2. Syllabification in French.

2.0. Introduction.

In this chapter, a proposal will be formulated concerning the assignment of syllabic structure in French. It will be argued that syllabification takes place at a later stage in the derivation than the underlying level. Then, a theory of syllabification will be worked out making use of the concept of markedness. For this purpose, the concept of markedness will be enlarged, taking into account the number of syllables of which a given form (or 'prosodic unit') consists, as a factor in determining the degree of markedness of that form.

2.1. The point in the derivation at which syllabification takes place.

In this subsection, I will treat the issue of whether or not syllabic structure is present at the underlying level in French. I will argue that it is not. Essentially two arguments will be given for the assumption that syllabification takes place at a later stage in the derivation, after the application of at least one rule.

2.1.1. The truncation phenomena.

The forms in (1) display the conditions of application of the well-known truncation process in French:

(1)a. petit ami /pətitami/ [pətami] 'little friend'
   b. petit papa /pətitpapa/ [pətipapa] 'little papa'
   c. cher ami /ʃərami/ [ʃərami] 'dear friend'
   d. cher papa /ʃərpapa/ [ʃərpapa] 'dear papa'

In the phonetic form in (1b), the second t has been deleted. Confronted with these data, one may think that these are the result
of a syllable sensitive rule which deletes obstruents in syllable-final position. This point of view is held by Spa (1975). Like Vennemann and Hooper (see section 1.1.), he assumes an initial syllabification at the beginning of the phonological component (p. 78), but in contrast to Vennemann and Hooper he does not assume a persistent syllabification. According to him, the syllabification is repeated at a certain stage of the derivation and he mentions the possibility that "this reinterpretation (= resyllabification, R.N.) is the consequence of a cyclic process that is not the same for all languages" (p.79).

For the form in (2), in which the phenomenon of liaison (= non-application of truncation) occurs, Spa posits the derivation in (3) (p.80-81; the boundaries higher than the word-boundary between which the resyllabification process takes place are represented as #; Spa refers to Dell (1973) for a justification of the rules of ELISION, V-E, VCE_2):

(2) petites amies /patit+t+z#ami+t+z/ [p̩titzamj] 'little friends (fem.)'


In (3), the truncation rule (TRONC) applies to the z at the end of the form, but not to the one in the middle, because this z is not in syllable-final position at the stage of the derivation at which TRONC applies (i.e. after REINTERPRETATION).

As noted by Spa himself there are two major problems connected with his analysis. The first problem concerns forms as those in (4)

(4a) petit rat /p̩tittyrat/ [p̩tira] 'little rat'

b. petites roues /p̩tityt+z̩ru+z/ [p̩titru] 'little wheels'
For these forms the ordering of the rules as in (3) does not produce the correct results, cf. (5) (p.81):

(5) \[p\hat{o}tit\hat{rat}#\] underlying form

\[Sp\hat{o}tit\hat{rat}\$\] SYLL

\[Sp\hat{o}tit\hat{rat}\$\] REINT

\[\emptyset\] TRONC

\[*[p\hat{o}titra]\] surface form

Spa proposes two possible solutions to this problem (p.81-82):

(i) the lexicon prescribes for these words the exceptional rule ordering TRONC, REINT, which would give the correct results.

(ii) the normal order REINT, TRONC is maintained but a provision is linked with REINT which blocks its application in the case of a C$+_\text{voc}$ sequence.

The first solution is not a real solution, because it appears to be totally ad hoc. Treating an apparently regular phenomenon as an idiosyncrasy does not increase the explanatory power of the grammar.

The second solution must be rejected on the ground that an intervocalic tr cluster is always taken into the onset of the latter syllable in French. The forms in (6) and (7) receive the same pronunciation, and native speakers locate the syllable boundary to the left of the tr cluster.

(6) petit trou /p\hat{o}tit\hat{ru}/ [p\hat{o}titru] 'little hole'

(7) petites roues/p\hat{o}tit\hat{z}\hat{ru}+z/ [p\hat{o}titru] 'little wheels'

The second problem connected with Spa's analysis concerns the fact that no instances can be found of the syllable sensitive truncation rule applying morpheme-internally. This fact in itself is not surprising, because morpheme-internally a syllable-final obstruent would always be deleted and would consequently be lost in the lexicon. The real problem is, however, that there are many everyday words in French which are pronounced with a syllable final morpheme-internal obstruent, e.g. rester \[r\hat{e}ste\], esperer \[e\hat{spere}\]. Spa argues that these phonetic forms must be due to the prononciation savante 'scholarly pronunciation',
and that words like these are marked as irregular in the lexicon.

I feel that this reasoning is very unconvincing. If these pronunciations are artificial, one must be able to notice a tendency in careless speech to omit the syllable-final obstruents. There is not the slightest tendency among French speakers, however, to pronounce words like esperer and rester as [esper] and [reste] respectively. Historically speaking, the rule may have existed as a syllable-sensitive rule, but it is undeniable that present-day French allows for obstruents at the end of a syllable.

