be correct for, e. g., English and Dutch compounds. However, this observation does not force us to assign an inherent property of cyclicity to stress rules, since word stress rules can be assumed to apply within the word formation cycle. That is, they function as redundancy rules with respect to existing words which are stored in the lexicon with a specification of their stress patterns. The word formation rule for compounds can use the words that are stored in the lexicon as base words, and form, for instance, the compound *koffiemachine* 'coffee machine' from *koffie* 'coffee' and *machine* 'machine'. The only rule that is required here for the derivation of the stress pattern of the compound is a rule that predicts which of the two primary stresses of the base words will gain the victory. The victor is the primary stress of the first part. This can be accounted for in two ways. In Chomsky and Halle (1968) a Compound Stress Rule assigns [1 stress] to the primary stressed syllable of the first part of the compound; the other [1 stress] is reduced to [2 stress] by means of a stress subordination convention. I prefer the alternative in which the CSR itself reduces the [1 stress] of the second part of the compound to [2 stress]. This makes the stress subordination convention superfluous. The stress pattern of a more complex compound such as *koffiemachinebediende* 'coffee machine operator' is derived as follows in this alternative approach:

1 st	WF-cycle	[[k ¹ offie] _N	[mach ¹ ine] _N _N	
	CSR		₂	
2 nd	WF-cycle	[[[k ¹ offie] _N	[mach ² ine] _N _N	[bed ¹ iende] _N _N
	CSR		₂	₂

In this way, we get only three degrees of stress: primary stress, secondary stress and no stress. The syllable with primary stress is the syllable with a pitch change when the word is used as a one word-sentence. These are the only degrees of stress that are agreed upon by all phoneticians. Note, however, that the claim that the cyclicity of stress rules follows from the organization of the word grammar, is logically independent from the problem of how to formulate the Compound Stress Rule.

According to Chomsky and Halle (1968), cyclic application of stress rules is also necessary for complex words derived by suffixation. Again, this is predicted by the organization of the word grammar, if we locate the Main Stress Rule in the Word Formation Cycle. The stress pattern of, for instance, *theatrical* is derived as follows:

base word	[theatre] _N
MSR	1
1 st WF-cycle	[[theatr] _N ic + al] _A
MSR	2 1
Stress Adjustment Rule	3

According to Kiparsky (1979), cyclicity must also be maintained in a metrical theory of word stress.

Counterexamples to the claim 'once stressed, always stressed' can be found among Dutch complex words derived by suffixation, for instance in the following word pairs:

(4)	prof ¹ et	'prophet'	— prof ² et ¹ es	'female prophet'
	abs ¹ urd	'absurd'	— abs ² urditeit ¹	'absurdity'
	vol ¹ ume	'volume'	— vol ² umineus ¹	'huge'
	Amer ¹ ika	'America'	— Amer ² ikaans ¹	'American'
	kan ¹ aal	'canal'	— kan ² aliseer ¹	'to canalize'

If we applied the relevant stress rule in a cyclic fashion, we would predict the wrong stress patterns *prof²et¹es*, *abs²urditeit¹*, *vol²umineus¹*, *Amer²ikaans¹* and *kan²aliseer¹*. It appears that the stress patterns of the complex words in (4) can be derived as follows:

- (i) a rule for main stress assigns [1 stress] to the final stressable syllable of the suffix (a syllable is stressable if it does not contain a schwa);
- (ii) a rhythmic rule, which also applies to simplex words, assigns [2 stress] to stressable syllables that are separated from a stressed syllable by one unstressed syllable, or by two just in case the syllable that would then be stressed is the first or final syllable of the word. The following simplex words illustrate the effect of the rhythmic rule

(5)	olif ² ant ¹	kan ² ap ¹ ee	infin ² it ¹ ief	Con ² stantin ¹ opel	encycl ² op ¹ edie
	domin ² ee	par ² ap ¹ u	Wag ² eningen	B ² andarana ¹ ike	par ² all ¹ elogram

So the derivation of the stress patterns of the complex words in (4) is only possible if we assume a language-specific principle that erases the main stress of the base word for a certain category of complex words. Note that we cannot invoke a principle of 'stress clash' here. Such a principle could predict the change of *prof²et¹es* to *prof²et¹es*, but in words such as *abs²urditeit*, *Amer²ikaans* and *kan²aliseer* no stress clash would arise, since the two stressed syllables would not be adjacent.

Let us now look at complex words derived by prefixation. Dutch has two types of prefixes: some bear the main stress of the word to which they belong, some do not. This has to be learned. Compare:

(6) (i) <i>Prefixes with [1 stress]:</i>	(ii) <i>Prefixes without [1 stress]:</i>
¹ aartsgem ² een (aarts-)	ervaar (er-)
¹ oergev ² aarlijk (oer-)	ontm ¹ oet (ont-)
¹ herformul ² eer (her-)	vertr ¹ ouw (ver-)
¹ ultramod ² ern (ultra-)	² achterh ¹ aal (achter-)
¹ hypernerv ² eus (hyper-)	² overstr ¹ oom (over-)
¹ onderverh ² uur (onder-)	on ¹ aangen ² aam (on-)

Some of the prefixes in (6 ii) have secondary stress, but this is predicted by the rhythmic rule referred to above. The derivation of the stress patterns of the words in (6) is straightforward now: prefixes with [1 stress] are specified as such by their Word Formation Rules. The Compound Stress Rule can be generalized in order to predict that the primary stress of the base word is reduced in these cases (Dutch prefixes are followed by #, cf. Booij 1977).

The rhythmic rule should be located outside the WF-cycle, since it is an automatic phonological rule that also applies to simplex words. Thus, we correctly predict that the claim 'once stressed, always stressed' does not pertain to those secondary stresses that are assigned to a word by the rhythmic rule. Compare:

(7) ² gram ¹ matikaal 'grammatical'	² on ¹ gram ² matikaal 'ungrammatical'
² organise ¹ er 'to organize'	re ² organise ¹ er 'to reorganize'
² subst ¹ antiatie 'substantiation'	tr ² anssubst ¹ antiatie 'transsubstantiation'

The stress pattern of *reorganiseer*, for example, is derived as follows:

base word	organiseer
Main Stress Rule	1
prefixation	re
rhythmic rule	2 2

This also suggests that languages may differ as to the location of their word stress rules: a language may have all its stress rules in the WF-cycle, or some of the stress rules may be located outside the WF-cycle (as for English the 'post-cyclic' Stress Adjustment Rule and for Dutch the rhythmic rule of secondary stress), or it may have all its stress rules outside the WF-cycle, i. e. the word stress system of that language is completely non-cyclic¹⁰.

Finally, two other interesting consequences of the theory outlined above should be noted. Firstly, it implies that *segmental* rules can also be applied 'cyclically' without any additional theoretical complication. Examples of such rules are given in e. g. Brame (1972). Secondly, since cyclicity is no longer an inherent property of stress rules, cyclicity will be predicted for *word* stress only. This is a desirable consequence, as was pointed out to me by Prof. P. Kiparsky, since in metrical phonology the rules that assign prosodic structure to a phrase or sentence do not apply cyclically (cf. Selkirk 1978).

¹⁰ A more extensive analysis of Dutch word stress will be published in Booij (to appear).

Thus, I hope to have shown that an adequate theory about the organization of grammars is of great importance for the theory of rule ordering and rule application.

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