Chapter 2

SCHWA DELETION AND EPENTHESIS IN FRENCH

French has a famous and notoriously complex pattern of alternation between Ø and schwa. Consider the following pair:

(1) ALTERNATION BETWEEN ə AND Ø:

a.	*carafe de vin*	[karafdə̲vɛ̃]	'carafe of wine'
b.	*pichet de vin*	[piʃɛdvɛ̃]	'pitcher of wine'

The crucial difference between (1a) and (1b) lies in the realization of the preposition *de*, which surfaces as [də] in (1a) and as [d] in (1b). This type of alternation based on the presence or absence of [ə] – generally called *e muet* 'mute e' or schwa[1] (even when it does not have, when it surfaces, the phonetic value attributed to schwa in the IPA)[2] – is omnipresent in French and is subject to numerous factors: segmental, morphological, syntactic, prosodic and rhythmic, stylistic, sociolinguistic, etc. (see Verluyten 1988 for a summary). A general account of the distribution of this vowel represents a seemingly unsurmountable challenge.

What everybody agrees on is that schwa surfaces to break up or avoid complex consonant clusters. Analyses mainly fall into two groups: sequential and prosodic. They all fall short of accounting for the complete range of facts, but I will argue that the prosodic approach is doomed to failure and that substantial progress may only be obtained within a sequential one.

This chapter is organized as follows. I first lay out my assumptions about the underlying status of schwa and synthesize the data that I believe any theory of the distribution of this vowel has to account for. A presentation and evaluation of the various syllabic analyses follow. Upon the conclusion that the syllabic approach is empirically inadequate, I propose in the last section a number of sequential

[1]Other terms used to refer to this vowel include: *e* caduc, *e* instable, *e* féminin, *e* français, *e* svarabhaktic, *e* bifide, *e* semi-muet, *e* intermittent, etc. See Walter (1976, 1990) for more attested terms, up to the Renaissance, and for a short history of these denominations.

[2]When it surfaces, this vowel generally has the value [œ] or [ø] in the dialect I am concerned with here (see below; e.g. Dell 1973/1980/1985; Morin 1978), as well as in my own Québec French variety (Martin 1998). But I will retain the symbol [ə], which is the traditional one, to distinguish this vowel from the stable vowels /œ/ and /ø/.

generalizations that I believe adequately characterize the main segmental factors involved in the behavior of schwa. These are precisely the generalizations that were established in the previous chapter, which gain additional support from a process of vowel deletion and vowel epenthesis. Note that the data provided here all come from what could be characterized as the speech of educated urban speakers from Northern France, in particular Paris.[3]

2.1. BASIC FACTS

2.1.1. THE UNDERLYING STATUS OF SCHWA

The underlying status of schwa has generated a substantial body of literature. Are we dealing with vowel epenthesis or vowel deletion? What is the domain of application of the process of schwa deletion/epenthesis? My position on these issues departs from what is assumed in most previous analyses, at least in generative phonology. So it is not useless to discuss it here, especially for those readers who are familiar with the topic. Notice however that the specific division of work I assume between epenthesis and deletion is not absolutely crucial for the proposals I am going to make about the segmental factors in the distribution of schwa.

First, I define schwa as a vowel that alternates with Ø in the same lexical or morphological context. For example, the word *demain* 'tomorrow' may surface as [dmɛ̃] or [də̲mɛ̃], and the adverbial suffix *-ment* comes with or without [ə], depending on the adjective it attaches to, e.g. *fortement* 'strongly' [fɔrtə̲mɑ̃] vs. *sottement* 'foolishly' [sɔtmɑ̃]. This vowel is systematically denoted [ə], whatever its precise phonetic value is. I exclude from the domain of schwa all morpheme-internal vowels that always or never surface in contemporary French, including those that derive from historic schwas. I assume that these vowels, usually denoted with <e> in the orthography, have been reanalyzed as stable /œ/'s or have disappeared from the underlying representation. Representative examples are 1) *squelette* 'skeleton', which is always pronounced [skœlɛt] *[sklɛt] and for which I adopt the underlying representation /skœlɛt/, and 2) *samedi* 'Saturday', systematically pronounced

[3]Unlike other authors, I do not use the term Standard French, which has a normative flavor I consider irrelevant here. If it is true that educated speakers from Paris and other Northern cities ultimately determine much of the norm, we cannot safely claim that everything they say corresponds to what would generally be considered normative. For an essential discussion of the notion of Standard French and other empirical problems in French phonology, see Morin (1987a, 2001).

