

Syllabification and Syllable Changing Rules in French*

Roland Noske
University of Amsterdam/Z. W. O.

0. INTRODUCTION

In this paper, a proposal will be formulated concerning the assignment of syllable structure in French. It will be proposed that syllabification takes place according to the following principles:

- the prohibition against violating the notion of ‘possible French syllable’
- the tendency to achieve the lowest possible syllabic markedness.

A new concept of syllabic markedness will be developed, which also takes into account the number of syllables of a given form.

Then, a principled account will be given concerning two syllable changing processes in French, viz. the deletion of schwa and the change of high vowels into glides. It will be shown that these processes, which take place in apparently disparate contexts, can be accounted for in a principled and natural way if one assumes that they are governed by precisely the same conditions as those that govern syllabification, viz. the prohibition against violating the notion of ‘possible French syllable’ and the tendency to achieve the lowest possible syllabic markedness.

In section 1, a proposal for syllabification will be formulated. The notion of ‘possible French syllable’ will be expressed by means of a syllable template and a set of conditions on the cooccurrence of segments. There will be several digressions in order to account for apparent counter-examples to my proposal.

In section 2, the following two rules will be formulated accounting for the processes of schwa-deletion and the change of high vowels into glides (semivocalization):

- (1) *Schwa-Deletion*
 $\text{ə} \rightarrow \emptyset$

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- (2) *Semivocalization*

$$\begin{bmatrix} +\text{syll} \\ +\text{high} \end{bmatrix} \rightarrow [-\text{syll}]$$

These two rules will be assumed to be members of a class of rules without environment, to which the following two conditions are applicable. These conditions reflect the same tendencies as those that govern the syllabification process.

- (3) *The Syllabification Condition*
 The output of the environmentless rules must be exhaustively syllabifiable.
- (4) *The Markedness Condition*
 The environmentless rules *may not* apply if the syllabic markedness value of their output would be higher than that of their input; they *can* apply if the syllabic markedness value of their output is equal to that of their input; they *must* apply if the syllabic markedness value of their output is lower than that of their input.

Many cases of schwa-deletion and semivocalization will be treated, illustrating the working of the rules and the conditions. Also, some other proposals will be critically examined demonstrating that in those proposals certain facts have to be explicitly stated, while in my theory they can be explained in a natural way.

In an appendix, it will be shown that the metrical proposals put forth by Selkirk (1978) and Vergnaud and Halle et al. (1978) contain a number of inconsistencies.

1. THE ASSIGNMENT OF SYLLABLE STRUCTURE IN FRENCH.

As is commonly known, the syllabic structure of a given string of segments is highly predictable in a great many languages. This had led linguists to devise syllabification mechanisms which assign syllabic structure to phonological strings.¹ Most of these theories are based on the well-known *onset-rime* bipartition, advocated by Selkirk (this volume), Kaye and Lowenstamm (1982) and Vergnaud and Halle et al. (1978), among others. According to this assumption the syllable is divided into two parts: the *onset*, containing all material prior to the syllabic *peak* (or *nucleus*, usually consisting of a vowel; however in some languages other segments may function as a syllabic peak) and the *rime*, containing the remainder of the material in the syllable.



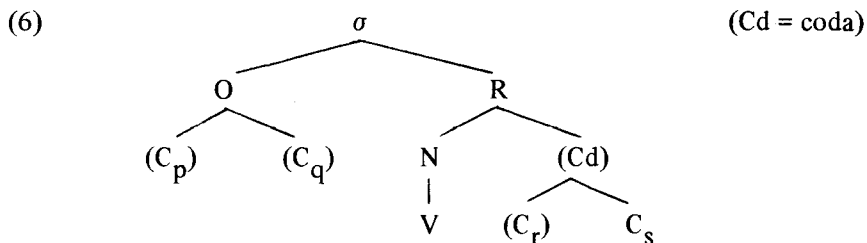
Another feature of most syllabification proposals is the notion of a 'possible syllable' in a given language. This notion is embodied in one way or another in the proposals of Kuryłowicz (1948), Vennemann (1972), Hooper (1972), Kahn (1976), Vogel (1977), Broselow (1979), Lowenstamm (1979), Selkirk (this volume), among others. In my syllabification proposal for French, I will assume the *onset-rime* bipartition as a universal of syllable structure. I will also assume that the notion of 'possible syllable' plays an important role in the assignment of syllabic structure. For this reason, I will discuss the notion of 'possible French syllable' in detail. During that discussion I will postulate the existence of monophonemic diphthongs in French, i.e. diphthongs which constitute a single phoneme.

I will then show that syllabification does not take place at the underlying level in French, but at some intermediate stage in the derivation after the application of at least one phonological rule.

Finally, I will propose a syllabification mechanism for French, making use of the principle of syllabification to lowest possible markedness.

1.1. The notion of 'possible French syllable'.

In addition to the universal *onset-rime* bipartition mentioned in (5), I will assume a language specific part of the syllable structure. It will be expressed by means of a syllable template as in Selkirk (this volume), as well as by a set of conditions on the cooccurrence of segments. The following template will be assumed:

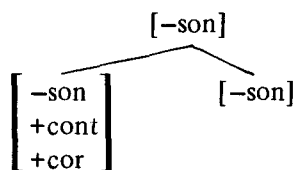


It should be noted that according to this template, the onset may be empty, but the rime must contain at least one segment. Some phonologists allow for empty rimes in which segments are inserted (see, e.g., Lowenstamm (1979) for Old English and Yiddish and ter Mors (1981, 1982) for Klamath). For French, however, there is little or no evidence for such extensive epenthesis processes. There is thus no reason to assume that a French rime may be empty at any stage of the derivation.

Another thing to be noted is that the rime may contain an optional coda, but that this coda, if present, cannot be empty.

In addition to the template given in (6), I will adopt an auxiliary template. This template will account for the sequences of *s* + obstruent which can occur in French onsets and codas. These sequences would otherwise be excluded by the conditions on the cooccurrence of segments which will be given in (10), below. The auxiliary template expresses the fact that an *s* + obstruent cluster may be analyzed as one obstruent.

(7) *auxiliary template*



This template is to be interpreted in accordance with the Feature Percolation Convention (FPC) proposed by Vergnaud (1979):

- (8) FPC: If a node in a tree is labelled with a particular feature or feature complex, then all segments dominated by the node in question must possess the feature or features.

As the reader will notice, the auxiliary template (7) is rather like the auxiliary template proposed by Selkirk (this volume) in order to account for similar phenomena in English.

The set of conditions on the cooccurrence of segments applicable to the main syllable template (6) will refer to the following strength hierarchy which I will assume for French. This hierarchy is similar to the language-universal strength scales proposed by Jespersen (1920) and de Saussure (1915), rather like the strength scale Hooper (1976) proposes for Spanish, and identical to the one proposed by Vogel (1977):

- (9) *a strength scale for French*
 obstruents/nasals/liquids/glides
 4 3 2 1

The following conditions on the main syllable template (6) will refer to the above strength scale:

(10) *a set of conditions on the main syllable template*

- i. $p > q$
- ii. if $q = 2$, then $p = 4$
- iii. $r = 2$
- iv. if $r = 2$, then $s = 4$

Note that C_r is optional, thus condition iii. does not imply that condition iv. is automatically fulfilled. Conditions i. and ii. express the fact that a French *onset* can consist of a cluster of obstruent+nasal², obstruent+liquid, or nasal+glide, as well as liquid+glide, but not of a cluster of two obstruents³, two nasals, two liquids, two glides, nasal+liquid. Conditions iii. and iv. express the fact that a French *coda* may consist of a cluster of liquid+obstruent⁴, but cannot consist of two obstruents⁵, two nasals, two liquids⁶, two glides, liquid+nasal⁷, nasal+obstruent⁸.

1.2. *Monophonematic diphthongs.*

The syllable template (6) and the set of conditions (10) exclude onsets consisting of a stop+liquid+glide cluster. Yet these onsets seem to appear abundantly in French. Examples are given in (11).

- | | | | | |
|------|----|---------|----------|----------|
| (11) | a. | [trwa] | 'three' | (trois) |
| | b. | [trɥit] | 'trout' | (truite) |
| | c. | [plɥi] | 'rain' | (pluie) |
| | d. | [brɥi] | 'noise' | (bruit) |
| | e. | [grwɛ̃] | 'muzzle' | (groin) |

I will argue here that the phonetic glide+vowel sequences in these forms are in fact single phonemes, just as e.g. affricates are often considered single phonemes. There are two arguments for this assumption.

The first argument concerns the fact that glides followed by a vowel are normally in free alternation with a homorganic high vowel in French, cf. (12).

- | | | | | |
|------|----|-------------------|------------|-----------|
| (12) | a. | [lue] ~ [lwe] | 'to rent' | (louer) |
| | b. | [nier] ~ [nje] | 'to deny' | (nier) |
| | c. | [ilia] ~ [ilja] | 'there is' | (il y a) |
| | d. | [luest] ~ [lwɛst] | 'the West' | (l'Ouest) |

In the forms in (13) however, where the high vowel is preceded by a tautosyllabic obstruent+liquid cluster, the pronunciation with a glide is not possible⁹:

- | | | | | |
|------|----|---------------------|-------------|----------|
| (13) | a. | [griɛf] * [grjɛf] | 'grievance' | (grief) |
| | b. | [adriɛ̃] * [adrjɛ̃] | 'Adrien' | (Adrien) |

This argument is used by Kaye and Lowenstamm (1980, 1981a) in connection with a slightly different assumption¹¹. They also note that it is only $wa \sim w\bar{e}$, $\bar{u}i$, $je \sim j\bar{e}$ that can be found in the environment OL ___ or that can be found in words where the glide does not alternate freely with a homorganic high vowel. It can thus be inferred that these sounds must form part of the phoneme inventory of French.

1.3. *The point in the derivation where syllabification applies.*

In this subsection, I will argue that syllabification does not take place at the underlying level in French, but at a later stage, after the application of at least one rule. For the sake of the argument, we first have to consider some examples of the working of the well-known process of consonant truncation in French. Consider the forms in (16):

- (16) a. petit ami /pətit#ami/ [pətitami] 'little friend'
 b. petit papa /pətit#papa/ [pətipapa] 'little papa'
 c. cher ami /ʃɛr#ami/ [ʃɛrami] 'dear friend'
 d. cher papa /ʃɛr#papa/ [ʃɛrpapa] 'dear papa'

In the phonetic form of (16b) the second *t* has been deleted. Confronted with these data, one may think that they are the result of a syllable sensitive rule which deletes obstruents in syllable-final position. Spa (1975) takes this position, but also indicates two important problems connected with the analysis of the truncation process as a syllable sensitive rule.

For the first problem we must look at the form in (17) (Spa (1975:81)):

- (17) petit rat /pətit#rat/ [pətira] 'little rat'

In (17) the word-final *t* of /pətit/ has been deleted (as well as that in /rat/ but this latter deletion does not concern us here), due to the process of consonant truncation. If this process were indeed a syllable sensitive process, it could be inferred that the word-final *t* of /pətit/ is in syllable-final position at the point of the derivation at which the truncation process applies. Now look at the forms in (18) and (19):

- (18) petit trou /pətit#tru/ [pətitru] 'little hole'
 (19) petite roue /pətit+ə#ru/ [pətitru] 'little wheel'

These forms receive the same pronunciation and in both cases native speakers locate the syllable boundary to the left of the *tr* cluster¹². In fact

an intervocalic *tr* cluster is always incorporated in the onset of the second syllable in French. Returning to the form in (17), we see that the second *t* of /pətit#rat/, which is part of an intervocalic *tr* cluster, cannot be in the onset of the latter syllable at the point in the derivation at which the truncation process takes place, if it is assumed that this process is a syllable sensitive process consisting of the deletion of syllable-final obstruents. This contradiction between the distribution of syllabic structure in the phonetic forms in (18, 19) and the intermediate structure at which the (allegedly) syllable sensitive truncation process applies in (17) could be resolved by assuming that word boundaries are initially boundaries for syllabification, and that a resyllabification process ignoring word boundaries takes place after the truncation process has applied. This latter assumption, however, would produce another problem: it would imply that the second *t* in (16a), /pətit#ami/, would find itself in syllable-final position at the point in the derivation at which truncation applies because there is a word boundary following it. This would result in the deletion of this *t*, thus incorrectly yielding *[pətiami].

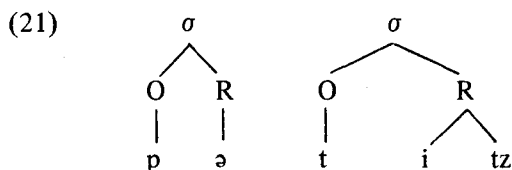
The second problem connected with the analysis of French consonant truncation as a syllable sensitive rule concerns the fact that no instances can be found of the truncation process taking place morpheme internally. This fact in itself is not surprising because morpheme-internal syllable-final obstruents would always be deleted and would consequently be lost in the lexicon. The real problem, however, is that there are many everyday words in French which *are* pronounced with a morpheme-internal syllable-final obstruent, e.g. *rester* [rɛste] 'to stay', *espérer* [ɛspɛrɛ] 'to hope'.

The two problems mentioned above disappear if it is assumed that the process of consonant truncation in French is not the result of a syllable sensitive rule, but rather of a rule referring to morpheme and word boundaries¹³.