The two problems connected with the analysis of the truncation phenomena as being the result of a syllable-sensitive rule presented above are too serious for one to solve them by means of idiosyncratic markings in the lexicon. Instead of formulating a rule referring to phonological boundaries, I think it is preferable to formulate the truncation rule as a rule referring to syntactic and morpheme boundaries. This has been done by Dell (1973, p.258; 1980, p.157):

(8) Dell's truncation rule

\[-son] \rightarrow \emptyset / \{ [\#] \} \]

This rule is more complicated than the one proposed by Spa, but produces adequate results. The fact that this rule is more complicated than the one formulated by Spa (which is probably its historical form) may not be accidental. The rule is no longer productive in the sense that new words, including slang words whose pronunciation cannot be attributed to some scholarly pronunciation, are not subject to the truncation rule, as for instance mec [mek] 'guy'. It seems not unnatural that a rule that is falling into decay becomes more complicated to formulate.
2.1.2. Two arguments against syllabification taking place at the underlying level.

Having exposed the problems connected with the analysis of the truncation phenomena as being the result of a syllable-sensitive rule, and having shown that it is better to assume a rule that refers to syntactic and morphological boundaries, I will now give two arguments against the assumption that syllabification takes place at the underlying level.

The first argument concerns the organisation of the grammar. Selkirk (1979) proposes the principle of a mapping mechanism converting the syntactic structure into the phonological structure. Although Selkirk is not explicit about it, it seems more than reasonable to assume that the syntactic structure is no longer present once the mapping mechanism has applied. (Otherwise a multidimensional representation would be needed, enlarging considerably the required storage and processing capacity of the language organ). Syllabification is assumed to be part of this mapping mechanism. It can thus be inferred that once syllabification has applied, the syntactic and morphological structure is no longer present. Under these assumptions, the truncation rule, which as has been shown in section 2.1.1, must refer to syntactic boundaries, has to apply before syllabification takes place.

The second argument against syllabification taking place at the underlying level is provided by the syllable structure of forms like the adjective in (9):

(9) ils sont petits /pətitʃ/ 'they are small'

If the syllabification applies prior to the truncation rule, which deletes the _z, the syllabification of petits would be as in (10):

(10) $pəstiz$
This would mean that _tz_ would form the coda of the second syllable. Such a coda however, never shows up at the surface in French. The syllabification device will have to include in one way or the other the notion of 'possible syllable', as embodied in the proposals of, among others, Kuryłowicz (1947), Vennemann (1972), Hooper (1972), Kahn (1976), Vogel (1977), Broselow (1979), Selkirk (forthc.) and Vergnaud & Halle (1978). The notion of 'possible syllable' 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, the more so since _tz_ would constitute a rather marked coda because it violates the well-known sonority or strength hierarchy, proposed by, among others, Jespersen (quoted by Malmberg (1962)), Saussure (1915) and Hooper (1972, 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 at the side of the nucleus. But in a _tz_ coda, the position of the fricative is at the side of the syllable boundary. Thus French would have to be marked for this exception to the sonority hierarchy, only on the ground that an underlying syllable, not a phonetic one, displays such an order of segments. This would be 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 mere fact remains that underlyingly the rather marked _tz_ coda has to be assumed.

All these troubles can be done away with if one adopts the principle of an initial syllabification taking place later in the derivation, just as in Egyptian Arabic (cf. section 1.4.), which also shares with French the related phenomenon of syllable divisions regardless of
word boundaries (traditionally called *enchaînement* by French grammarians).

The assumption of a later initial syllabification also strengthens the concept of the syllable. Under this assumption, it is not necessary to distinguish between a morphological and a phonological syllable, which would refer to boundaries constituted by different principles, as in Spa's proposal.

2.2. The notion of 'possible French syllable'.

In this section, I will give a definition of the notion of possible French syllable. It will be assumed that the syllable is hierarchical in nature, as proposed by Selkirk (forthc.), Vergnaud & Halle (1978) and Lowenstamm (1979). The syllable will be thought of as being obligatorily expanded into onset and rime, as in Lowenstamm's proposal, but unlike Selkirk's proposal, in which the expansion into onset is optional (but in which the expansion into rime is obligatory).