[samdi] *[samə̲di] and which contains no medial vowel in its underlying representation /samdi/).[4]

Second, I consider that the underlying status of schwa is not uniform. Schwa appears in two broad morphological contexts: at morpheme/word junctures, and morpheme-internally. I believe that all schwas found at morpheme and word boundaries are epenthetic, whereas morpheme-internal ones are underlying.[5] The distribution of schwa vs. Ø at boundaries depends on independent phonological and morphological conditions, and vowels do not have to be posited underlyingly.[6] But morpheme-internal schwas, which are found only in the first syllable of polysyllabic morphemes (e.g. *demain* above), are unpredictable and cannot be epenthetic.[7] Morin (1974) suggests this combination of underlying and epenthetic schwas but does not

[4]I also exclude from my discussion the so-called [ə]-[ɛ] alternation. Three cases arise in modern French: [ɛ] alternates with Ø (i), with [œ] (which I analyze as a stable /œ/) (ii), or with a deletable schwa (according to the definition adopted here) (iii).

(i) *appelle* 'call.PRESENT' [apɛl] vs. *appeler* 'call.INFINITIVE' [aple]
(iii) *pèse* 'weigh.PRESENT' [pɛz] vs. *peser* 'weigh.INFINITIVE' [pœze]
(iii) *mène* 'lead.PRESENT' [mɛn] vs. *mener* 'lead.INFINITIVE' [m(ə)ne]

I follow Morin (1988), who convincingly argues that these alternations are not phonological in contemporary French but are to be derived by allomorphy. See also Morin (1978, 1998).

[5]I am not concerned here with the exact representation of this vowel: as /œ/ with a special diacritic marking it as deletable (e.g. Morin 1978), an empty/featureless nuclear position (e.g. Anderson 1982; Withgott 1982; Charette 1991; Noske 1993), or a floating vowel (e.g. Hyman 1985; Tranel 1987a, Encrevé 1988).

[6]One may legitimately suspect that there are arguments for positing underlying schwas at morpheme boundaries (other than tradition and orthography). Dell (1973/1980/1985) is the author that most explicitely and most carefully presents the case for underlying schwas. His arguments are in large part theory-internal (final schwas in non-clitic words are posited to protect the preceding consonant from deletion), empirical arguments being very limited (mainly the behavior of schwa before h-aspiré words and the suffix *-rions/-riez* (1st/2nd person plural forms of the conditional present tense). Morin (1978) and Tranel (1981) convincingly argue against these theoretical and empirical arguments. Tranel, however, retains underlying schwas in clitics (*te, que, de, me, ne, se, ce, le*), for the reason that a schwa is pronounced in the citation form of these words. I believe this to be an unnecessary stipulation. The distribution of schwa in clitics is predictable from the phonological and morphological context, which makes its presence underlyingly unnecessary. We may assume that the presence of schwa in the citation form follows from a requirement in French that all prosodic words or utterances contain a vowel. Déchaine (1990, 1991) also comes to the conclusion that clitics do not contain underlying schwas in Québec French.

[7]Contra Martinet (1969, 1972). Dell (1973/1980/1985), Morin (1974), Verluyten (1988), Noske (1993) also argue against Martinet for reasons of predictability. However, the unpredictability of schwa in the initial syllable of polysyllabic morphemes cannot be extended to schwa in general, as done e.g. by Verluyten (1988) and Noske (1993, 1996). Note that these morpheme-internal schwas often tend to either disappear or become stable in various dialects, with a substantial amount of idiolectal variation. See Walter (1977, 1990), Hansen (1994), and Walker (1996) about the stabilization of schwa in Parisian French.

pursue it. So the additional vowel in (1a), which appears at a clitic-noun boundary, is not present underlyingly; the process here is one of vowel insertion, not schwa deletion, as is assumed in most studies. I take every morphological juncture to be a potential site for epenthesis. However, I exclude from consideration junctures followed by a 'h aspiré', however these should be treated (see e.g. Dell 1973/1980/1985 and Tranel 1981 for different views on this topic).