Having shown that it is better to assume that the truncation phenomena in French are the result of a rule referring to morpheme and word boundaries rather than to syllable boundaries, I will now give an argument against the assumption that syllabification takes place at the underlying level. Consider the form in (20):

(20) ils sont petits /pətit+z/

If the syllabification applies prior to the application of the truncation rule (which deletes the *t* as well as the *z*) the syllabification of *petits* would be as in (21):



This would mean that *tz* would form the coda of the second syllable. Such a coda however, never shows up at the surface in French¹⁴. The notion of 'possible French syllable' (as defined in section 1.1.) would thus have to be extended to include a coda consisting of a *tz* cluster, which would only occur in underlying syllables. This is far from elegant, especially since *tz* would constitute a rather marked coda because it violates the well-known sonority or strength hierarchy as proposed by Jespersen (1920), Saussure (1915) and Hooper (1976): a fricative is considered to be less 'strong' or more 'sonorous' than a voiceless stop. Its unmarked position with regard to the voiceless stop is on the nucleus side of the stop, i.e. to the left of the stop. But in a *tz* coda, the position of the fricative is on the other side of the stop, next to the syllable boundary. Thus French would have to be marked for this exception to the sonority hierarchy, purely on the grounds that an underlying syllable, not a phonetic one, displays this order of segments. This would lead to a complication of the grammar.

If one adopts Lowenstamm's position, which is that syllabic structure is present in the lexicon, the argument dealing with the extension of the notion of 'possible syllable' no longer holds because Lowenstamm does not use this notion in his theory. But the fact remains that underlyingly the rather marked *tz* coda has to be assumed.

All these problems can be solved if one assumes that the initial syllabification takes place later in the derivation, a position adopted by Broselow (1979) for Egyptian Arabic. In her article, Broselow shows that two sandhi rules of this language are not at all simplified if their environment is described in terms of syllable structure. She thus shows that there is no need for syllabification rules to apply at the underlying level. I refer the reader to her article for the details; she also gives an ordering hypothesis to which I will return below. In Noske (1981) I showed that the data given by Broselow *force* us to assume a late syllabification in Egyptian Arabic.

The fact that syllabification must take place at a later stage than the underlying level in French as well as in Egyptian Arabic may not be coincidental. In both languages, syllabification takes place across word boundaries and segments belonging to two different words may be syllabified together – a phenomenon traditionally called *enchainement* by French grammarians. In this respect, French and Egyptian Arabic appear to be very different from, e.g., German in which syllabification is blocked

by word boundaries and even some morpheme boundaries. See, e.g., (22) and (23), in which the glottal stops have been inserted by a process triggered by a syllable initial vowel:

(22) Zahnarzt /t^san#art^st/ [tsanʔartst] 'dentist' ('tooth doctor')

(23) Verabredung /vər+ap+red+uŋ/ [vərʔapreduŋ] 'appointment'

The relationship between late initial syllabification and syllabification across word boundaries may be due to the fact that this syllabification takes place at a point in the derivation at which syntactic and morphological information is no longer available to phonological rules.

We now come to the question of whether syllabification should take place once only or whether there is resyllabification. Broselow (1979) formulates the following ordering hypothesis (p. 368), which she assumes would replace the hypothesis that syllabification takes place at the underlying level:

(24) Rules which insert, delete, or change the position of vowels in a string must precede rules of syllable structure assignment and therefore must also precede all rules which crucially refer to syllable structure.

A counterexample to this hypothesis is provided by the French forms in (25):

(25) a. bon /bən/ [bõ] 'good' (masc.)
 b. bonne /bən+ə/ [bõŋ] 'good' (fem.)

The rule of nasalization in French, which deletes a nasal consonant in syllable-final position and nasalizes the preceding vowel, has applied in (25a). This rule does not apply in (25b) even after the deletion of the schwa. It should be inferred, then, that the rule of nasalization which crucially refers to syllable structure is ordered before the rule which deletes the schwa. Thus syllable structure has to be present at the point of the derivation at which the rule deleting the schwa applies, which means that the assignment of the syllable structure has already taken place at this stage of the derivation. Because the rule deleting the schwa destroys part of the syllable structure, it has to be assumed that a resyllabification takes place after the application of the rule deleting the schwa. It thus has to be assumed that syllabification has to take place more than once. It must also be concluded that Broselow's ordering hypothesis, however attractive, must be rejected.

1.4. *The syllabification rules.*

Now that the notion of 'possible French syllable' has been defined and that we have seen that syllabification cannot take place at the underlying level in French, we can proceed to define the syllabification process. Apart from a proposal by Basbøll¹⁵ and one by Lowenstamm which I will discuss below, essentially only one principle has been proposed to govern the process of syllabification: the Maximal Cluster Approach (MCA), as it is termed by Lowenstamm (1979, 1981). The principle is based on a claim by non-generative phonologists, e.g. Kuryłowicz (1948), according to whom consonant clusters are possible syllable onsets and codas only if they are observed word-initially and word-finally respectively. It has been formalized in different versions by Kahn (1976), Vogel (1977) and Selkirk (this volume), among others. The essence of these proposals is that a given string is syllabified in three stages:

- (i) one syllable is associated with each [+syll] segment of the string.
- (ii) a maximum number of consonants preceding each [+syll] segment is associated with the syllable containing the relevant [+syll] segment. The consonants must form a permissible word-initial cluster.
- (iii) the remaining consonants are associated with the syllable containing the [+syll] segment preceding them. These consonants must form a permissible word-final cluster¹⁶.

It has been pointed out by Lowenstamm (1979: 38; 1981: 589) that this approach is inadequate for French. The MCA would syllabify words like

- (26) aspirer [aspire] 'to breath'
 (27) ausculter [ɔskylte] 'to auscultate'
 (28) astuce [astys] 'wit'

as (. indicates a syllable boundary):

- (26') .a.spi.re.
 (27') .ɔ.skyl.te.
 (28') .a.stys.

These syllabifications, however, are incorrect. The correct ones are:

(26'') .as.pi.re.

(27'') .os.kyl.te.

(28'') .as.tys.

Lowenstamm uses the rule of Closed Syllable Adjustment (which changes *e* and *ə* to ϵ in closed syllables) to motivate this distribution of syllable boundaries. He shows that this rule apparently functions to produce ϵ in the second members of pairs as:

- | | | | | |
|------|----|-------------|-------------|-----------------------|
| (29) | a. | étudiant | [etydjã] | 'student' |
| | b. | estudiantin | [ɛstydjãtẽ] | 'typical of students' |
| (30) | a. | gérer | [ʒere] | 'to manage' |
| | b. | gestion | [ʒɛstjõ] | 'management' |
| (31) | a. | fêter | [fete] | 'to celebrate' |
| | b. | festin | [fɛstẽ] | 'festive' |

It can be seen that in forms like (29b), (30b) and (31b) the *s* must belong to the first syllable because the rule of Closed Syllable Adjustment has applied. Lowenstamm provides additional motivation for the syllabification in (26''), (27'') and (28'') by mentioning the fact that there are many French words starting with ϵ followed by *s* + stop, as in (32), but no words starting with *e* followed by *s* + stop.

- | | | | | |
|------|----|----------|----------|-----------|
| (32) | a. | Esquimau | [ɛskimo] | 'Eskimo' |
| | b. | espoir | [ɛspwar] | 'hope' |
| | c. | estomac | [ɛstoma] | 'stomach' |

The MCA wrongly syllabifies (26), (27) and (28) as (26'), (27') and (28') respectively because *sp*, *st* and *sk* are possible French word-initial clusters as can be seen in (33):

- | | | | | |
|------|----|----------|-----------|-----------|
| (33) | a. | spécial | [spesjal] | 'special' |
| | b. | station | [stasjõ] | 'station' |
| | c. | scandale | [skãdal] | 'scandal' |

This type of onset is provided for in my definition of 'possible French syllable' by the auxiliary template (7). A possible remedy for the wrong predictions made by MCA could be provided by assuming a readjustment rule, transferring the *s* from the onset to the coda of the previous syllable

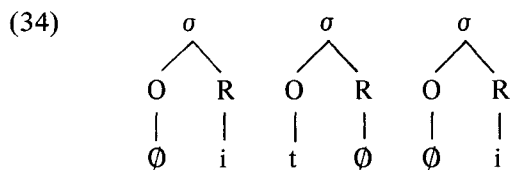
if it is preceded by a vowel and followed by a plosive. This solution has been adopted by Selkirk (this volume). Unfortunately no independent motivation can be found for such a readjustment process¹⁷.

As an alternative to the MCA Lowenstamm (1979: 97) proposes two principles, given here as (33):

- (33) a. Principle I – minimize the number of syllables
 b. Principle II – minimize the degree of markedness of each syllable.

Lowenstamm uses these principles in his language universal syllabification proposal, which is in fact a *resyllabification* proposal because Lowenstamm assumes syllabic structure to be present in the lexicon. He also assumes that syllabification takes place persistently. In section 1.3. I showed that syllabic structure cannot be present at the underlying level in French, but has to be assigned later in the derivation. Hence it cannot be present in the lexicon¹⁸. I have also shown that syllabification in French has to take place more than once during the derivation. Given this state of affairs, I will adopt the intuitively sound idea of a persistent syllabification, but I will change it to the hypothesis that syllabification is persistent *once it has first applied*.

Let us now return to the principles in (33). Lowenstamm proposes Principle I because his framework allows for zero rimes. Without Principle I, a word like *iti* could have a structure like:



If one rejects the possibility of zero rimes in French, as I do, Principle I appears to become superfluous. I will use the idea behind this principle, however, in my syllabification proposal for French which I will give shortly, for reasons that will be explained.

But first, consider Principle II in (33). Concerning this principle, the question can be asked how one is to decide about the markedness of a given syllable. The following markedness metric is given by Kaye and Lowenstamm (1981b:292) (also in Lowenstamm (1979:62)):

(35)	onset	rime	markedness
	C	V	0
	∅	∅	1
	CC	VC	2
	CCC	VCC	3
	C ₁ ...C _n	VC ₁ ...VC _{n-1}	n

This metric treats onsets and rimes separately. Kaye and Lowenstamm claim that the markedness for syllables should not be computed by adding the markedness of the onset to that of the rime. Yet, Kaye and Lowenstamm used the concept of syllabic markedness, by which they mean an ordered pair whose first member is the markedness specification of the onset and the second the markedness specification of the rime (Kaye and Lowenstamm (1981b:295), Lowenstamm (1979:67)¹⁹).

It is unclear, however, how the markedness metric in (35) should evaluate the syllabification of the forms in (26), (27) and (28), which are used by Lowenstamm himself in order to show the inadequacy of the MCA. The correct syllabification of (26), displayed in (26''), would have the following markedness values for onsets and rimes according to the markedness scale in (35):

(36)	σ		σ		σ		
	O	R	O	R	O	R	
		∧					
	∅	as	p	i	r	e	
	1	2	0	0	0	0	(markedness values)

The syllabification that is predicted by the MCA (displayed in (26')) would have the following markedness values for onsets and rimes:

(37)	σ		σ		σ		
	O	R	O	R	O	R	
			∧				
	∅	a	sp	i	r	e	
	1	0	2	0	0	0	(markedness values)

The difference between (36) and (37) is that in (36), the coda of the first syllable has markedness value 2, and the onset of the second syllable markedness value 0, while in (37), the situation is reversed. Principle II

in (33) cannot predict the correct syllabification, because it says nothing about the way the markedness values are spread over the word (or the higher prosodic unit which constitutes boundaries for syllabification). Thus Principle II makes no prediction with respect to the correct syllabification of words like [aspire].

This might lead the reader to the conclusion that this principle should be rejected. I think, however, that such a conclusion would be premature. The idea that syllabification is governed by a tendency to achieve the lowest possible markedness is a potentially insightful principle. It allows us to account for the syllabic divisions within a string of segments without resorting to otherwise unmotivated readjustments. Rather than trying to define yet another principle governing the syllabification process, it seems better to focus our attention on the markedness scale in (35). This markedness scale treats a VC rime on a par with a CC onset. There are however many languages that can have VC rimes, but not CC onsets. The reverse situation, however, does not occur. This suggests that a VC rime is less marked than a CC onset. Also, there is no case in which the rime will receive markedness value 1, because the syllable template in (6) does not allow for zero rimes. I therefore tentatively assume the following markedness scale, which replaces Kaye and Lowenstamm's markedness scale in (35):

(38)	onset	rime	markedness value
	C	V	0
	∅	VC	1
	CC	VCC	2
	CCC	VCCC	3
	C ₁ ...C _n	VC ₁ ...C _n	n

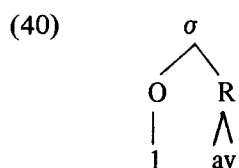
Principle II in (33) can now predict the correct syllabification of [aspire]. According to the markedness scale in (38), the markedness of the onsets and the rimes in (26') and (26'') will be:

(39)	a.				b.				
		σ	σ	σ	σ	σ	σ	σ	
		O R	O R	O R	O R	O R	O R	O R	
*			∧			∧			
		∅ a	sp i	r e	∅	as p	i r	e	
		1 0	2 0	0 0	1 1	0 0	0 0	0	
					(markedness values)				

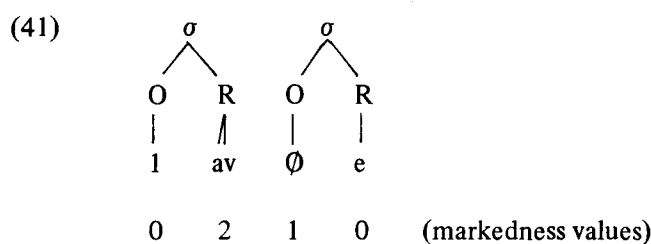
As one can see, the syllabification in (39b) only has two onsets or rimes

with markedness values 1, while (39a) has a rime with markedness value 1 and an onset with markedness value 2. Because of the lower markedness, Principle II in (33) will select (39b) as the correct syllabification.