Lowenstamm's proposal allows for nodes to be empty. An empty node, however, is more marked than a node filled with one segment. In this way, the fact is expressed that a syllable consisting of only one vowel is more marked than a CV syllable. There are numerous phonological processes (vowel insertion, consonant insertion and deletion) that result in a CV syllable. Processes resulting in a syllable structure of V syllables, however, have been rarely, if ever, attested. Thus, with Lowenstamm, I will assume as a universal syllable structure:

\[
\begin{array}{c}
\sigma \\
0 & R
\end{array}
\]

(\(\sigma = \text{syllable}, 0 = \text{onset}, R = \text{rime}\))

I consider the remainder of the syllable structure of a language, however, to be language-specific, because of the vast differences one encounters among languages in this respect. Lowenstamm allows empty rimes for Yiddish and Old English, which are already present in the lexicon and in which vowels are inserted at some stage of the deriva-
tion (Lowenstamm (1979) p.12-43) For French, however, there is little or no evidence for such extensive epenthesis processes as proposed by Lowenstamm for Yiddish and Old English. Also, as shown in section 2.1., there is evidence that syllable structure in French is not present in the lexicon. There is thus no reason to assume that a French rime can be empty at any stage of the derivation.

2.2.1. A syllable template for French.

I will assume the following syllable template for French, which together with a set of conditions on the coocurrence of segments will express the notion of 'possible French syllable':

\[
\begin{align*}
&\text{(12) a syllable template for French} \\
&\begin{tikzpicture}
&\node (O) at (0,0) {O};
&\node (Q) at (-2,1) {Q};
&\node (R) at (2,1) {R};
&\node (N) at (0,2) {N};
&\node (Cb) at (-3,2) {C_b};
&\node (Cd) at (3,2) {C_d};
&\node (V_s) at (0.5,1.5) {V_s};
&\node (C_m) at (0.5,0.5) {C_m};
&\node (C_n) at (0.5,-0.5) {C_n};
&\draw (O) -- (Q);
&\draw (O) -- (R);
&\draw (Q) -- (Cb);
&\draw (R) -- (Cd);
&\draw (Cb) -- (V_s);
&\draw (Cb) -- (C_m);
&\draw (Cd) -- (C_n);
&\end{tikzpicture}
\end{align*}
\]

\(\text{(Cd = coda } N = \text{ nucleus)}\)

It should be noted, that according to this template, the rime is only optionally expanded into a coda, but that the coda, if it is present, cannot be empty.

2.2.2. An auxiliary template.

In addition to the template expressed in (12), I will adopt an auxiliary template, which 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 (see section 2.2.3., below). This auxiliary template expresses that an \(s\) + obstruent cluster may be analyzed as one obstruent.
This template is interpreted in accordance with the Feature Percolation Convention (FPC) (cf. (11) of chapter 1.). As the reader will notice, this auxiliary template is identical to the one proposed by Selkirk (forthc.) in order to account for similar phenomena in English (see section 1.3.).

2.2.3. A strength scale and a set of conditions on the syllable template.

I will assume the following strength hierarchy for French. This hierarchy is rather similar to the language-universal ones proposed by Jespersen (1920), Saussure (1915) and identical to Vogel's (1977) universal strength scale:

(14) a strength scale for French.

obstruents/nasals/liquids/glides

4 3 2 1

The following conditions on the main syllable template (12) will refer to the above strength scale:

(15) a set of conditions on the main syllable template

i. \( p > q \)

ii. if \( q = 2 \), then \( p = 4 \)

iii. \( m = 2 \)

iv. if \( m = 2 \), then \( n = 4 \)

Note that \( C_m \) is optional, thus condition iii. does not imply that the premise of condition iv. is automatically fulfilled.
Conditions (15i) and (15ii) express the fact that French onsets can consist of a cluster of obstruent+nasal, obstruent+liquid, nasal+glide, as well as liquid+glide, but not of a cluster of two obstruents, two nasals, two liquids, two glides, nasal+liquid.

Conditions (15iii) and (15iv) express the fact that a French coda may consist of a cluster of liquid+obstruent, but cannot consist of two obstruents, two nasals, two liquids, two glides, liquid+nasal, nasal+obstruent.

Apart from the conditions in (15), which refer to the strength scale, I will make here an hypothesis concerning the segments that can be found in the nucleus. This hypothesis will be an alternative to the Nuclear Integrity Constraint (NIC), proposed by Kaye and Lowenstamm (1986) (see section 1.2.3.). Instead of assuming, as Kaye and Lowenstamm, that the segments in a branching nucleus are linked together in the lexicon (a consequence of Lowenstamm's assumption that syllabic structure is present in the lexicon) and that these segments remain linked together throughout the derivation (a consequence of NIC), I assume that a branching nucleus (which, as Kaye and Lowenstamm have shown, can only consist of wa, iɛ and uɛ) is in fact filled with only one (diphthongal) phoneme which nevertheless occupies two segmental slots in the nucleus. The reason for this latter assumption is that it is often observed that the fact that a syllable contains a diphthong or a long vowel (which also has to be one phoneme) is often a conditioning factor for numerous phonological (especially prosodic) processes. In recent proposals in the metrical phonology the phenomena in question have been accounted for by means of the assumption of a branching nucleus. It goes without saying that a phoneme cannot be split up, thus the part of NIC prohibiting this is now accounted for in a natural way. Additional evidence for the assumption of certain diphthongs as phonemes is the fact that it is only wa, iɛ and uɛ that are found in branching nuclei (cf. section 1.2.3.). One other feature of NIC has still to be accounted for, before this condition can be abolished altogether: the fact that according...
to NIC, no material may be entered into the nucleus, if one segment is
already present. I will account for this by the following condition
which I will call the Branching Nucleus Constraint ($\text{BNC}$):

$$\text{BNC: The elements in a branching nucleus should be part of one single}
\text{phoneme.}$$

BNC also accounts for the fact that no other diphthongs than $\text{wa, je, yi}$
can be found in the nucleus.