2.1.2. THE DISTRIBUTION OF SCHWA ACROSS CONTEXTS

Before reviewing and assessing the syllabic proposals, it is necessary to get a sufficiently clear picture of the facts. The behavior of schwa depends on the segmental, prosodic, and morphological context. The following morphological contexts may be identified, with one example for each of them. I use "+" to indicate any word-internal boundary, "=" for clitic boundaries and a space for (phonological) word boundaries.

(2) CONTEXTS OF OCCURRENCE OF SCHWA:
Junctures:[8]

a. Before the (consonant-initial) derivational suffixes *-ment*, *-rie*, *-té*[9]:

justement	'justly'	/ʒyst+mã/	[ʒystə̲mã]
garderie	'daycare'	/gard+ri/	[gardə̲ri]
propreté	'cleanliness'	/prɔpr+te/	[prɔprə̲te]

b. Before conditional and future endings, except 1st/2nd plural conditional:

doublerai	'double+FUT.1SG'	/dubl+re/	[dublə̲re]

c. Before the 1st/2nd plural conditional endings *-rions/-riez*:

fumeriez	'smoke+COND.2PL'	/fym+rje/	[fymə̲rje]

d. At clitic boundaries (all clitics are proclitics: *te, que, de, se, ce, je, me, ne, le*):

Alice le fait	'A. does it'	/alis l=fɛ/	[alislə̲fɛ]
bol de lait	'bowl of milk'	/bɔl d=lɛ/	[bɔldə̲lɛ]
il pense que non	'he thinks not'	/il=pãs k=nɔ̃/	[ilpãskə̲nɔ̃]

[8]There is an additional junctural context where schwa may appear: between elements of compounds, as in (i):

(i) *garde-robe* 'wardrobe' /gard+rɔb/ [gardə̲rɔb]

I leave compounds aside, which seem to behave mostly like sequences of words from the segmental point of view, with less variation. An important distinction between compounds and words concerns the effect of rhythm, more specifically the number of syllables in the second member of the compound. The relevant facts are described in Léon (1966) and analyzed in Mazzola (1992) and Côté (2000a).

[9]See Morin (1978) for additional suffixes, which are very restricted and not productive.

e. At word boundaries (including verb-pronoun boundaries):

acte pénible	'painful act	/akt penibl/	[akt(ə)penibl]
ferme-toi	'close yourself'	/fɛrm twa/	[fɛrm(ə)twa]

Morpheme-internal:

f. In the first syllable of polysyllables:

une demande	'a request'	/yn dəmɑ̃d/	[yndə̲mɑ̃d]

It is an absolute rule that schwa never appears next to a vowel. In this respect schwa contrasts with all other vowels in French, which freely appear in hiatus. Underlying schwas are all in interconsonantal position[10], and epenthesis never takes place at a boundary that is adjacent to a vowel. The following examples illustrate the failure to epenthesize next to a vowel.

(3) NO SCHWA NEXT TO A VOWEL:

a.	*beauté*	'beauty'	/bo+te/	[bote] *[bo̲ə̲te]
b.	*louerai*	'rent+FUT.1SG'	/lu+re/	[lure] *[lu̲ə̲re]
c.	*geste adroit*	'agile gesture'	/ʒɛst adrwa/	[ʒɛstadrwa] *[ʒɛstə̲adrwa]

Utterance-initial (post-pausal) and utterance-final (pre-pausal) schwas[11] are also not found in the speech described here (4). Note that utterance-initial schwas occur in other varieties, e.g. the colloquial French of lower-middle-class Parisians (according to Morin's (1987a) subjective description) and in Québec French. The analysis proposed here naturally accounts for the absence of epenthesis at utterance edges in the dialect under consideration, but also allows for the existing variation on this point.

(4) NO SCHWA UTTERANCE-INITIALLY AND UTTERANCE-FINALLY:

a.	*je parlais*	'I spoke'	/ʒ=parlɛ/	[ʒ(ə)parlɛ] *[ə̲ʒparlɛ]
b.	*la piste*	'the track'	/la=pist/	[lapist] *[lapistə̲]

From the facts illustrated in (3) and (4), it follows that schwa occurs only between two consonants. It has long been noticed that the distribution of schwa

[10]Cases like *dehors* 'outside' [dœɔr] are irrelevant: I consider the first vowel to be a stable [œ] and not a schwa, since it is always pronounced.