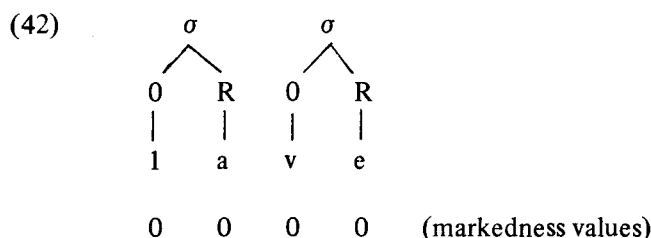
At this point, something must still be decided about Principle II. Probably, Lowenstamm proposed this principle only in view of cases like the French form /lav+e/ 'to wash'. Because of this assumption that syllable structure is present in the lexicon, the structure of the lexical part of this form will underlyingly be as in (40):



A morphological rule will now create the form in (41) (with markedness values according to Kaye and Lowenstamm's markedness scale in (35):



Because of Principle II, the string will be resyllabified as:



In this case, the markedness values of all onsets and rimes have decreased or remained the same. In the case of the choice between (39a) and (39b) however, the markedness value 2 of the onset of the second syllable in (39b) has to be evaluated in terms of the markedness value 1 of the rime of the first syllable in (39b). As a result, it may be concluded that it is the sum of the markedness values of the onsets and rimes of a given form

that must be considered. This is why I introduce here the notion of *syllabic markedness of the prosodic unit*. The prosodic unit meant here is the unit that constitutes the boundaries for syllabification, and which as we have seen above can vary considerably from language to language.

- (43) The syllabic markedness of the prosodic unit can be computed in the following way:
- i. determine the markedness of all onsets and rimes by means of the markedness scale in (38);
 - ii. add the markedness values together and add 1 to the sum of the markedness values for each syllable.

The second clause in (43ii) is based on the assumption that a form consisting of n syllables is less marked than a form consisting of $n+1$ syllables, other things being equal (e.g. in the case of a string of CV syllables). In fact, this clause just incorporates Principle I of (33) (reduction of the number of syllables) into the principle of syllabification to lowest possible markedness. The idea will receive further motivation in section 2 when I discuss schwa-deletion and semivocalization.

The syllabic markedness values for the two possible syllabifications of [aspire] are:

(44) a.

σ	σ	σ
O R	O R	O R
∅ a	sp i	r e

$$1 + 0 + 2 + 0 + 0 + 0 + 3 \text{ (=number of syllables)}$$

$$= 6$$

b.

σ	σ	σ
O R	O R	O R
∅ as	p i	r e

$$1 + 1 + 0 + 0 + 0 + 0 + 3 \text{ (=number of syllables)}$$

$$= 5$$

The principle of syllabification to lowest possible markedness correctly predicts that (44b) is the correct syllabification.

1.5. *A summary of the syllabification proposal.*

At this point, it seems useful to give a summary of the proposals on syllabification made above. I propose that syllabification in French takes place as follows:

- (45) i. Syllabification does not take place at the underlying level, but at a later stage, after the application of the truncation rule;
 ii. once the initial syllabification has taken place, (re-)syllabification takes place persistently.
- (46) Syllabification takes place according to the following principles:
 i. syllabification must be wellformed according to the templates in (6) and (7), subject to the conditions in (10) (which refer to the strength scale in (9));
 ii. minimize the syllabic markedness (determined by the markedness scale (38) and the number of syllables) of the prosodic unit which constitutes the domain for syllabification.

1.6. *Stop+liquid clusters and resyllabification under the influence of stress.*

The proposal on syllabification in French has still to be modified and elaborated on two points. The first one concerns the behaviour of stop+liquid clusters. The syllabification proposal that I have made above would predict the wrong syllabification for words like (47):

- (47) librement /librəmã/ 'freely'

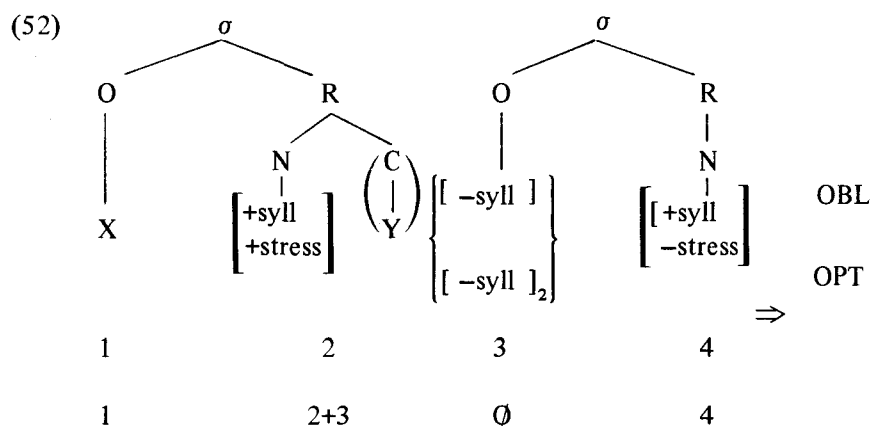
According to the proposal, (48a) would be selected as the correct syllabification, because its syllabic markedness is lower than that of (48b):

- (48) a.
- | | | | | | |
|---|----|---|---|---|---|
| σ | | σ | | σ | |
| O | R | O | R | O | R |
| | | | | | |
| l | ib | r | ə | m | ã |
- 0 + 1 + 0 + 0 + 0 + 0 + 3 (=number of syllables)
 = 4

Here, a word must be said about the concept of syllabic markedness developed above. It might strike the reader as odd that it is only the number of segments of a given form that determines the syllabic markedness of a given form. Indeed, as the above case from Latin shows (as well as the French case in (81), see section 2.1., below) the nature of the segments might also be a factor in determining the syllabic markedness of a given form. In fact a more elaborated concept of syllabic markedness than the one put forth in the present article may have to express the interaction of several, sometimes conflicting, tendencies like: (i) the tendency to achieve a CV syllable, and (ii) the tendency to achieve a maximal onset²². The exact nature of this interaction may or may not be different for individual languages.

We come now to the second point where my syllabification proposal needs to be modified. Like Selkirk (this volume), I will assume that a specified resyllabification takes place under the influence of stress. This resyllabification will apply once the stress has been assigned. I will assume that like the general syllabification process, this resyllabification will apply persistently once it has first applied. I will also assume that this resyllabification process takes precedence over the general syllabification process during its reapplications. Also, for reasons that will become clear in section 2.1., I will assume that the syllable templates can be violated by this resyllabification process. Thus in a sense this resyllabification process is 'stronger' than the general syllabification process.

The nature of the resyllabification process is as follows: a stressed syllable will attract segments from the onset of the following syllable, if this latter is unstressed. Selkirk (this volume) makes a similar proposal for English, while Hoard (1971) and Basbøll (1972) have integrated the attraction of segments under the influence of stress in their accounts of syllabification in English and Danish respectively. I will tentatively formulate this resyllabification as follows:



The analyses by Selkirk (1978) and Vergnaud and Halle (1978) are of a more principled character. They are based on the metrical theory developed by Liberman and Prince (1977). These analyses are not of primary concern to us here, but will be treated in the appendix to this article.

I now come to my own proposal. As mentioned above, I will assume only one rule of schwa-deletion. The analysis will account for the fact that only schwa, and no other vowel, can be deleted in French, apart from three isolated cases²⁴. In fact, it is just this that is expressed by the rule:

(55) *Schwa-Deletion*:

$$ə \rightarrow \emptyset$$

The rule, which is formulated without an environment, will be assumed to be a member of a class of rules without environments (to which, as will be shown in section 2.2., the rule of Semivocalization also belongs), to which the following conditions are applicable:

(56) *The Syllabification Condition*:

The output of the environmentless rules must be exhaustively syllabifiable.

(57) *The Markedness Condition*:

The environmentless rules *may not* apply if the syllabic markedness value of their output would be higher than that of their input, they *can* apply if the syllabic markedness value of their output is equal to that of their input, they *must* apply if the syllabic markedness value of their output is lower than that of their input.

The Markedness Condition in (57) can also be expressed by means of the α convention, if it is assumed that the rules of the class of environmentless rules are optional, just as the rules in the Chomsky and Lasnik framework in syntax (like free deletion in Comp, etc.):

(57') *The Markedness Condition* (formalized):

if $S(\alpha A(R)) < S(-\alpha A(R))$, then $*-\alpha A(R)$,

in which S = syllabic markedness value

A = application

R = member of the class of environmentless rules.

I will first discuss the Syllabification Condition in (56). This condition need not be stated as an independent condition, because it is in fact a consequence of the persistent character of the syllabification mechanism.

In section 1.4., motivation was provided for the assumption that syllabification is persistent once the initial syllabification has applied. In addition, it was shown in section 1.3. (see the forms in (25)) that the rule of Schwa-Deletion is applicable at a place in the derivation where the syllabic structure is already present. Hence, the syllabification mechanism automatically applies to the output of the rule of Schwa-Deletion. The Syllabification Condition in (56), then, follows from the straightforward assumption that if the syllabification mechanism fails to syllabify a given string then any further derivation of that string is blocked. The working of the condition can be seen in the contrast between the possible deletion of schwa in forms like those in (58) and (59) versus the non-deletion of schwa in (60):

(58)

a. pudiquement	/pydikəmā/	[pydikmā]	'chastely'
b. bombement	/bōbəmā/	[bōbmā]	'bombing'
c. froidement	/frwadəmā/	[frwadmā]	'coldly'

(59)

a. débarquement	/debarkəmā/	[debarkmā]	'debarcation'
b. escarpement	/ɛskarpəmā/	[ɛskarpmā]	'steep slope'
c. heurtement	/œrtəmā/	[œrtmā]	'collision'
d. éternement	/enɛrvəmā/	[enɛrvmā]	'excitement'
e. renversement	/rāvɛrsəmā/	[rāvɛrsmā]	'reversal'
f. émergement	/emɛrʒəmā/	[emɛrʒmā]	'emergence'
g. écorchement	/ekɔrfəmā/	[ekɔrfmā]	'flaying'
h. sveltement	/svɛltəmā/	[svɛltmā]	'slimly'
i. burlesquement	/byrlɛskəmā/	[byrlɛskmā]	'burlesquely'
j. manifestement	/manifɛstəmā/	[manifɛstmā]	'manifestly'

(60)

a. probablement	/prɔbabləmā/	[prɔbabləmā]	'probably'
b. simplement	/sɛpləmā/	[sɛpləmā]	'simply'
c. aveuglement	/avœgləmā/	[avœgləmā]	'blindly'
d. encerclement	/ãserkləmā/	[ãserkləmā]	'encirclement'
e. librement	/librəmā/	[librəmā]	'freely'
f. âprement	/aprəmā/	[aprəmā]	'rudely'
g. tendrement	/tãdrəmā/	[tãdrəmā]	'tenderly'
h. autrement	/otrəmā/	[otrəmā]	'differently'
i. maigrement	/mɛgrəmā/	[mɛgrəmā]	'meagrely'
j. médiocrement	/mediɔkrəmā/	[dediɔkrəmā]	'in a mediocre way'
k. ivrement	/ivrəmā/	[ivrəmā]	'in a drunk way'
l. exactement	/ɛgzaktəmā/	[ɛgzaktəmā]	'exactly'

The forms in (58) and (59) can also be assumed to contain a schwa underlyingly, because they can also be pronounced with a schwa²⁵. The contrast between the forms in (58) and (59) and the forms in (60) is a direct consequence of the Syllabification Condition. This becomes clear if one compares the consonants preceding the schwa in the underlying forms in (58) and (59) to those in (60). In the underlying forms in (59), the schwa is preceded by a liquid+obstruent cluster or an s+obstruent cluster, while in the underlying forms in (58), the schwa is preceded by only one consonant. In both cases the consonant or consonants preceding the schwa constitute a possible coda in French, while the consonant clusters in the forms in (60) do not form a possible French coda²⁶.

Another example of the working of the condition can be found in the forms in (61) and (62) (these examples are taken from Dell (1973: 231):

(61) *insistera* /ɛ̃sistə+r+a/ [ɛ̃sist(ə)ra] 'will insist'

(62) *soufflera* /suflə+r+a/ [sufləra] *[sufɫra] 'will whistle'

In the phonetic form in (62), the schwa is obligatorily present, because *ɫ* does not constitute a possible French coda (except in utterance-final position, this case will be treated below, see (74)).

Additional motivation for the Syllabification Condition is provided by the forms in (63) and (64), which are taken from Dell (1973: 229):

(63) *Henri devrait partir* /ɑ̃ri#dɛv+r+ɛ#part+ir/ [ɑ̃rid(ə)vʁɛpartir]
'Henri would have to leave'

(64) *Jacques devrait partir* /ʒak#dɛv+r+ɛ#part+ir/ [ʒakdɛvʁɛpartir]
*[ʒakdvʁɛpartir] 'Jacques would have to leave'

The difference between these forms is that in the case of (63) the syllable containing schwa is immediately preceded by a vowel (abstracted away from the syllable boundary), whereas in (64) it is preceded by a consonant. The result of the deletion of schwa in the underlying form would be the consonant sequence *kdvr*. This sequence cannot be analyzed into a possible coda followed by a possible onset, hence the derivation is blocked by the Syllabification Condition. In (63) on the other hand, the deletion of schwa results in the consonant sequence *dvʁ*, which is analyzable into a possible coda (*d*) followed by a possible onset (*vʁ*).

The Syllabification Condition is partially reflected in the output condition OLICONS proposed by Dell (1976:85; 1980: 215)²⁷:

(65) *OLICONS*:
*[-son] $\left[\begin{array}{l} +\text{son} \\ +\text{cons} \\ -\text{nas} \end{array} \right] [+cons]$

This condition replaces the condition in Dell's rule E-FUT prohibiting OL clusters in the input of this rules (see note 23) and it also accounts for the impossibility of (67b) as a phonetic realization of (66)²⁸.

(66) estre nouveau 'new star'

(67) a. [astrənuvo] b. *[astrnuvo]

Dell's condition OLICONS can be dispensed with by assuming the Syllabification Condition, which as we have seen does not need to be stated independently (in contrast with OLICONS), but follows from the assumption of the persistent character of the syllabification mechanisms.