2.3. The syllabification rules.

The notion of 'possible French syllable' has now been defined, and
we can now proceed to define the syllabification process. Apart from
Hooper's proposal, essentially only one principle has been proposed as
governing the process of syllabification: the Maximal Cluster Approach
(MCA) as it is termed by Lowenstamm. Before formulating my own proposal,
I will show the inadequacies of this principle with regard to the syllabi-
fication in French.

2.3.1. The Maximal Cluster Approach.

The Maximal Cluster Approach is based on a claim made by non-generative
phonologists, e.g. Kuryłowicz (1947), according to whom consonant
clusters are possible syllable onsets and codas if they are observed
word-initially or word-finally respectively. It has been proposed
in different versions by Kahn (1976), Vogel (1977), and Selkirk (forthc.).
The essence of these proposals is that a given string of segments is
syllabified in three steps:

(i) one syllable is associated with each $[+\text{syll}]$ segment of the string.
(ii) a maximum number of consonants preceding each $[+\text{syll}]$ segment
is associated with the syllable containing the relevant $[+\text{syll}]$ segment.
The consonants must form a permissible word-initial cluster.
(iii) the remaining consonants are associated with the syllable containing
the $[+\text{syll}]$ segment preceding them. These consonants must form a
a permissible word-final cluster.$^{17}$

It has been pointed out by Lowenstamm (1979, p.38) that this approach
is inadequate for French. The MCA would syllabify words like
(17) aspirer [aspire] 'to breath'
(18) ausculte [ɔskylte] 'to auscultate'
(19) astuce [astys] 'wit'

as:
(17') ɑ$spɪ$re$
(18') ɔ$skylste$
(19') ɑ$stys$

These syllabifications, however, are incorrect. The correct ones are:
(17'') ɑ$spɪ$re$
(18'') ɔ$skylste$
(19'') ɑ$stys$

Lowenstam motivates this type of syllabification by the functioning of the rule of Closed Syllable Adjustment, which changes ɛ, θ to ɛ in closed syllables. He shows that this rule apparently functions to produce the ɛ in the second members of pairs as:
(20)a. étudiant [ɛtydjø] 'student'
     b. estudiantin ɛtsydtʃtɛ] 'typical of students'
(21)a. gérer [ʒere] 'to manage'
     b. gestion ɛstʃɛ] 'management'
(22)a. fêter [ʃete] 'to celebrate'
     b. festin ʃistʃi] 'festive'

More motivation in favor of a syllabification of the type of the forms in (17''), (18''), (19'') can be found in the fact that there are many French words starting with ɛ followed by s + stop, cf. (23), but no words starting with ɛ followed by s + stop.
(23)a. Eskimo [ɛskimo] 'eskimo'
     b. espoir [ɛspwar] 'hope'
     c. estomac [ɛstoma] 'stomach'
It can thus be inferred that in forms like (20b), (21b) and (22b), the rule of Closed Syllable Adjustment must have applied because of the fact that the $s$ belongs to the first syllable.

The MCA makes the wrong predictions in (17'), (18') and (19') because $sp$, $st$ and $sk$ are possible French word-initial clusters, as can be seen in (24):

(24)a. spécial [spesjal] 'special'
   b. station [stasjɔ̃] 'station'
   c. scandale [skændal] 'scandal'

A possible solution would 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 (forthc.). As is the case with the readjustment needed if one adopts a syllabification at the underlying level, no independent motivation can be found for such readjustment process. This is why this solution should be rejected.

A readjustment would also be needed if one would adopt the proposal made by Hooper (1972), treated in section 1.1.2. I repeat here her universal syllable boundary insertion rule:

(25) Hooper's universal syllable boundary insertion rule:

\[
\emptyset \rightarrow s / [+\text{syl}] \left\{ \begin{array}{c}
[-\text{syl}]_o \\
[-\text{son}] [-\text{nasal}] \\
[+\text{cons}] [-\text{cons}]_o \\
\end{array} \right\} [+\text{syl}]
\]

As noted by Lowenstamm, Broselow (1976,p.50) shows that Hooper's rule would produce incorrect results for Egyptian Cairo Arabic, because it would syllabify a word like (26) as in (26'), while the correct syllabification is as in (26''):
Thus this proposal would have to be complemented by a readjustment rule, transferring the syllable boundary to the right of the $a$. But in that case, a generalization will have been lost, because, as Broselow writes (p.50): "all this cumbersome machinery serves to obscure the fact that Egyptian Cairo Arabic never allows more than one [−syll] segment to begin a syllable."