[11]Schwas may be found utterance-finally in 'educated Parisian French' (Fagyal 1998, 2000), but they derive from an epenthesis process that is to be distinguished from the one analyzed here. These schwas are rhythmically-conditioned and serve to avoid final stress and create an (unmarked) trochaic foot. They may appear in practically any segmental context, including sometimes after vowels (a fact overlooked by Fagyal). This is very similar to the situation found in Galician (Martínez-Gil 1997).

depends largely on what precedes the boundary or the underlying schwa. But the following context also has an effect. In reviewing the relevant data about schwa, I find it useful to distinguish the segmental contexts according to the number of preceding and following consonants: 1. C*C: the boundary or underlying schwa is preceded and followed by only one consonant; 2. C*CC: the boundary or underlying schwa is preceded by only one consonant and followed by two; 3. CC*C: the boundary or underlying schwa is followed by only one consonant and preceded by two. The asterisk * here and in the rest of this chapter indicates any potential site where schwa may surface, either a boundary or an underlying schwa. In the table below, I indicate for each combination of the morphological and segmental contexts whether schwa is obligatory, optional, or excluded. In several categories, the behavior of schwa is not uniform and depends on the nature of the consonants. That is, in a given morphological context and with a given number of consonants, schwa may be optional or excluded, or optional or obligatory. When the case arises I provide an example for each possibility, without stating the more specific conditions that determine the choice. These conditions are far from clear and have not been seriously investigated. The main goal of this chapter is precisely to define them.

Note that the distinction between optional and excluded schwa after one consonant is a subtle one and should not be interpreted too radically. One could argue that schwa is always possible, under the right conditions. But some schwas (in clitics and morpheme-internally) sound normal in natural linguistic conditions, whereas others (at word boundaries and word-internally before suffixes) require special circumstances. In these cases I considered schwa to be excluded, but the analysis would not be radically altered by considering it simply more marked or less likely.[12]

The complexity of the distribution of schwa and the fact that most studies of it focus on a subset of the data make it useful to have a complete picture presented in a condensed form. This will also allow us to get a clearer idea of the empirical adequacy of the analyses I present and discuss below.

[12]Strong emphasis expressed by initial stress may for instance license schwa in forms like *doucement* 'gently, slowly' [**dú**sə̲mɑ̃] or *donne-lui!* [**dɔ́**nə̲lɥi] 'give him!', in which schwa may serve to avoid a clash between the (emphatic) initial stress and the (regular) final one. But I have considered schwa in these contexts to be generally excluded. Schwa also seems to appear quite freely in the sequence [ɲ-m], e.g. in *enseignement* 'teaching' [ɑ̃sɛɲ(ə)mɑ̃] and *dignement* 'with dignity' [diɲ(ə)mɑ̃]. I leave this sequence aside here.

Table 3:
Distribution of schwa across various morphological and segmental contexts