Coming now to the working of the Markedness Condition, I will give examples of cases in which the rule of Schwa-Condition is made obligatory by the working of the Markedness Condition, then of cases in which Schwa-deletion is optional, and finally of a case in which the Markedness Condition prohibits the deletion of schwa.

First, three cases of obligatory schwa-deletion will be exemplified. In each case, the Markedness Condition blocks the derivation of the string if the rule of Schwa-Deletion does not apply. The first example concerns the form in (68):

(68) l'or /lə#or/ [lɔr] *[ləɔr] 'the gold'

The resulting syllabic markedness values of the phonetic forms in the case of application and non-application of Schwa-Deletion can be seen in (69a) and (69b) respectively:

(69) a.
$$\begin{array}{c} \sigma \\ \swarrow \quad \searrow \\ \text{O} \quad \text{R} \\ | \quad \wedge \\ \text{l} \quad \text{ɔr} \end{array}$$

0 + 1 + 1 (=numb. of syll.) = 2

b.
$$\begin{array}{cc} \sigma & \sigma \\ \swarrow \quad \searrow & \swarrow \quad \searrow \\ \text{O} \quad \text{R} & \text{O} \quad \text{R} \\ | \quad | & | \quad \wedge \\ \text{l} \quad \text{ə} & \emptyset \quad \text{ɔr} \end{array}$$

0 + 0 + 1 + 1 + 2 = 4

The Markedness Condition prohibits the derivation of the form in (69b), where Schwa-Deletion has *not* applied, because its syllabic markedness value is higher than that of the form in (69a) (the form in which Schwa-Deletion *has* applied). Another example can be found in (70):

(70) jolie maison /ʒoli+ə#mezɔ̃/ [ʒolimezɔ̃] *[ʒoliəmezɔ̃] 'bonny house'

The resulting syllabic markedness values of the phonetic forms in the case of application and non-application of Schwa-Deletion can be seen in (71a) and (71b) respectively.

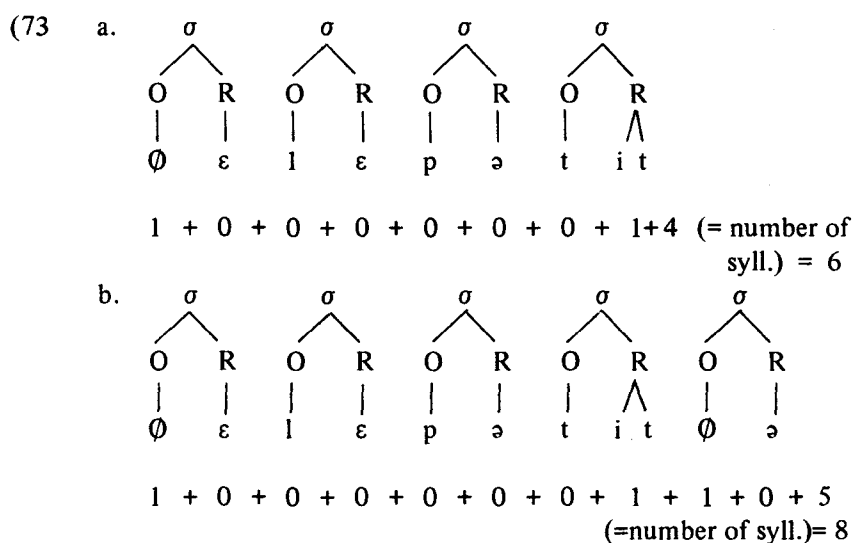
- (71) a.
- | | | | | | | | |
|---|---|---|---|---|---|---|---|
| σ | | σ | | σ | | σ | |
| O | R | O | R | O | R | O | R |
| | | | | | | | |
| ʒ | o | l | i | m | ε | z | ð |
- 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 4(= number of syll.) = 4
- b.
- | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| σ | | σ | | σ | | σ | | σ | |
| O | R | O | R | O | R | O | R | O | R |
| | | | | | | | | | |
| ʒ | o | l | i | ∅ | ə | m | ε | z | ð |
- 0 + 0 + 0 + 0 + 1 + 0 + 0 + 0 + 0 + 0 + 5
(= number of syll.) = 6

The Markedness Condition prohibits the derivation of the form in (71b) because its syllabic markedness value is higher than that of (71a).

The third example of obligatory schwa-deletion has already been mentioned in (53) and is repeated below:

- (72) elle est petite /ɛl#ɛ#pətɪt#ə/ [ɛlɛpətɪt] *[ɛlɛpətɪtə]

It was hypothesized earlier that the second *t* in this form is retracted to the preceding syllable by a specified resyllabification which overrules the general principle of syllabification to lowest possible syllabic markedness. This hypothesis was put forward by analogy with similar proposals for English and Danish. Further motivation is provided by the structures for (72) given below in (73). The assumption that the second *t* in this form has been restricted to the preceding syllable makes it possible to account for the obligatory deletion of schwa here. Compare the two syllabic markedness values derived from deletion and non-deletion of schwa respectively:

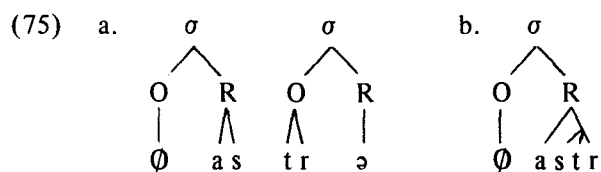


Here again, the Markedness Condition blocks the derivation of the form in (73b) because its syllabic markedness value is higher than that of (73a). If it was not assumed that the second *t* in *petite* was restructured, the deletion of schwa would wrongly be predicted to be optional because the increase in the degree of markedness of the rime of the last syllable by 1 (due to the incorporation of the *t*) would be compensated for by the decrease in the number of syllables by 1²⁹.

We should now look at the form in (54), repeated here as (74):

(74) *astre* /astrə/ [astr(ə)] 'star'

In this form the deletion of schwa is optional. The optionality is not due to the Markedness Condition, but rather to the fact that the specified resyllabification under the influence of stress by (52) is optional if there are two consonants following the rightward boundary of the stressed syllable. Thus the two possible syllabic configurations of this form are:



In the form in (75b) the specified resyllabification has applied (recall that this specified resyllabification may violate the syllable template) and the schwa has consequently been obligatory deleted, analogous to the deletion

of schwa in (73). In (75a), on the other hand, the deletion of schwa is not possible because the normal syllabification process does not allow for the *tr* cluster to be included in the coda of the previous syllable and the nucleus can also not be empty according to the template in (6). It is the fact that both (75a) and (75b) are possible syllabic configurations associated with the form in (74) that makes the deletion of schwa in (74) appear to be optional. As mentioned, the syllabic configuration in (75b) constitutes a violation of the syllable template and, in this case, of the sonority hierarchy as well. Indeed it is only in cases like these that codas like the one in (75b) cannot occur, i.e. at the end of the prosodic unit which constitutes the domain for syllabification. Compare (76a, b) and (77a, b):

- (76) a. probable /prɔbablə/ [prɔbabl(ə)] 'probably'
 b. probablement/prɔbablə+mã/ [prɔbabləmã] *[prɔbablmä]
 / 'probably'
- (77) a. (ce train est) le vôtre /lə#votrə/ [ləvotr(ə)] '(this train is)yours'
 b. votre train /votrə#trɛ/ [votrɛtrɛ] *[votrɛrɛ] 'your train'

The forms in (76a) and (77a) display an optional schwa-deletion analogous to that in (74), but in (76b) and (77b) the schwa which would be deleted is not preceded by a stressed syllable. Since the schwa is not preceded by a stressed syllable, the resyllabification rule (52) cannot apply.

We come now to cases in which the working of the Markedness Condition makes the deletion of schwa optional. Most of the forms in which the deletion of the schwa is optional have the following structure:

- (78)
- $$\begin{array}{c}
 \sigma \qquad \qquad \sigma \\
 \diagdown \quad \diagup \quad \diagdown \quad \diagup \\
 X \quad C_0 \quad V \quad C \quad \bar{\epsilon} \quad Y
 \end{array}$$

The deletion of the schwa in these cases decreases the number of syllables by one, but adds a segment to the rime of the preceding syllable, the result being:

- (79)
- $$\begin{array}{c}
 \sigma \\
 \diagdown \quad \diagup \quad \diagdown \\
 X \quad C_0 \quad V \quad C \quad Y
 \end{array}$$

The result of the deletion of schwa in cases like these is that the syllabic markedness value remains the same, because decreasing the number of syllables by 1 means decreasing the syllabic markedness values by 1, but adding a consonant to the rime increases it by 1. The Markedness Condition thus predicts that the deletion of schwa in cases like these is op-

tional. An example can be found in (63) above. More examples are given in (80):

- (80) a. *derechef* /dərəʃɛf/ [dər(ə)ʃɛf] ‘once more’
 b. *revenir* /rə+vən+ir/ [rəv(ə)nir] ‘to come back’
 c. *je ne crois pas* /ʒə#nə#krwa#pa/ [ʒən(ə)krwapa] ‘I do not believe’
 d. *tu le verras* /ty#lə#vɛr+a/ [tyl(ə)vɛra] ‘you will see him’

Another example in which schwa-deletion is optional can be found in (61) repeated here as (81):

- (81) *insistera* /ɛ̃sistə+r+a/ [ɛ̃sist(ə)ra] ‘will insist’

The Markedness Condition would normally block the deletion of schwa in this form, because the deletion would cause the onset of the last syllable to be doubly filled, which increases the markedness value by 2, while the number of syllables only decreases by one, so the overall increase in the syllabic markedness value is 1. Cases like these, however, are accounted for by the provision for stop+liquid clusters made in section 1.6., by which such clusters are assigned syllabic markedness value 1 instead of 2. The above case provides additional motivation for this provision, c.f. the syllabic configurations displayed in (82)³⁰:

- (82) a.
- | | | | |
|------|-------|-----|-----|
| σ | σ | σ | σ |
| O R | O R | O R | O R |
| | | | |
| ∅ ε̃ | s i s | t ə | r a |
- 1 + 0 + 0 + 1 + 0 + 0 + 0 + 0 + 4 (= number of syll.) = 6
- b.
- | | | |
|------|-------|-------|
| σ | σ | σ |
| O R | O R | O R |
| | | |
| ∅ ε̃ | s i s | t r a |
- 1 + 0 + 0 + 1 + 1 + 0 + 3 (= number of syll.) = 6

Finally, I will give an example in which the deletion of schwa is blocked by the working of the Markedness Condition. For this, we must consider the underlying form in (83):

(83) tu devenais /ty#dævəne/

the three possible phonetic realizations are:

(84) a. [tydævəne] b. [tydavnɛ] c. [tydvəne]

The form in (85), however, is impossible:

(85) *[tydvne]

The derivation of this form is blocked because its syllabic markedness value is higher than those of (84a, b, c) cf. (86) and (87):

(86) a.

σ	σ	σ	σ
O R	O R	O R	O R
t y	d ə	v ə	n ɛ

0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 4 (= number of syllables) = 4

b.

σ	σ	σ
O R	O R	O R
	/	
t y	d əv	n ɛ

0 + 0 + 0 + 1 + 0 + 0 + 0 + 3 = 4

c.

σ	σ	σ
O R	O R	O R
\		
t yd	v ə	n ɛ

0 + 1 + 0 + 0 + 0 + 0 + 3 = 4

(87)

σ	σ
O R	O R
/	\
t yd	vn ɛ

0 + 1 + 2 + 0 + 2 = 5

Having illustrated the working of the Syllabification and Markedness Conditions in the case of schwa-deletion, I will now briefly discuss four cases in which the theory outlined above does not give the right predictions. In two of these cases possible solutions will be given.

The first case concerns examples like the ones in (88), which are taken from Vergnaud and Halle (1978:5-7):

- (88) a. souvenir [suv(ə)nir] 'souvenir'
 b. jalousement [ʒaluz(ə)mã] 'jealously'
 c. passera [pas(ə)ra] 'will pass'
 d. volera [vɔl(ə)ra] 'will fly'

Although Vergnaud and Halle claim the schwa deletion as optional, it is obligatory according to Dell (1983; 1980) and most of the native speakers I have been able to consult. Indeed for most speakers of standard French, the deletion of schwa seems to be obligatory if only one intervocalic consonant precedes the schwa, and if there is no word boundary between the consonant and the preceding vowel.

The obligatoriness can be accounted for in two ways. The first one is that the markedness value of the rime does not increase by 1, but by a lower value. This amounts to saying that the decrease in the syllabic markedness value in the forms in (88) caused by the decrease in the number of syllables is not completely compensated for by the increase in the markedness values of the rimes preceding the schwa.

Another solution would be to postulate a resyllabification applying every time a full vowel is followed by a schwa. This means that the idea of a specified resyllabification proposed in section 1.6. (see (52)) is generalized to include resyllabifications under the influence of secondary stress. The schwa then finds itself in a syllable of which the onset is empty. Consequently, the deletion of the schwa decreases the syllabic markedness value of the form as is the case with the forms in (70), (72) and (75b), cf. (89):

- (89) a. $\begin{array}{c} \sigma \\ \diagup \quad \diagdown \\ \text{O} \quad \text{R} \\ | \quad \diagup \\ \text{v} \quad \text{ɔl} \end{array}$ $\begin{array}{c} \sigma \\ \diagup \quad \diagdown \\ \text{O} \quad \text{R} \\ | \quad | \\ \emptyset \quad \text{ə} \end{array}$ $\begin{array}{c} \sigma \\ \diagup \quad \diagdown \\ \text{O} \quad \text{R} \\ | \quad | \\ \text{r} \quad \text{a} \end{array}$ b. $\begin{array}{c} \sigma \\ \diagup \quad \diagdown \\ \text{O} \quad \text{R} \\ | \quad \diagup \\ \text{v} \quad \text{ɔl} \end{array}$ $\begin{array}{c} \sigma \\ \diagup \quad \diagdown \\ \text{O} \quad \text{R} \\ | \quad | \\ \text{r} \quad \text{a} \end{array}$
- 0 + 1 + 1 + 0 + 0 + 0+3=5 0 + 1 + 0 + 0 + 2=3

The idea of syllabification according to this principle has been suggested by Basbøll (1978). The contrast between the obligatoriness of the schwa-

deletion within one word and the optionality of the schwa-deletion if the syllable preceding the schwa belongs to a different word, may be the result of the optional treatment of a word boundary as a boundary for syllabification. If it *is* a boundary for syllabification, it is consequently also a boundary for the computation of the syllabic markedness values, because the notion of syllabic markedness developed in section 1.4. crucially relates to syllabification. In that case the deletion of schwa would be forbidden. On the other hand, deletion of the schwa would be obligatory if the syllabification process did not respect the word boundary. Unfortunately, the two solutions suggested above are not compatible with other features of my proposal, such as my treatment of the contrast in behaviour between *probable* and *probablement*.