We may conclude that MCA as well as Hooper's proposal do not give the correct results for certain languages, and would necessitate readjustment rules in order to account for these languages. These readjustment rules, however, seem to be exempt of explanatory power. In addition, it may be concluded that a syllabification device will have to include the notion of 'possible syllable' in order to account for cases like the one of Egyptian Arabic.

2.3.2. Lowenstamm's alternative to MCA.

An alternative principle to the MCA has been adopted in the syllabification proposal made by Lowenstamm (1979,p.97). This proposal, which I have already partially treated in section 1.2., is repeated here as (27) and (28):

The proposal rests on two hypotheses:

(27)i. syllable structure is entered into the lexicon together with the segmental strings

ii. segmental strings are syllabified at any time

The syllabification device proper is as in (28):

(28)i. strings are analyzed by a syllable template, subject to the principles of ii.

ii. a. Principle I - minimize the number of syllables

b. Principle II - minimize the degree of markedness of each syllable

iii. reanalyze by ii.
As shown in section 2.1., it is problematic to assume that syllabic structure is present at the underlying level in French, thus Lowenstamm's hypothesis (27i) has to be rejected. Hypothesis (27ii) will then have to be changed to the assumption that the segmental strings are syllabified at any time, once the initial syllabification has taken place.

Principle I of (28ii) is needed in Lowenstamm's framework, because that framework allows for zero rimes; without Principle I, a word like *iti* could have a structure like:

\[
\begin{array}{cccc}
\sigma & \sigma & \sigma \\
\overset{\sigma}{R} & \overset{\sigma}{R} & \overset{\sigma}{R} \\
\overset{\sigma}{i} & \overset{\sigma}{i} & \overset{\sigma}{i} \\
\overset{\sigma}{t} & \overset{\sigma}{i} & \overset{\sigma}{t} \\
\overset{\sigma}{i} & \overset{\sigma}{t} & \overset{\sigma}{i} \\
\end{array}
\]

If one rejects the possibility of zero rimes, as I do (cf. section 2.2.), Principle I of (28ii) becomes superfluous.

Principle II of (28ii) provides us with an interesting alternative to the rule, result from section 1.2.1. that Lowenstamm proposes a markedness convention with regard to the feature \(\text{segment}\). This convention results in the following markedness metric (Lowenstamm (1979)p.62):

\[
\begin{array}{ccc}
\text{onset} & \text{rime} & \text{markedness} \\
C & V & 0 \\
\emptyset & \emptyset & 1 \\
CC & VC & 2 \\
CCC & VCC & 3 \\
C_1\ldots C_n & VC_1\ldots C_{n-1} & n \\
\end{array}
\]

Furthermore, Lowenstamm claims that there is no level of markedness for syllables (p.64), such that the markedness of the syllable cannot be computed by adding the markedness of the onset to that of the rime. Lowenstamm yet uses the concept of syllable markedness, by which he means an ordered pair whose first member is the markedness specification of the onset and the second the markedness specification of the rime(p.67).

Let us now return to the problem of the syllabification of words like
the ones in (17), (18) and (19). The correct syllabification of (17),
displayed in (17') would have the following markedness values for
onsets and rimes according to the markedness scale in (30), cf. (31):

\[
\begin{array}{cccccc}
\sigma & \sigma & \sigma \\
O & R & O & R & O & R \\
1 & 1 & 1 & 1 & 1 & 1 \\
\beta & as & p i r & e \\
1 & 2 & 0 & 0 & 0 & 0 \\
\end{array}
\]

The syllabification that is predicted by the RCA (displayed in (17'))
would have the following markedness values for onsets and rimes:

\[
\begin{array}{cccccc}
\sigma & \sigma & \sigma \\
O & R & O & R & O & R \\
1 & 1 & 1 & 1 & 1 & 1 \\
\beta & a & s p i r e \\
1 & 0 & 2 & 0 & 0 & 0 \\
\end{array}
\]

The difference between (31) and (32) is that in (31), the coda of
the first syllable has markedness value 2, and the onset of the second
syllable markedness value 0, while in (32), these values are just the
inverse. Principle II of (28ii) cannot predict the correct syllabification,
because it says nothing about the way the markedness values are
spread over the word (or prosodic unit across which the syllabification
takes place).