/C*C/	/C*CC/	/CC*C/
a. Before derivational suffixes		
(5) ə **EXCLUDED** *fruiterie* /frɥit+ri/ 'fruit store' [frɥitri]	N/A	(15) ə **OBLIGATORY** *garderie* /gard+ri/ 'kindergarden' [gardəri]
b. Before future/conditional endings (except cond. 1/2 plural)		
(6) ə **EXCLUDED** *gâterai* /gat+re/ 'spoil+FUT.1SG' [gatre]	N/A	(16) ə **OBLIGATORY** *doublerai* /doubl+re/ 'double+FUT.1SG' [dubləre] (17) ə **OPTIONAL** *garderai* /gard+re/ 'keep+FUT.1SG' [gard(ə)re]
c. Before conditional 1st/2nd plural endings		
N/A	(10) ə **OBLIGATORY** *gâteriez* /gat+rje/ 'spoil+COND.2PL' [gatərje]	(18) ə **OBLIGATORY** *garderiez* /gard+rje/ 'keep+COND.2PL' [gardərje]
d. At clitic boundaries		
(7) ə **OPTIONAL** *Annie le salut* /ani l=saly/ 'A. greets him' [anil(ə)saly] *plein de linguistes* 'full of linguists' /plɛ̃ d=lɛ̃gɥist/ [plɛ̃d(ə)lɛ̃gɥist]	(11) ə **OPTIONAL** *Annie le grondait* /ani l=grɔ̃dɛ/ 'A. scorned him' [anil(ə)grɔ̃dɛ] *plein de psychologues* 'full of psychologists' /plɛ̃ d=psikɔlɔg/ [plɛ̃d(ə)psikɔlɔg]	(19) ə **OBLIGATORY** *Annick le salut* /anik l=saly/ 'A. greets him' [anikləsaly] (20) ə **OPTIONAL** *Esther le salut* /ɛstɛr l=saly/ 'E. greets him' [ɛstɛrl(ə)saly]
e. At word boundaries		
(8) ə **EXCLUDED** *attaque pénible* /atak penibl/ 'painful attack' [atakpenibl]	(12) ə **EXCLUDED** *attaque frontale* /atak frɔ̃tal/ 'frontal attack' [atakfrɔ̃tal] (13) ə **OPTIONAL** *(il n')aime rien* /ɛm rjɛ̃/ '(he) likes nothing' [ɛm(ə)rjɛ̃]	(21) ə **OPTIONAL** *acte pénible* /akt penibl/ 'painful act' [akt(ə)penibl]
f. Morpheme-internally		
(9) ə **OPTIONAL** *la fenêtre* /la=fənɛtr/ 'the window' [laf(ə)nɛtr]	(14) ə **OPTIONAL** *la secrétaire* /la=səkretɛr/ 'the secretary' [las(ə)kretɛr]	(22) ə **OBLIGATORY** *une demande* /yn dəmɑ̃d/ 'a request' [yndəmɑ̃d] (23) ə **OPTIONAL** *une fenêtre* /yn fənɛtr/ 'a window' [ynf(ə)nɛtr]

As repeatedly mentioned in research on schwa, the tendency is for schwa to be absent when only one consonant precedes, irrespective of the number of following consonants (first two columns), and to be present after more than one consonant (last column). As a consequence, the context following potential sites for schwa (any juncture or underlying schwa) has been largely neglected. But the facts are more subtle and complex, and I believe that the distinction made between C*CC and C*C contexts is warranted and necessary. Let us quickly go over the relevant facts.

C*CC qualitatively differs from C*C in two cases. First, the 1st/2nd person plural conditional endings *-rions/-riez* (UR: /-rjɔ̃, -rje/) trigger obligatory schwa insertion after *all* consonant-final verbal stems, whether preceded by one or two consonants (10, 18).[13] In the context C*C schwa is never required. Second, whereas at word boundaries I consider schwa to be generally excluded in the context C*C, epenthesis appears to be optional with certain sequences in the context C*CC. Words beginning in a /r/+glide sequence (/rj-, rw-, rɥ-/) are among those that optionally trigger schwa insertion after a consonant-final word (13); compare them with the 1st/2nd plural conditional endings *-rions/-riez*. But other combinations also have this effect. In addition to word boundaries and 1st/2nd plural conditional endings, we find a quantitative difference in the likelihood of schwa between C*C and C*CC contexts at clitic boundaries and morpheme-internally: schwa is more likely to appear in C*CC (11, 14) than in C*C (7, 9).

In the preceding table, a vowel always intervenes between the relevant epenthesis site and the beginning of the utterance (context /...VC(C)*C(C)V.../). For the contexts d. (at clitic boundaries) and f. (morpheme-internally), however, the consonant that precedes the underlying schwa or the boundary may appear post-pausally (context /C*C(C)V.../):