A second problem concerning schwa-deletion has been noted by Dell (1973: 232; 1980: 208). It concerns the forms:

- (90) a. hésiteriez /ezitə+r+iez/ [ezitərje] *[ezitrje] 'would hesitate'
 b. volerions /vələ+r+iõz/ [vələrjõ] *[vəltrjõ] 'would fly'

The problem here is that the schwa in these conditional forms cannot be deleted, while the deletion is possible and obligatory for most speakers for some in the corresponding forms of the future:

- (91) a. hésiterez /ezitə+rez/ [ezit(ə)re] 'will hesitate'
 b. volerons /vələ+r+iõz/ [vəl(ə)rõ] 'will fly'³¹

For this problem a straightforward solution can be found. It must be assumed that the morphemes *-ions*, *-iez* contain underlyingly a glide instead of a high vowel. Evidence for this can be found in the minimal pair:

- (92) a. à Lyon /a#liõ/ [aljõ]~[aliõ] 'in Lyons'
 b. allions /al+jõz/ [aljõ] *[aliõ] '(we) went'

While the form in (92a) can be pronounced with both a high vowel and a glide (the second pronunciation being the result of the application of the rule of Semivocalization, to be treated in section 2.2.), the form in (92b) can only be pronounced with a glide, because it contains a glide underlyingly. The deletion of schwa in (90a), which is now assumed to have as underlying form /ezitə+r+jez/, would cause the onset of the last syllable in this form to become *trj*. This is not a permissible onset, because the syllable templates proposed in (6) and (7) do not allow for an onset consisting of three segments (except if the first and second segments are an *s* and an obstruent respectively), thus the derivation is filtered out by the

Syllabification Condition. The deletion of schwa in the form in (90b), now assumed to have as underlying form /vələɾjɔ̃z/, is blocked by the Markedness Condition. Deletion of the schwa would increase the syllabic markedness value of the form:

(93) a.
$$\begin{array}{c} \sigma & & \sigma & & \sigma \\ \diagdown & & \diagdown & & \diagdown \\ \text{O} & & \text{R} & & \text{O} & & \text{R} \\ | & & | & & | & & | \\ \text{v} & & \emptyset & & \text{l} & & \text{ər} & & \text{j} & & \text{ɔ̃} \end{array}$$

$0 + 0 + 0 + 1 + 0 + 0 + 3 = 4$

b.
$$\begin{array}{c} \sigma & & \sigma \\ \diagdown & & \diagdown \\ \text{O} & & \text{R} & & \text{O} & & \text{R} \\ | & & \wedge & & \wedge & & | \\ \text{v} & & \emptyset \text{l} & & \text{rj} & & \text{ɔ̃} \end{array}$$

$0 + 1 + 2 + 0 + 2 = 5$

I will come back to the problem involving the verb-endings *-ions*, *-iez* in section 2.2. when I discuss Semivocalization.

The third problem concerning schwa-deletion is the fact that the deletion of the schwa in the negative particle *ne* takes precedence over the deletion of another schwa. This fact is noted by Dell (1973: 255); 1980: 236). Compare the forms in (94) and (95):

(94) je le demande /ʒə#lə#dəmɑ̃də/ [ʒəldəmə̃d]~[ʒələdmɑ̃d]
'I ask it'

(95) je ne demande pas /ʒə#nə#dəmɑ̃də#pɑz/ [ʒəndəmə̃dpa]
*[ʒənədmɑ̃dpa] 'I do not ask'

In (94) either the schwa in *le* or the one in the first syllable of *demande* can be deleted, but in (95) only the schwa in *ne* can be deleted. For this problem (for which Dell has formulated a rule that seems entirely ad hoc³²), I see no phonological solution. It can only be stated that the schwa in *ne* is more accessible for deletion than other schwas.

The fourth problem concerns the deletion of schwa in utterance-initial position, in examples like:

(96) a. venez ici /vən+ez#isi/ [vneisi] 'come here'
b. te fais pas de bile /tə#fɛ#pɑz#də#bil/ [tʃɛpadbil] 'don't worry'
(slang)

In these cases, the deletion of schwa appears to violate the Markedness Condition, and in the case of (96b) even the Syllabification Condition. Unfortunately, I see no direct solution to this problem, but it may be related to the observation that languages generally allow a wider range

of syllable types word-initially and word-finally than word-medially.

2.2. SEMIVOCALIZATION

I now come to the second rule formulated without environment, viz. Semivocalization, and I will show how this rule interacts with the Syllabification Condition (56) and the Markedness Condition (57). I assume that the rule of Semivocalization is stated as:

(97) *Semivocalization*:

$$\begin{bmatrix} +\text{syll} \\ +\text{high} \end{bmatrix} \rightarrow [-\text{syll}]$$

The facts that have to be accounted for are given in (98)³³:

- (98) i. no glide can be preceded by a tautosyllabic OL cluster;
 ii. in other cases there exists a free alternation between high vowels and glides in prevocalic position; if a prevocalic glide is preceded by a vowel or if it is in utterance-initial position, however, it cannot alternate with a high vowel.
 iii. there are exceptions to the statements in (i) and (ii) in words whose phonetic forms always contain a glide.

I will give examples of each of these cases and I will show how my theory accounts for them. The case in (98 i.) is very straightforward. The Syllabification Condition forbid the application of the rule of Semivocalization because an OLG cluster does not constitute a permissible French onset (cf. the templates in (6) and (7)). Examples are given in (99):

- (99) a. Adrien /adriē/ [adriē] *[adrjē] 'Adrien'
 b. grief /griɛf/ [griɛf] *[grjɛf] 'grievance'
 c. influence /ɛflyās/ [ɛflyās] *[ɛflɥās] 'influence'
 d. trouser /tru+e/ [true] *[trwe] 'to punch a hole'
 e. publier /pybli+e/ [pyblie] *[pyblje] 'to publish'

Examples of the first clause in (98 ii.), i.e. cases in which the high vowel is in prevocalic position, can be found in (100)³³:



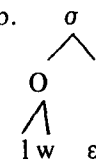
- (100) a. l'ouest /lə#uɛst/ [luɛst]~[lwɛst] 'the west'
 b. nier /ni+e/ [nie]~[nje] 'to deny'
 c. nuage /nya₃/ [nya₃]~[ny₄a₃] 'cloud'

- d. tu as vu /ty#a#vy/ [tyavy]~[tʰavy] 'you have seen'
 e. skier /ski#e/ [skie]~[skje] 'to ski'
 f. il y a /il#i#a/ [ilia]~[ilja] 'there is'

In these cases, the syllabic markedness values resulting from application and non-application of Semivocalization are the same. Hence the Markedness Condition renders the application of Semivocalization optional. Cf. the syllabic configurations in (101):

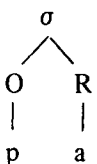


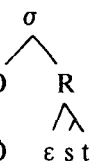
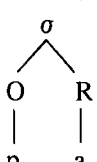

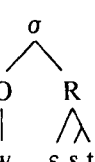
In (101b), the increase of the syllabic markedness because of the inclusion in the onset of a second segment is compensated for by the decrease in the number of syllables of the form, as well as by the fact that there is no longer an empty onset.

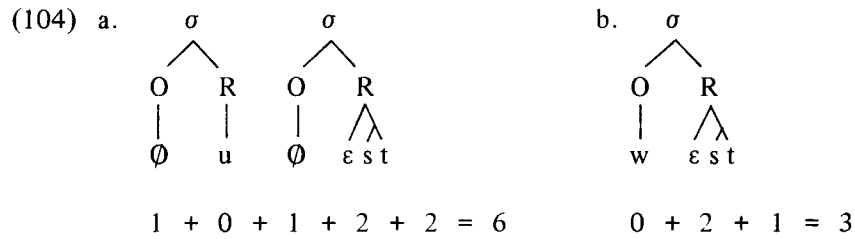
The second part of (98 ii) is exemplified by forms like the ones in (102):

- (101) a.   b. 
- 0 + 0 + 1 + 2 + 2 = 5 2 + 2 + 1 = 5

- (102) a. Paris-Ouest /pari#uest/ [pariwest] *[pariɛst] 'Paris-West'
 b. ouest /uest/ [west] *[uest] 'west' (spoken in isolation)

In these cases, non-application of Semivocalization would result in a higher syllabic markedness value than application, cf. (103) and (104):

- (103) a.    
- 0 + 0 + 0 + 0 + 1 + 0 + 1 + 2 + 4 = 8
- b.   
- 0 + 0 + 0 + 0 + 0 + 2 + 3 = 5



Because of the higher syllabic markedness in the case of non-application of Semivocalization, the Markedness Condition blocks the derivation of (103a) and (104a).

Cases like the ones referred to in (98 iii.) have already been mentioned in (11), where it was argued that the diphthongs in these forms in fact constitute single phonemes. The forms in (11) are repeated here as (105), with their underlying forms (the arcs under the diphthongs in the underlying forms indicate the monophonematic status of these diphthongs)³⁴:

(105) a.	trois	/trwa/	[trwa]	*[trua]	'three'	y
b.	truite	/trɥjtə/	[trɥit]	*[tryit]	'troute'	y
c.	pluie	/plɥj/	[plɥi]	*[plyi]	'rain'	y
d.	bruit	/brɥj/	[brɥi]	*[bryi]	'noise'	y
e.	groin	/grwɛ̃/	[grwɛ̃]	*[gryɛ̃]	'muzzle'	y

As already pointed out in section 1.2., these forms do not display an alternation glide/high vowel because of the fact that the diphthongs here are single phonemes. This is also why these diphthongs can be preceded by a tautosyllabic OL cluster – a configuration otherwise disallowed by the template in (6). Other examples of cases mentioned in (98 iii.) can be found in:

(106) a.	voir	/vɥar/	[vwar]	*[vuar]	'to see'
b.	puisse	/pɥis+ə/	[pɥis]	*[pyis]	'(he) can (subjunctive)'
c.	tienne	/tjɛn+ə/	[tjɛn]	*[tiɛn]	'(he) holds (subjunctive)'
d.	bois	/bɥa/	[bwa]	*[bua]	'wood'
e.	bien	/bjɛ̃/	[bjɛ̃]	*[biɛ̃]	'well' (adv.)
f.	puits	/pɥj/	[pɥi]	*[pyi]	'well' (n.)

At this point a few words must be said about an apparent counterexample to my proposal. De Kok and Spa (1978:72) note that the forms in (107) do not display a free alternation vowel/glide:

(107) a.	antieuropéen	/ãtiøropeɛ̃/	[ãtiøropeɛ̃]	*[ãtjøropeɛ̃]	'anti-European'
b.	semi-aride	/səmi+aridə/	[səmiarid]	*[səmjariid]	'half-dry'
c.	milliampère	/mili+ãper/	[miliãper]	*[miljãper]	'milliamperere'

The non-application of Semivocalization in these cases can be accounted for by assuming that the boundary between the two formatives in these words is a boundary for syllabification. In that case, the Syllabification Condition blocks the derivation, because *tj* and *lj* are not possible French codas.

I will also briefly discuss here the behaviour of the verb-endings *-ions*, *-iez*. The high vowel/glide alternations in these forms display a pattern different from other high vowel/glide alternations. It was argued in section 2.1. (see (90) and (92)) that these forms contain a glide underlyingly³⁵. However, there is one case in which these verb-endings show up with a high vowel at the surface: in the case where they are preceded by an OL cluster. An example can be found in (108)³⁶:

(108) *entrions* /ãtr+jõz/ [ãtriõ] *[ãtrjõ] ‘(we) entered’

This pattern of high vowel/glide alternation is by no means limited to the verb-endings *-ions*, but also occurs with the noun-endings *-ier*, *-ion* (Jaap Spa, personal communication). For example:

- | | | | | | |
|-------|----|------------------|------------|------------|-------------|
| (109) | a. | <i>poirier</i> | [pwarje] | *[pwarie] | ‘pear tree’ |
| | b. | <i>couturier</i> | [kutyryje] | *[kutyrie] | ‘tailor’ |
| | c. | <i>espion</i> | [ɛspjõ] | *[ɛspiõ] | ‘spy’ |
| | d. | <i>camion</i> | [kamjõ] | *[kamiõ] | ‘lorry’ |
-
- | | | | | | |
|-------|----|-------------------|-----------|------------|----------------------|
| (110) | a. | <i>ouvrier</i> | [uvrie] | *[uvrje] | ‘worker’ |
| | b. | <i>encrier</i> | [ãkrie] | *[ãkrje] | ‘inkpot’ |
| | c. | <i>histrion</i> | [istriõ] | *[istrjõ] | ‘bluffer’ |
| | d. | <i>amphitryon</i> | [ãfitriõ] | *[ãfitrjõ] | ‘host (at a dinner)’ |

The intriguing fact about this type of alternation is that the high vowel occurs only in a position where a glide would not have been possible because it would violate the notion of ‘French possible syllable’, viz. in a position after an OL cluster. This change from a glide into a high vowel may be the result of a separate process applying before, or during, syllabification. It cannot apply after syllabification because an OLG cluster is disallowed by the syllable template in (6). The process of semivocalization, on the other hand, has to apply after syllabification has taken place. This can be seen by looking at the form in (100a), repeated here as (111):

(111) *l’ouest* /lɔ#uɛst/ [luɛst] ~ [lwɛst] ‘the west’

Schwa-Deletion has to be ordered before Semivocalization, otherwise it would not be able to apply in (111) if Semivocalization has applied³⁷.