2.3.3. An adaptation and elaboration of Lowenstamm's theory.

The inability of Principle II to correctly predict the syllabification
of words like [aspirit] might lead the reader to the conclusion that
this principle should also be rejected. I think, however, that such a
conclusion would have been drawn too hastily. The idea that syllabifica-
tion is governed by a tendency to achieve the lowest possible markedness
seems a potentially insightful principle to account for the syllabic
divisions across the 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 to the markedness scale in (30). Recall from section 1.2.1, that this metric is based on the following markedness convention:

\[(33) \text{[u segment]} \rightarrow [\text{+segment}] / [_{0/R}] \]

This markedness convention is, in accordance with Kean's (1975) complement convention, a collapsing of the following four specifications:

\[(34)\]
\[a. \text{[u segment]} \rightarrow [\text{+segment}] / [_{0/R}] \]
\[b. \text{[m segment]} \rightarrow [\text{-segment}] / [_{0/R}] \]
\[c. \text{[u segment]} \rightarrow [\text{-segment}] / [_{0/R}] \]
\[d. \text{[m segment]} \rightarrow [\text{ segment}] / [_{0/R}] \]

The environment \[_{0/R}\] means a non-branching onset or rime, the environment \[_{0/R}\] means a branching onset or rime. If one does not accept the possibility of zero rimes, which is not needed in French (cf. section 2.2.), and which is of a rather abstract character because empty rimes, in contrast with empty onsets, never show up at the surface, the nature of the markedness convention in (33) becomes rather strange. It refers to the possibility of zero rimes, while this possibility does not exist. In the framework of the template in (12), it is only the coda, not the entire rime, that can be phonetically absent. Instead of (33), I propose, therefore, two markedness conventions, one for onsets and one for codas:

\[(35) \text{[u segment]} \rightarrow [\text{ segment}] / [_{0}] \]
\[(36) \text{[m segment]} \rightarrow [\text{ segment}] / [_{Cd}] \]
The markedness convention for onsets (35) is the same as the markedness convention (33), but with the exclusion of the interpretation as \([\text{\textit{R}} \ \text{\textit{]-}}]\).

As (33), markedness convention (35) is interpreted in accordance with Kean's (1975) complement convention.

The markedness convention for codas in (35) expresses the fact that a CVC syllable can be considered as being more marked than a CV syllable, a CVCC syllable as more marked than a CVC syllable, etc. Markedness convention (36) should not be interpreted in accordance with the complement convention. There are two practical reasons for this: If we interpret (36) in accordance with the complement convention, one of the specifications would be:

\[(37) \ \text{\textit{]-}} \ \text{\textit{segment}} \rightarrow \text{\textit{-segment}} / \text{\textit{C}}_d \ \text{\textit{]-}}\]

There is no case in which (37) will have any meaning, because a coda, if present, cannot be empty (see note 14). Another of the specifications would be:

\[(38) \ \text{\textit{]-}} \ \text{\textit{segment}} \rightarrow \text{\textit{+segment}} / \text{\textit{C}}_d \ \text{\textit{]-}}\]

This specification would clearly lead to absurd results, because it would specify a segment in a branching coda as unmarked. The result would be that a CCC coda would be specified as completely unmarked. It should be remarked that the assumption that (36) should not be interpreted in accordance with the complement convention is a mere provision without theoretical motivation. According to Kean (1975), only markedness conventions referring to major class features should not be interpreted in accordance with the complement convention. Although not a major class feature, the feature \(\text{\textit{segment}}\) is of some more fundamental order than, e.g., the feature \(\text{\textit{strident}}\). It should also be noted that because of the branching character of the coda in (38), it is the juxtaposition and not the superposition of features that is relevant for the convention in that specification. Nevertheless, the fact remains that (35), which also refers to the feature \(\text{\textit{segment}}\), must be interpreted
in accordance with the complement convention. The theory of markedness clearly awaits further elaboration with regard to the markedness of syllable structure.

With the assumption of (35) and (36), the following markedness scale can be drawn:

(39) onset rime markedness value
   |     |     |                      |
   C C V V 0
   Ø Ø VC 1
   CC CC VCC 2
   CCCCC VCCCC 3
   Cn Cn VCCn n

Principle II of (28ii) can now predict the correct syllabification of [aspire]. According to the markedness scale in (39), the markedness values of the onsets and rimes of the syllabifications as displayed in (17') and (17'') will be:

(40)a. b.  
   0 0 0 0 2 0 0 0 0 1 1 0 0 0 0 0 (markedness values)

As one sees, the syllabification as in (40b) only has two onsets or rimes with markedness value 1, while (40a) has a rime with markedness value 1 and an onset with markedness value 2. Because of the lower markedness, Principle II of (28ii) will select (40a) as the correct syllabification.