3. CONCLUSION

I have proposed an alternative theory of Syllabification for French on the basis of an idea proposed by Lowenstamm (1979), viz. syllabification to lowest possible markedness. It was shown that the concept of markedness as developed by Kaye and Lowenstamm is unable to yield the correct predictions for French if we accept the principle of syllabification to lowest possible markedness. I therefore developed a concept of syllabic markedness which involves a somewhat different markedness scale from the one proposed by Kaye and Lowenstamm and which also takes into account the number of syllables in each given form. Another feature found in many syllabification proposals has been retained, viz. the requirement that the syllables conform to a syllable template.

It was then shown that two processes in French, Schwa-Deletion and Semi-Vocalization, depend on precisely the same principles as the ones that govern syllabification, viz. the prohibition against violating the notion of 'possible French syllable' and the tendency to achieve lowest possible syllabic markedness. Schwa-deletion and semivocalization are both syllable changing processes and so it is not surprising that principles governing syllabification should play a role in conditioning their application. In fact, we may go one step further and claim that we have actually been able to explain restrictions on the application of schwa-deletion and semivocalization by means of independently needed syllabification conditions. As a result, the rules of Schwa-Deletion and Semivocalization (and perhaps syllable-structure-changing rules in general) can be stated in a maximally general form. That is, no environments need to be specified for these rules at all. It has thus been shown that the approach involving simplification of the rules as such, connected with the development of a system of (preferably language-independent) conditions, which has been paramount in EST syntax for the last few years, can also be fruitful in generative phonology.

In this article, I have confined myself to French. It is very likely, however, that given the generality of the processes discussed here, an account involving the same principles as the ones proposed here can be given of syllable changing processes in other languages.

APPENDIX

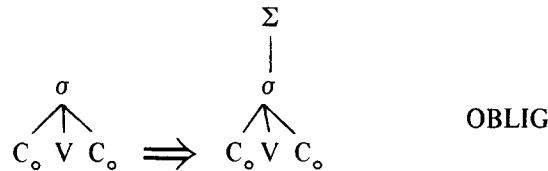
In this appendix, I will discuss two proposals inspired by the metrical theory proposed by Liberman and Prince (1977). These two proposals – Selkirk (1978) and Vergnaud and Halle (1978) – include accounts of some of the cases of schwa-deletion in French. I discuss the two proposals here because they are often referred to. There is a general failure to realize, however, that their analyses contain some inconsistencies, as will be shown below.

Selkirk (1978) uses the notion of *foot* in her analysis of schwa-deletion. This term is borrowed from Liberman and Prince (1977). The *foot* is a higher order unit composed of syllables, just as the syllable is a higher order unit composed of segments. The principles governing the composition of feet in particular languages are thought to be partly universal, partly language specific.

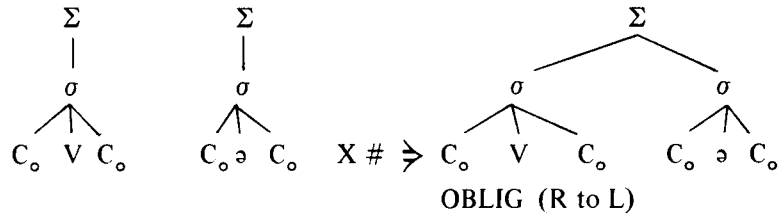
According to Selkirk, French is different from a language like English where feet normally consist of two, perhaps three, syllables. In French the feet consist generally of one syllable (Selkirk mentions that the traditional distinction between syllable-timed languages like French and stress time languages like English can perhaps be viewed as following from the difference in the general definition of foot in the two languages). There are cases, however, in which the French foot can consist of two syllables. According to Selkirk, in addition to a general principle that makes a foot out of each syllable, a second principle is at work, by which a foot that consists of a syllable whose vowel is a schwa can be merged with the preceding foot, cf. the principles of French Foot Formation in (112) (Selkirk 1978: 144); Σ is the symbol used for foot):

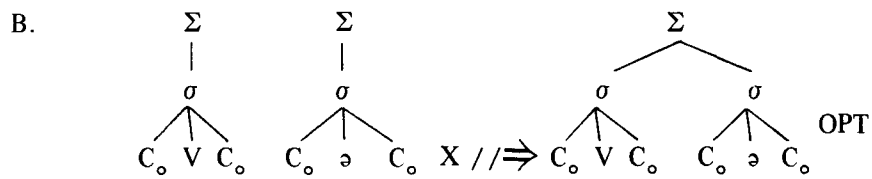
(112) Selkirk's *French Foot Formation*:

I. *The Simple Foot*



II. *The Derived Foot*





Rules (I), (IIA) and (IIB) apparently apply in the given order. (IIA) differs from (IIB) in two ways: (IIA) operates between word boundaries, and is obligatory, while (IIB), has the entire utterance as its domain, and is optional.

Somewhat later in her article (p. 145), Selkirk gives a rule of schwa-syncope, which refers to the notion of foot:

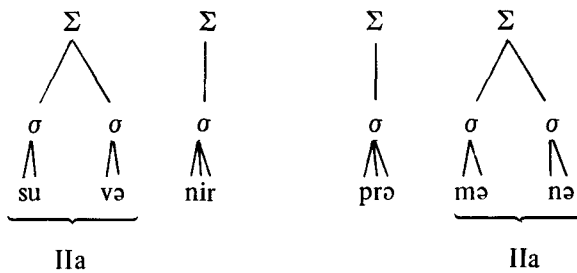
(113) Selkirk's ə-syncope:

$$\text{ə} \rightarrow \emptyset / \left[\begin{array}{c} \dots \text{VC} __ \dots \\ \Sigma \qquad \qquad \Sigma \end{array} \right] \text{ OBLIG}$$

This rule accounts for the deletion of schwa in forms like those in (114):

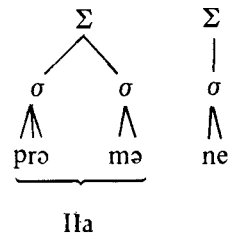
(114) a. *souvenir*

b. *promène*



[suvnir] 'to remember' [prəmɛn]³⁸ 'walk'

c. *promener*

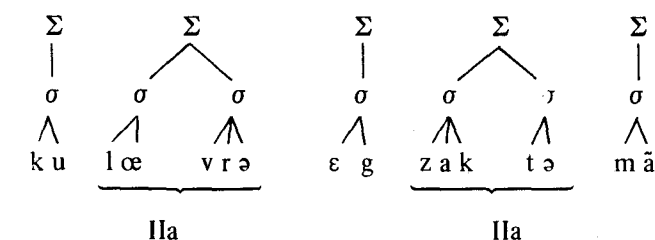


[prɔmne] 'to walk'

The rule cannot delete the schwas in forms like those (115) because of the two preceding consonants:

(115) a. *couleuvre*

b. *exactement*



[kulœvrə]
'kind of snake'

[ɛgzaktəmā]
'exactly'

In (115a), the schwa can be deleted depending on other factors, in particular the stress pattern of the sentence, as indicated by Dell (1973) and others (cf. my account of this phenomenon in section (see (74) and (75)). The deletion of schwa in forms like those in (114) is obligatory because both rule (IIA) of (112) (which forms bisyllabic feet in the form of (114)) and the schwa-syncope rule in (113) are obligatory. However, if a word boundary occurs between a syllable containing a schwa and the preceding syllable, the deletion of schwa is optional, because in that case a bisyllabic foot can only be formed by the application of rule (IIB), which is optional, and the SD of the rule of schwa-syncope in (113) properly includes a bisyllabic foot. The sentence in (116) thus has five possible realizations, which are displayed in (117)³⁹ (Selkirk (1978: 146)):

(116) Il a envie de te revoir /il#a#ãvi#dɛ#tə#rɛ+vwar/ 'he feels like seeing you again'

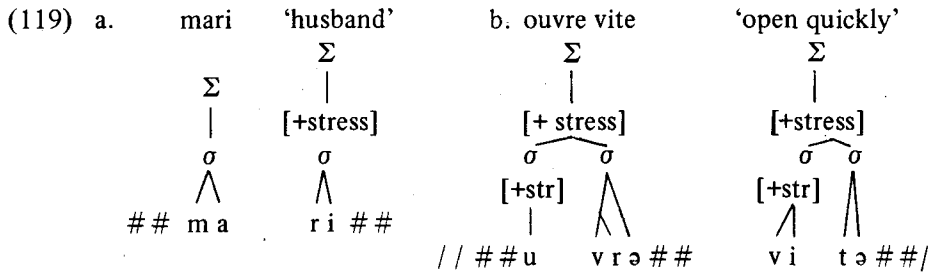
- (117) a. [ilaãvidɛtɛrɛvwar]
 b. [ilaãvidɛtɛrɛvwar]
 c. [ilaãvidɛtɛrɛvwar]
 d. [ilaãvidɛtɛrɛvwar]
 e. [ilaãvidɛtɛrɛvwar]

Selkirk also makes use of the French Foot Formation in order to account for two other phenomena in French: stress assignment and the change of *e* and *ə* to *ɛ* in certain environments.

For stress assignment she simply posits the rule: 'stress the last foot in a word', cf. (118):

(118) $\Sigma \rightarrow [+stress] / ___ \#$

She then gives two examples of the functioning of this rule (p. 148), cf. (119):



In the formulation of rule (118), no mention of ∂ needs to be made, because the realization of stress on the first syllable inside each foot in forms like (119b) follows automatically from the fact that it is in some sense the 'nucleus' of the foot or 'supersyllable'. Put in terms of the framework of Liberman and Prince (1977), the syllable on the left is stressed because it is the strong member of an S-W pair:

For the change of e and ∂ to ϵ , Selkirk posits the rule:

(120) $\left\{ \begin{matrix} e \\ \partial \end{matrix} \right\} \rightarrow \epsilon / [C_{\Sigma} ___ W_{\Sigma}]$
 $W \neq \emptyset$

This rule can account for the alternation e/ϵ and ∂/ϵ in the pairs of (121):

- (121) a. cédait [sedε]/ cède [sɛd] 'gave in/gives in'
 b. célébrait [selebrε]/ célèbre [selɛbr] 'celebrated/famous'
 c. insérait [ɛserε]/ insère [ɛser], insertion [ɛsersjɔ̃]
 'included/includes, inclusion'
 d. sevrerait [səvrε]/ sèvre [sɛvr] 'weaned/weans'

This rule can also account for the occurrences of ϵ in forms like those in (122), where it is not in a closed syllable:

- (122) a. céderiez [sɛdərje] 'would give in'
 b. sèvrerez [sɛvrərə] 'will wean'
 c. (elle est) célèbre donc [selebrədɔ̃k] 'so (she is) famous'
 d. sèvre-le [sɛvrələ] 'wean it'

Selkirk concludes that she has given a unified account of the phenomena involving schwa in French by using a prosodic approach: according to her, the special status of French “mute *e*” follows from its special status in prosodic structure.

However, I will demonstrate that this conclusion is overly optimistic. For this, I will give instances of schwas that are maintained in places where they should be deleted according to Selkirk’s proposal, and of schwas that are deleted in places that Selkirk’s proposal does not account for. It will be shown that in these latter cases, the deletions of schwa have certain features in common with schwa-deletions that Selkirk does account for. In other words, it will become clear that Selkirk has captured a spurious generalization. I will also show that Selkirk’s rule in (120) makes the wrong predictions. In addition, I will show that if one tries to resolve the problems, one gets into more trouble.

The first instance I wish to discuss concerns the apparent optionality of the deletion of schwas which according to Selkirk’s proposal of French Foot Formation would be part of the second syllable of a bisyllabic foot. As we have seen in section 2.1. (cf. (83)), the form in (123) has the three possible phonetic forms given in (124):

(123) *tu devenais* /ty#dəvənɛ/ ‘you became’

(124) a. [tydəvənɛ] b. [tydəvnɛ] c. [tydvənɛ]

Selkirk’s proposal can only account for (124b) because rule (IIA) of the rules of French Foot Formation in (112) obligatory makes a foot out of the first two syllables of /dəvənɛ/, and the rule of schwa-syncope in (113) is also obligatory. How can this situation be dealt with if one wishes to maintain the essence of Selkirk’s proposal? (124a) could be derived by making the rule of schwa-syncope optional. In that case the rule cannot account anymore for the obligatoriness of the schwa-deletion in (114b) /prəmənə/ [prəmɛn]. This is not a problem in itself, because a rule deleting the final schwa is needed anyhow for the deletion of schwa in words like (115a) /kulœvrə/ (cf. my treatment of this phenomenon in (74) and (75) of section 2.1.).

It is more difficult to revise Selkirk’s proposal in order to account for (124c). It could be accounted for by not assuming (IIA) but only (IIB). Bisyllabic feet would then only optionally be formed out of two monosyllabic feet, the second of which has a schwa as its vowel. Another possibility would be to reverse the order of rules (IIA) and (IIB). But in both these cases other problems arise: the rule of stress assignment in (118) would not be able to account for the stress in (125):

(125) *il sèvre* /il#səvrə/ [ilsevr] 'he weans'

In (125), the first schwa of the underlying form has been changed to ε by application of rule (120). If one assumes only rule (IIB), which is optional, no bisyllabic foot would need to be formed out of /səvrə/, and the stress assignment rule in (118) would assign stress to the final syllable of the word, which has a schwa as its vowel. This is clearly the wrong result. As indicated by Selkirk, the final schwa is deleted depending on the stress pattern, so the stress assignment rule will have to apply before the deletion. Reversing the order of rules (IIA) and (IIB) would present the same problem. Because of the optionality of (IIB), a possible outcome would be:

(126) [ilsə] [vrə]
 Σ Σ Σ Σ

Rule (118) would assign stress to the second foot in (126), which would again mean stressing the final syllable containing schwa. It has to be concluded, then, that Selkirk's proposal cannot be adapted to account for the deletion of schwa of the type displayed in (124c), unless the rule of stress assignment in (118), which occupies a central place in Selkirk's proposal is dropped.

In addition to the problems concerning the deletion of schwa, another objection may be raised against Selkirk's proposal. For this we must look once again at the underlying form in (123) *tu devenais* /ty#dəvənɛ/. According to Selkirk's rules of Foot Formation in (112), the division in feet must be as in (127):

(127) [ty] [dəvə] [nɛ]
 Σ Σ Σ Σ Σ Σ

Rule (120), the rule which changes e and ∂ to ε if these vowels are preceded by a consonant and followed by non-null material within the same foot, would have to apply to the foot [dəvə], making it [dɛvə]. However,

the phonetic form *[dɛvənɛ] does not occur. Other forms to which rule (120) apparently does not apply can be found in (128):

(128) a. *derechef* /dərəʃɛf/ [dər(ə)ʃɛf] *[dɛr(ə)ʃɛf] 'once more'
 b. *démesure* /deməsyrə/ [dem(ə)syr] *[dɛm(ə)syr] 'excess'
 c. *développeur* /devəlope/ [dev(ə)lope] *[dɛv(ə)lope] 'to develop'
 d. *revenir* /rəvənir/ [rəv(ə)nir] *[rɛv(ə)nir] 'to come back'

In the forms in (128), a foot can optionally be formed out of the two syllables containing schwa (by virtue of rule (IIB) of (112). Rule (120) would have to apply subsequently, but would produce the wrong outcome:

- (129) a. je ne crois pas /ʒə#nə#krwa#pa/ [ʒən(ə)krwapa]
 *[ʒən(ə)krwapa] 'I do not believe'
 b. tu le reverras /ty#lə#rəvɛra/ [tyl(ə)rəvɛra]
 *[tylɛrəvɛra] 'you will see him again'

I see no way that rule (120) could be modified in order to account for its non-application to the forms in (128) and (129). The rule has been devised by Selkirk to replace the well-known rule of Closed Syllable Adjustment (which changes *e*, and *ə* to *ɛ* in closed syllables), in order to account also for the phonetic forms in (122). Because of the counter-examples in (128) and (129), rule (120) has to be rejected and one may fear that the occurrences *ɛ* in the phonetic forms in (122) can only be accounted for by a morphological rule, which *historically* may have had a phonetic motivation.

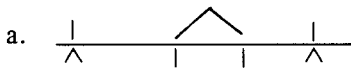
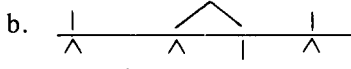
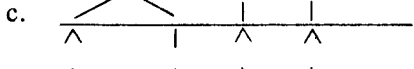
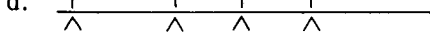
As a conclusion to this criticism of Selkirk's proposal, it can be said that Selkirk's proposal can only account for a fairly limited number of cases of schwa-deletion in French, that the metrical rule she proposes in order to account for the phenomena of the alternations *e/ɛ* and *ə/ɛ* is empirically inadequate, and that if one wishes to broaden Selkirk's analysis in order to account for more cases of schwa-deletion, another feature of her proposal, viz. the rule of stress assignment, cannot be maintained.

The proposal by Vergnaud and Halle (1978: 5.2.) involves an account for certain types of schwa-deletion in French in which they "lean heavily on the solution advanced by Selkirk (1978) (. . .)" (p. 5-7). According to their proposal, full vowels and schwas in the context CC___ are represented by branching nodes, while other vowels may or may not be branching. As an illustration, they give all possible representations of *tu devenais*, given here as (130):


- (130) /ty də və nɛ /
- | | | | | |
|----|---|---|---|---|
| a. | ^ | | | ^ |
| b. | ^ | ^ | | ^ |
| c. | ^ | | ^ | ^ |
| d. | ^ | ^ | ^ | ^ |

They assume that it is the branching or non-branching character of rimes that is relevant for foot formation, and that feet are not sensitive to the branching character of any other constituents of the syllable (p. 5-5).

Furthermore, they assume that “in French words a non-branching syllable is paired into a binary foot with its neighbor on the left and that this pairing is done by scanning the word from right-to-left in a maximal fashion” (p. 5-9). In the case of (130), the following sequences of feet are formed:

- (131) /ty də və nɛ /
- a. 
- b. 
- c. 
- d. 

The line in each one of the representations in (131) separates the foot level from the syllable level. Vergnaud and Halle posit as their rule of ‘e-muet-elision’ the rule:

- (132) ə → Ø / 

Vergnaud and Halle can thus account for the following three phonetic forms of *tu devenais*:

- (133) a. [tydävəɛ] b. [tydävɛ] c. [tydvəɛ]

The shortcomings of the proposal by Vergnaud and Halle are much the same as the ones of Selkirk’s. First a word must be said about the data given by the authors on page 5-8. They contrast the words in (134) in which schwa-deletion is possible, with those in (135), in which according to them, schwa-deletion is not possible (p. 5-7, 5-8):

- (134) a. souvenir [suv(ə)nir] ‘souvenir’
 b. jalousement [ʒaluz(ə)mã] ‘jealously’
 c. passera [pas(ə)ra] ‘will pass’
 d. volera [vɔl(ə)ra] ‘will fly’
- (135) a. parvenir [parvənir] ‘to arrive’
 b. exactement [ɛgzaktəmã] ‘exactly’
 c. percera [pɛrsəra] ‘will pierce’
 d. soufflera [sufləra] ‘will whistle’

These data are, however, incorrect. (135a) and (135c) *can* be pronounced without schwa. For (135a) confirmation of this fact can be found in Martinet and Walter (1973) (who in fact do not list [parvnir], but do list [parvnō] and [parvny] (we 'arrive', 'arrived')). For (135c) Dell proposes his rule E-FUT (see note 2). It should be noted that the group of consonants preceding the schwa in the forms in which the schwa can be deleted (135a, c) form a possible French coda, whereas the group of consonants preceding the schwa in forms where it cannot be deleted (135b, d) do not.

Secondly, it should be noted that because of the fact that only schwas preceded by a single consonant may be non-branching, bisyllabic feet cannot be formed in forms like (125), repeated here as (136):

(136) *il sèvre* /il#səvrə/ [ilɛvrə] 'he weans'

This makes Vergnaud and Halle's analysis incompatible with the one by Selkirk discussed above (recall that Vergnaud and Halle declare that their analysis "leans heavily" on Selkirk's). Selkirk's rule of stress assignment in (118) cannot assign stress to the syllable containing ϵ in (136), but will assign stress to the syllable containing schwa. Also, in forms with only one intervocalic consonant preceding the schwa like (137), a bisyllabic foot is only optionally formed according to Vergnaud and Halle's proposal, because a schwa preceded by only one consonant may or may not be branching.

(137) *fine* /finə/ [fin] 'delicate'

This means that stress will not be unequivocally assigned to the first syllable in the underlying form in (137).

Thirdly, Selkirk's rule (120), which changes e and ∂ to ϵ , will not be able to change the leftmost schwa in the underlying form in (136) to ϵ , because it is not followed by material within the same foot as rule (120) requires. In the case of only one intervocalic consonant as in (138), a bisyllabic foot is only optionally formed (exactly as in (137)), so rule (120) cannot always apply. Vergnaud and Halle's analysis incorrectly predicts that *[ilmənə] should be a possible phonetic representation.

(138) *il mène* /il#mənə/ [ilmən]

It must be concluded that although Vergnaud and Halle declare that their proposal "leans heavily" on Selkirk's, it in fact deprives Selkirk's analysis of a major part of its (alleged) motivation, viz. The account of the phenomena concerning the distribution of stress and the alternations between e/ϵ and ∂/ϵ .

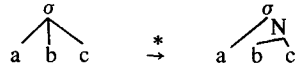
Even though Selkirk's and Vergnaud and Halle's analysis of French are cited frequently they do not in fact account for the data. The analysis of syllabification and syllable-concerning rules which I have presented in this paper is able to account for the data of schwa-deletion discussed in this appendix. My analysis differs from Selkirk's in that schwa-deletion is not considered as following from metrical structure, but rather as a consequence of the persistent application of the principles that govern syllabification.

NOTES

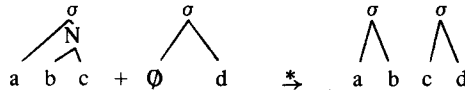
1. Some linguists, e.g. Lowenstamm (1979), assume that syllabic structure is present in the lexicon.
2. There are just a few French words that have an onset consisting of an obstruent + nasal cluster, e.g. *pneu* [pnø] 'tyre', *snob* [snøb] 'snob' and *smaragdite* [smaragdit] 'emerald'. These words are mostly of foreign origin, thus it is debatable whether an obstruent+nasal cluster constitutes a possible French onset.
3. Above a provision has been made for onsets and codas consisting of *s*+obstruent by means of auxiliary template (7).
4. This can be seen in *embarquement* [ãbarkəmã]~[ãbarkmã] 'embarcation, *renversement* [rãversəmã]~[rãversmã] 'reversal' and *département* [departəmã]~[departmã] 'department'. Not all French native speakers accept the pronunciation of these words without a schwa, it may thus be that their internalized notion of 'possible French syllable' does not contain a possible second segment in the coda.
5. There are codas consisting of *s*+obstruent, as accounted for by the auxiliary template (7). Codas like these can be found in one of the realizations of words like *brusquement* /bryskəmã/ 'suddenly', which according to Juilland (1965) can be pronounced as both [bryskəmã] and [bryskmã]. According to this and other sources on French pronunciation however, *exactement* /ɛgzaktəmã/ cannot be pronounced as *[ɛgzaktmã]. For the word-final codas in words like *exact* [ɛgzakt], as well as *parle* [parl] 'speak' and *vacarme* [vakarm] 'tumult', an explanation will be provided in section 1.6..
6. Cf. note 5.
7. Cf. note 5.
8. It will be shown in section 1.3. that the Nasalization rule, which deletes the nasal consonant and nasalizes the preceding vowel, applies before the rule which deletes the final schwa (Schwa-Deletion). This implies that if an underlying nasal consonant is assumed in a word like *plante* [plãt] 'plant' the underlying form thus being /planta/, the nasal consonant is not in the same syllable as the *t* at any level of the derivation at which it is present. Hence it is not necessary to allow for a coda consisting of a nasal consonant + obstruent. It is of course debatable whether a word like *plante* really contains an oral vowel + a nasal consonant underlyingly, because there is no alternation between the (phonetic) nasal vowel and an oral vowel + a nasal vowel in this form; in other words, it is debatable whether French has nasal vowels underlyingly or not. In this paper I will not go into this matter but will assume for the ease of exposition that where there is no alternation, the vowel is underlyingly nasal.
9. The forms in (13) can also be pronounced as [grijɛf] and [adrijɛ] respectively. Similarly, the forms in (12) can also be pronounced as [luwe], [nije], [ilija] and [luwest]. These forms however are not of concern to us here.
10. The form in (11'a) is a possible realization of (*il*) *troua* /tru+a/ '(he) punched a hole'.

11. Kaye and Lowenstamm assume that syllabic structure is present in the lexicon. They also claim that diphthongs like those in (11) and (15) consist of two segments each of which is dominated by the nucleus. In order to account for the fact that there is no alternation high vowel/glide in these cases they posit the Nuclear Integrity Constraint (NIC) which says:

NIC: a. Material may not be resyllabified into a non-null nucleus:



b. Resyllabification of the nucleus must involve the entire nucleus:



NIC can be dispensed with if it is assumed that the diphthongs in question are single phonemes.

12. The underlying schwa in (19) is deleted by a process which I will discuss in section 2.

13. In spite of the problems with the analysis of truncation as a syllable sensitive process, Spa nevertheless adopts this analysis because of the environment in the truncation rule proposed by Dell (1973: 258; 1980: 157), which does refer to syntactic and morpheme boundaries:

$$\text{TRONC: } [-\text{son}] \rightarrow \emptyset / \left. \begin{array}{l} \left\{ \begin{array}{l} + \\ \# \end{array} \right\} C \\ \# \# \end{array} \right\}$$

Spa points out that the environment stated in this rule is usually taken as an argument for a syllable sensitive process. He solves the problems connected with the form in (17) by assuming for words like those in (17) idiosyncratic markings in the lexicon (i.e. reversal of the ordering of resyllabification and truncation or blocking of resyllabification). For words with morpheme-internal syllable-final obstruents like *espérer* and *rester* he refers to the *pronunciation savante*, 'scholarly pronunciation' which is a notion from French historical linguistics. The pronunciation of words like these may indeed have been introduced artificially, but nowadays these pronunciations are not felt as artificial. If they were artificial one would be able to notice a tendency to omit the syllable-final obstruents. There is not the slightest tendency among French speakers however, to pronounce *espérer* and *rester* as *[ɛpere] and *[ɹɛte] respectively.

14. Apart from words like *axe* [aks] 'ax'. I assume that the coda in this form is the result of a specified resyllabification under the influence of stress, in which the syllable template can be violated. I will treat this specified resyllabification in section 1.6.

15. In a proposal for French syllabification, Basbøll (1978) assumes that consonants that find themselves between a full vowel and a schwa are attracted to the syllable containing the full vowel. He thus follows a proposal made by Hoard (1971) for English. The difference between Basbøll's and Hoard's proposal, however, is that Basbøll assumes that *every* full vowel is stressed as compared to a schwa.