At this point, something must still be decided concerning Principle II of (28ii). Probably, Lowenstamm proposed this principle only in view of cases like the French form /lav+e/ 'to wash'. Because of his assumption that syllable structure is present in the lexicon, the structure of the lexical part of this form will be originally as in (41):
A morphological rule will now create the form as in (42) (with markedness value according to Lowenstamm's markedness scale as displayed in (30):

Because of Principle II of (28i), 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 (40a) and (40b) however, it is the markedness of the coda of the first syllable together with that of the onset of the second syllable that must be considered.

This is why I introduce here the notion of syllabic markedness of a word (or prosodic unit):

The syllabic markedness of a prosodic unit can be computed in the following way:

1. determine the markedness of all onsets and rimes by means of (39);
2. add all markedness values;
3. add to this sum 1 for each syllable.

(44iii) is based on the assumption that a word consisting of n syllables is less marked than a word consisting of n+1 syllables, other things being equal (e.g. in the case of merely CV syllables). (43iii) will receive
further motivation in section 3.2. (on schwa-deletion) and 3.3. (on semivocalization).

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

(45)a. \[ \sigma \sigma \sigma \]
\[ \sigma \sigma \sigma \sigma \sigma \]
\[ / \& / / / / / \]
\[ p a s p i r e \]
\[ 1+0+2+0+0+0+3 \text{ (= number of syllables)} = 6 \]

(45)b. \[ \sigma \sigma \sigma \]
\[ \sigma \sigma \sigma \sigma \sigma \]
\[ / \& / / / / / \]
\[ p a s p i r e \]
\[ 1+1+0+0+0+0+3 \text{ (= number of syllables)} = 5 \]

The principle of syllabification to lowest possible markedness rightly predicts that (45b) is the correct syllabification.

2.4. A summary of the syllabification proposal.

At this point, it is useful to give a summary of the proposals on syllabification that I have made in the previous sections of this chapter. I have given motivation for the following proposals concerning French syllabification:

(46)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, syllabification takes place at any time;

(47) The syllabification proper takes place according to the following principle:
- minimize the syllabic markedness of the prosodic unit across which the syllabification takes place, in accordance with the syllable templates (12) and (13), subject to the conditions in (15), that refer to the strength scale in (14).

2.5. A provision for stop+liquid clusters and a proposal for a specified resyllabification under the influence of stress.

The proposal on syllabification in French has still to be modified
and enlarged on two points. The first one concerns the behaviour of stop+liquid clusters, while the second concerns a specified resyllabification under the influence of stress.

2.5.1. A provision for stop+liquid clusters.

The syllabification proposal that I have made in the previous sections would predict the wrong syllabification for words like (48):

(48) librement /libr?m/ 'freely'

According to the proposal, (49a) would be selected as the correct syllabification, because its syllabic markedness is lower than that of (49b):

(49)a. 
\begin{align*}
\sigma & \sigma & \sigma \\
0 & 0 & 0 & 0 & 0 \\
1 & ib & r & m & a \\
0 + 1 + 0 + 0 + 0 + 3 (= \text{number of syllables}) &= 4
\end{align*}

b. 
\begin{align*}
\sigma & \sigma & \sigma \\
0 & 0 & 0 & 0 & 0 \\
1 & i & b & r & m & a \\
0 + 0 + 2 + 0 + 0 + 0 + 3 (= \text{number of syllables}) &= 5
\end{align*}

This is clearly the wrong prediction. There can be found no instances in French in which the segments of a stop+liquid sequence are not tautosyllabic. I will hypothesize therefore that the two segments in such a sequence cannot be split up into two different syllables. Moreover, I will hypothesize that a stop+liquid cluster receives markedness value 1 instead of 2, which it would get according to the markedness scale in (39). The major reason for this will be given in section 3.1.2.2. But at this point, some motivation can be given. Pillinger (1981) has shown that in Latin, a CL cluster behaves differently from a cluster consisting
of a cluster of a consonant followed by another (tautosyllabic) consonant that is not a liquid in two ways by means of evidence from stress and meter. This can be found in (50), which is a scheme reproduced from the handout of Pillinger’s talk:

(50)

<table>
<thead>
<tr>
<th></th>
<th>CC</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>stress:</td>
<td>renders penultimate heavy</td>
<td>does not render penult. heavy</td>
</tr>
<tr>
<td>metre:</td>
<td>renders syllable heavy</td>
<td>does not render syll. heavy</td>
</tr>
<tr>
<td>degemination:</td>
<td>occurs if one C is part of a geminate cluster</td>
<td>does not occur if C is part of a geminate cluster</td>
</tr>
</tbody>
</table>

This evidence from Latin provides motivation for the assumption that a CL cluster is less marked than a CC cluster, and that under certain circumstances it acts as a single consonant.

Here, a word must be said about the concept of syllabic markedness developed earlier in this chapter. 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 that will be treated in section 3.1.2.), also the nature of the segments in question might 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 work may have to express the interaction of several, sometimes conflicting, tendencies, like (i) the tendencies to avoid a breach of the sonority hierarchy, (ii) the tendency to achieve a CV syllable, and also (iii) the tendency to achieve a maximal onset.