16. Vogel (1977) proposes as her 'Law of codas' that the remainder of the consonants must be associated to the syllable containing the [+syll] segment preceding them, regardless of whether or not they form a permissible word-final cluster.

17. One could argue that such readjustments represent the language-specific part of the syllabification process, while MCA represents the language-universal part. Still, the readjustments would have to be related to other phenomena in the language in question.

18. The assumption that syllabic structure is present in the lexicon is also questionable for another reason: the fact that the syllabic structure is generally predictable. The lexicon is generally thought of as a repository of idiosyncracies, not of regularities.

19. Kaye and Lowenstamm (1981b: 297) (also in Lowenstamm (1979: 69)) base the markedness scale in (35) on the following markedness convention:

$$[u \text{ segment}] \rightarrow [+segment] / [O/R \text{ —}]$$

According to Kaye and Lowenstamm, this markedness convention should be interpreted in accordance with Kean's (1975) complement convention and is considered to be the collapsing of four specifications:

- a. $[u \text{ segment}] \rightarrow [+segment] / [O/R \text{ —}]$
- b. $[m \text{ segment}] \rightarrow [-segment] / [O/R \text{ —}]$
- c. $[u \text{ segment}] \rightarrow [-segment] / \sim [O/R \text{ —}]$
- d. $[m \text{ segment}] \rightarrow [+segment] / \sim [O/R \text{ —}]$

By $\sim [O/R \text{ —}]$ Kay and Lowenstamm mean a branching onset or rime. This is a rather strange deviation from Kean's complement convention, because it is hard to see why a branching onset or coda should be considered as the *complement* of an onset or coda. In other words, it is unclear why a branching onset or coda does not remain an onset or coda all the same.

20. Except for the sequences *tl* and *dl*. In a word like *atlas* 'atlas', the syllabic boundary is located between *t* and *l*. The sequences *tl* and *dl* do not form permissible French onsets. This exclusion will have to be stated in the notion of 'possible French syllable', which means that it has to be included in the set of conditions on the main syllable template in (10). However, the condition prohibiting *tl* and *dl* onsets cannot refer to the strength scale in (9), because obstruent+liquid clusters should not be excluded in general. The impossibility of *tl* and *dl* as onsets, however, seems to be of an isolated character and all other conditions on the syllable template *are* expressible by means of the strength scale in (9).

21. Simon Dik has brought to my attention that the well-known *muta cum liquida* provision in Attic Greek metre (an obstruent-liquid sequence does not render the preceding syllable heavy) in fact constitutes a parallel case. The fact that this provision does not apply to verse written in other dialects of Ancient Greek appears to provide motivation for Vennemann's (1972: 13) statement that 'different syllabification is a possible dialect difference'.

22. See Cairns and Feinstein (1982) for an analysis concerning syllabic markedness in Sinhalese.

23. These rules are in the 1973 version of Dell's book (p. 258-9):

ELIS: $\text{ə} \rightarrow \emptyset / ___ ([-\text{seg}]) [+ \text{syll}]$	OBL
V-E: $\text{ə} \rightarrow \emptyset / V ___$	OBL
PAUS: $\text{ə} \rightarrow \emptyset / VC_0 ___ \S$	OBL
	(§ indicates a pausal boundary)
E-FIN: $\text{ə} \rightarrow \emptyset / VC_0 ___ \#$	OBL
NE-EX: $\text{ə} \rightarrow \left[\begin{array}{l} -\text{rule INI} \\ -\text{rule VCE}_1 \end{array} \right] \left\{ \begin{array}{l} ___ \# n \text{ə} \# \\ V \#_1 n \text{ə} \# C ___ \end{array} \right\}$	OBL
INI-EX: $\text{ə} \rightarrow [-\text{rule INI}] \left[\begin{array}{l} -\text{son} \\ -\text{cont} \end{array} \right] ___ \#_0 \left[\begin{array}{l} -\text{son} \\ -\text{cont} \end{array} \right]$	OBL
INI: $\text{ə} \rightarrow \emptyset / \int C ___ (\#) C$	OPT
VCE ₁ : $\text{ə} \rightarrow \emptyset / V \#_1 C ___ (\#) C$	OPT
VCE ₂ : $\text{ə} \rightarrow \emptyset / VC ___ (\#) C$	OBL
E-FUT: $\text{ə} \rightarrow \emptyset / X ___ \text{r}+$	OPT
condition: $X \neq \text{OL}$	

In the 1980 version of his book the formulations of some rules were somewhat altered and the output constraint OBLICONS was added (p. 239-41):

FIN-DEL _b : $V \rightarrow \emptyset / VC_0 ___ \#$	
VCE ₁ : $\text{ə} \rightarrow \emptyset / V \#_1 C ___ ([-\text{seg}]) [+ \text{seg}]$	OPT
VCE ₂ : $\text{ə} \rightarrow \emptyset / VC ___ ([-\text{seg}]) [+ \text{seg}]$	OBL
FUT-DEL: $\text{ə} \rightarrow \emptyset / ___ \text{r}+$	OPT
(replace E-FUT)	
OBLICONS: $*[-\text{son}] \left[\begin{array}{l} + \text{son} \\ + \text{cons} \\ - \text{nas} \end{array} \right] [+ \text{cons}]$	

24. These cases are: the obligatory deletion of the vowel in the feminine definite singular article *la* /la/, the optional deletion of the vowel in the second person singular pronoun *tu* /ty/, both in prevocalic position, and the obligatory deletion of *i* in *si* /si/ before *il* /il/.

25. The tendency to omit the schwa is generally greater in forms where the schwa is preceded by a single consonant, as in (58), than in forms where it is preceded by more than one consonant (as in 59). Some speakers do not accept the pronunciations in (59), which may be explained by the assumption that the internalized notion of 'possible French syllable' does not allow for a second segment in the coda (see note 4).

26. Except in utterance-final position, for which an explanation will be provided below (see (74) and (76)).

27. In Dell (1980) this condition is called OBLICONS.

28. According to Dell the underlying form is: /astr##nuvo/ and an optional epenthesis rule is applicable to this form. In the case of non-application of this epenthesis rule the derivation is blocked by OLICONS. OLICONS does not block the deriv-

ation of *astre* /astr/, pronounced in isolation or at the end of a sentence, in the case of non-application of the epenthesis rule. As a result, the phonetic form can be both [astrə] and [astr].

29. In the form in (72), the first schwa can also be deleted (optionally), but that deletion is not of concern to us here.

30. According to Dell, a schwa can be deleted in the environment CC__r only in the case of a future form (the deletion is not possible if CC = OL). He cites some non-future forms in which a schwa in the environment CC__r cannot be deleted, e.g. *fumisterie* [fymistəri] 'hoax'. According to Lerond (1980) and Dubois (1960) however, this form can also be pronounced without a schwa. It thus appears that there is no morphological conditioning involved here, contrary to Dell's suggestion.

31. For many speakers the deletion of schwa in (91b) is obligatory.

32. i.e. rule NE-EX in note 22.

33. The facts as they are stated here have been extracted from de Kok and Spa (1978), except for the second clause in (90ii), which is from my personal observation, but has been confirmed by Spa and native speakers.

De Kok and Spa propose the following two rules (1978: 68-69).

DIER: $[+cons] \rightarrow [-cons] / \cdot C_2 \left[\begin{array}{c} +voc \\ -round \end{array} \right]$ OBL

SEMI-VOC: $[+voc] \rightarrow [+cons] \left[\begin{array}{c} +high \\ -mid \\ -stress \end{array} \right] V$ OPT

In addition to these rules they propose the following global constraint:

$$\cdot [-son]_1 \left[\begin{array}{c} +son \\ +cons \\ -nas \end{array} \right] \left[\begin{array}{c} -son \\ +high \\ -mid \end{array} \right] / \circ \left[\begin{array}{c} +son \\ +cons \\ -nas \end{array} \right]_1 \left[\begin{array}{c} -cons \\ +high \\ -mid \end{array} \right]$$

What this condition says is that (1978: 70):

"if at the underlying level a syllable boundary is followed by the sequence: one or more obstruents, one or more non-nasal sonorant consonants (=liquid or glide), and a closed vowel, then the syllable boundary must also be followed by this sequence at the surface level".

they assume a word like *grief* [grief] to contain a glide underlyingly which seems strange because the phonetic form of this word always contains a high vowel.

Most of the examples used in section 2.1. are from de Kok and Spa's article.

34. The underlying forms in (105) and (106) are questionable on other grounds. E.g., the question can be asked whether *bruit* contains an underlying word-final *t* or not and whether *bien* and *groin* contain a nasal vowel underlyingly or an oral one followed by a nasal consonant. These questions, however, are not of concern to us here.

35. The question may be asked whether there are underlying glides in French at all. Kaye and Lowenstamm (1981a) do not assume them, but hypothesize that the phonetic nature of a high vowel is determined by its place in the syllable. I think that underlying glides do exist in the verb-endings *-ions*, *-iez* in the noun-endings *-ier*,

-ion (to be mentioned below), as well as in a limited number of other forms which are mostly of foreign origin:

- a. le whisky /lə#wiski/ [lə wiski] *[lwiski] 'the whisky'
- b. le yaourt /lə#jaurt/ [ləjaurt] *[ljaurt] 'the yoghurt'
- c. le huit /lə#ɥit/ [lə ɥit] *[lɥit] 'the (number) eight'

These forms can be contrasted with:

- d. l'ouest /lə#uɛst/ [luɛst]~[lwɛst] 'the west'

As is displayed in the underlying forms given here, I assume that the contrast in application vs. non-application of Schwa-Deletion between (a, b, c) and (d) is due to the fact that in forms in which the deletion of schwa does not take place, there is underlyingly a glide, while in forms where Schwa-Deletion does apply, the schwa is followed by a high vowel.

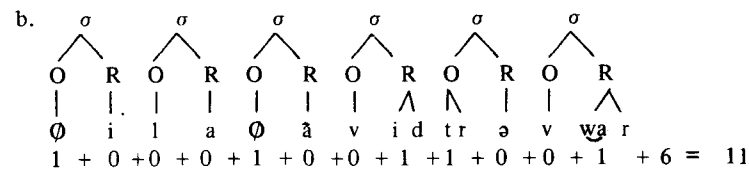
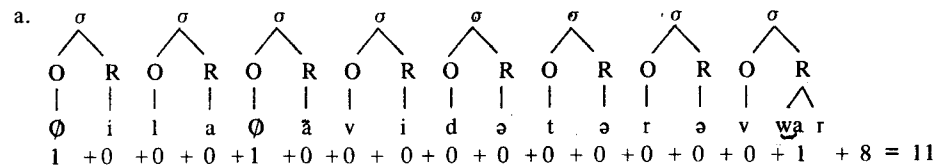
36. As is the case with all forms where a high vowel is followed by another vowel, a homorganic glide can be epenthesized after the high vowel, if the high vowel has not turned into a glide itself. This epenthesis process, however, is not of concern to us here.

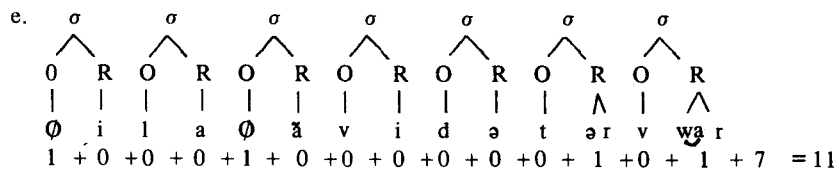
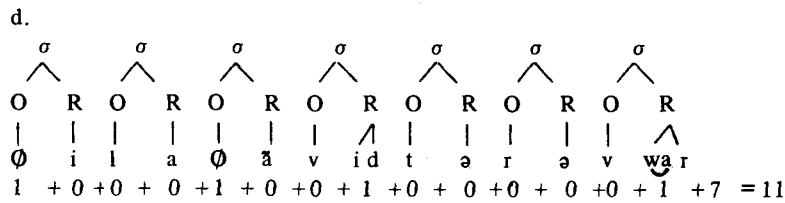
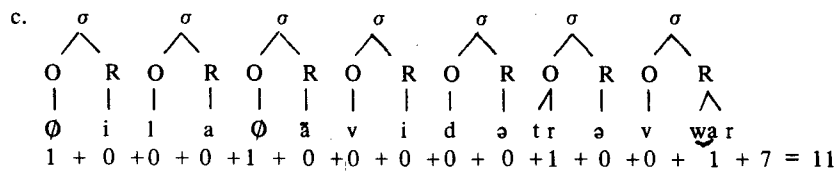
37. Cf. the forms in (a, b, c) in note (35) where a glide is assumed to be present underlyingly and where Schwa-Deletion cannot apply.

We have already seen in section 1.3. (see example (25)) that Schwa-Deletion has to follow Nasalization. Nasalization has to follow the initial syllabification, because it crucially refers to syllable structure. It was also argued in section 1.3. that the rule of truncation has to precede initial syllabification. We thus come to the following ordering of rules: Truncation, Initial Syllabification, Nasalization, Schwa-Deletion, Semivocalization.

38. The first schwa in this form is changed to \emptyset by the application of rule (120), to be given below.

39. In my analysis given above the five possible phonetic realizations of (116) are accounted for by the fact that they all receive the same syllabic markedness value:





In (b) and (c) the *tr* cluster in the onset of the penultimate syllable receives markedness value 1 instead of 2 (which it would normally get according to the markedness scale in (38)) because of the provision for stop+liquid clusters made in section 1.6. The *d* in (b) and (d) is devoiced due to assimilation with the following *t* (the *d* is shown here in its original form, for reasons of clarity); it does *not*, however, degeminate.

In (116) not all schwas can be deleted. In my analysis this is accounted for by the fact that the resulting *dtrv* cluster cannot be analyzed in a possible coda followed by a possible onset. Hence, the derivation is blocked by the Syllabification Condition (56).

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