The exact nature of this interaction may or may not be different for individual languages.

2.5.2. A specified resyllabification under the influence of stress.

Like Selkirk (see section 1.3.), 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 3.1.1.2, 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 (forthc., see (41) of the previous chapter) has made a similar proposal for English, while Hoard (1971) and Haase (1972) have integrated the attraction of segments under the influence of stress in their accounts of the syllabification in English and Danish respectively. I will tentatively formulate this resyllabification as follows:

\[ (51) \ X \left[ +\text{syll} \right] \ C \_ \$ \left\{ \left[ -\text{syll} \right] \right\} \left[ +\text{syll} \right] \ Y \ \text{OB} \ \text{L} \ \text{OPT} \]

\[
\begin{array}{cccccc}
1 & 2 & 3 & 4 & 5 & 6 & 7 \\
1 & 2 & 3+5 & 4 & & 6 & 7 \\
\end{array}
\]

The full motivation for this resyllabification will be given in section 3.1.1.2, in the account for the obligatory deletion of schwa in (52) and the optional deletion of schwa in (53):

(52) elle est petite /ɛlɛspetit+/ 'she is small'

(53) astre /astrə/+ 'star'
2.6. Concluding remarks to chapter 2.

In this chapter, I have made a proposal for the syllabification in French, on the basis of an idea put forth in Lowenstamm (1979), viz. syllabification to lowest possible markedness. Additional motivation for the proposal will be provided in chapter 3. It has been necessary to make a provision for stop+liquid clusters. The fact that this provision is needed calls for a more elaborated theory of syllabic markedness, also taking into account the nature of the phonological segments. A theory of collocational properties of segments will have to be developed and will have to be integrated into the theory of markedness.

Notes to chapter 2.

1. Dell (1973,p.258-9) formulates these rules as follows:
   \[ \text{ELISION: } \phi \rightarrow \emptyset / \text{[-seg]} [\text{[+syll]}] \quad \text{DBL} \]
   \[ \text{V-E: } \phi \rightarrow \emptyset / \text{V} \quad \text{DBL} \]
   \[ \text{VCE2: } \phi \rightarrow \emptyset / \text{VC[\text{[\#]}]} \quad \text{DBL} \]

2. Apart from words like axe [aks] 'ax', I assume that the marked 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 specifies resyllabification in section 2.5.2.

3. As will be shown in section 2.3, I will assume that a string of segments is resyllabified after the application of each phonological rule, provided that the first syllabification has taken place. Thus a deletion of a vowel will always be followed by a resyllabification, and as a result there will not occur an empty nucleus.

4. There are just a few French words that have an onset consisting of an obstruent+nasal cluster, e.g. pneu [pny]'tyre', snob [snb]'snob' and smaragdt [smrgrd] 'emerald'. These words are mostly of foreign origin, thus the question is debatable whether obstruent+nasal really constitutes a possible French onset.

5. In section 2.2.2., a provision has been made for onsets and codas consisting of s+obstruent by means of the auxiliary template in (13).

6. This can be seen in (57a) and (57b) of the previous chapter, embarquement [embarkmen][embarcation] and renversemment [ravrsmen][reversal]. See also note 18 of the previous chapter.

7. There are codas consisting of s+obstruent, accounted for by the auxiliary template (13). Codas like these can be found in one of the realizations of words like brusquement [bryskm] 'suddenly' which, according to Julland (1965) can be pronounced as both [bryskm] and [brskm]. According to this and other sources on French pronunciation, however, exactement [gzktrmn] cannot be pronounced as [gzktrnm]. For the word-final codas in words
like exact [kɔzakt], as well as parle [parl] 'speak' and vacarme [vəkərm] 'tumult', an explanation will be given in section 3.5.2.


10. It has been shown in section 1.4.1. 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 in words like plante /plɑːt/, the nasal consonant is not in the same syllable as the \( \tilde{t} \), at any level at which it is present. Hence it is not necessary to allow for a coda consisting of a nasal consonant + obstruent.

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

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

13. A closer look reveals that rule (25) incorporates in its environment the expression of 'possible onset' in the languages studied by Hooper (as well as Vennemann) i.e. Spanish, German and Icelandic. In fact (25) will give the correct results for most West-European languages, which are the languages most studied.

14. If the coda is phonetically absent, the rime has not been expanded into a coda, because if it was, at least one segment would be present, because the coda is obligatory expanded into at least one segment cf. template (12). This means that there can be no zero codas.

15. Deirdre Wheeler has brought to my attention that Cairns and Feinstein (1980) have written a paper concerning the markedness of segments in syllables. In that paper it is not only the number of segments, but also their nature that is proposed as relevant to the relative markedness of syllables. Unfortunately I have been unable to consult this paper.