[13]The sequences /C+rjɔ̃/ and /C+rje/ can also surface without schwa but with vocalization of the glide: [Crijɔ̃] / [Crije]. The important point is that the sequence [Crj] is banned. I only consider the schwa strategy here. Note that in normative French, the two repair strategies are mutually exclusive: schwa appears with verbs of the first conjugation (verbs in *-er*), while glide vocalization is used with verbs of the third group. The verbs *fonder* 'to found' and *fondre* 'to melt' form in this respect a minimal pair: their second plural conditional forms are, respectively, *fonderiez* [fɔ̃dərje] and *fondriez* [fɔ̃drije]. This distinction has led to the postulation of an underlying thematic schwa after stems of the first group (e.g. Dell 1973/1980/1985). But this contrast has largely disappeared in the spoken language, both strategies being available for all verbs (with very few exceptions), e.g. *aimeriez* 'like+COND.2PL' [ɛmərje] / [ɛmrije] (first group) and *prendriez* 'take+COND.2PL' [prɑ̃drije] / [prɑ̃dərje]. See Martinet (1969), Morin (1978), Bazylko (1981), Spence (1982). Bazylko in particular designed tests that show that speakers do not distinguish between [fɔ̃dərje] and [fɔ̃drije], both forms being available for the conditional of both *fonder* and *fondre*.

(24) OPTIONAL SCHWA AFTER A POST-PAUSAL CONSONANT:

a.	*le salut*	'the greeting'	/l=saly/	[l(ə)saly]
b.	*te fais pas de bile*	'don't worry'	/t=fɛ pa d=bil/	[t(ə)fɛpadbil]
c.	*demande-la*	'request it'	/dəmɑ̃d la/	[d(ə)mɑ̃dla]
d.	*je suis*	'I am'	/ʒ=sɥi/	[ʒəsɥi] [ʃsɥi]

In this case, schwa is generally optional, irrespective of the nature of the consonants.[14] The two examples in (24a,c) thus contrast with their utterance-medial counterpart given in (19) and (22), in which schwa is obligatory. The tolerance for practically any two-consonant cluster phrase-initially is well-known and discussed in numerous sources, from Grammont (1914/1961) and Fouché (1959) to Dell (1973/1980/1985), Rialland (1986), Tranel (1987a), and Noske (1993). Notice that these phrase-initial sequences may violate the Sonority Sequencing Principle, for example the sequence [ls] in (24a).

2.2. SYLLABIC ACCOUNTS

With these data in hand, we can review and evaluate the various approaches that have been taken in accounting for the distribution of schwa, in particular the syllabic ones. References to syllable well-formedness are numerous, dating back to at least Lesaint (1871), who writes: "Dans le corps du mot, l'e est muet toutes les fois que la consonne dont il est précédé peut, dans la prononciation, se joindre sans difficulté, sans effort, à la syllabe qui précède ou à celle qui suit." (Lesaint 1871: 33). In more recent times, explicitely syllabic analyses include: Pulgram (1961), Morin (1974), Cornulier (1975), Bouchard (1981), Anderson (1982), Noske (1982, 1988, 1993, 1996), Montreuil (1985), Tranel (1987a, 1999, 2000), Spa (1988), and Carbonneau (1989).[15]

[14]Two segmental restrictions have been mentioned in the literature. First, Dell (1973/1980/1985) claims that schwa must be present if the initial consonants are both stops, as in *te casse pas la tête!* 'don't overdo it!' /t=kas pa la=tɛt/ [tə̲kaspalatɛt]. Morin (1974) disagrees and gives a schwaless pronunciation for *te tracasse pas* 'don't worry' /t=trakas pa/ [ttrakaspa]. I believe there is a tendency to insert a schwa in such contexts, but this is not an absolute requirement. (See also Grammont 1914/1961: 117-118). Second, Fouché (1959) suggests that schwa is obligatory if the two consonants are identical. But Rialland (1994) gives the pronunciation [sswar] for *ce soir* 'this evening' (UR: /s=swar/), Léon (1966) gives [ʒʒu] for *je joue* 'I play (UR: /ʒ=ʒu/), and Malécot (1976) [ssɔ̃] for *ce sont* 'these are' (UR: /s=sɔ̃/); Morin's example above makes the same point, with a stop rather than a fricative in initial position. Here again, there may be a tendency rather than a law.

[15]To this list could be added two related foot-based analyses – Selkirk (1978) and Withgott (1982) – as well as Charette (1991), whose proposal is cast in Government Phonology. In this framework, the syllable is not recognized as a constituent, but its dependents, the onset and the rime, are. See Lyche & Durand (1996) for a detailed critique of Charette's analysis. Basbøll (1978, 1988) also discusses the role of the syllable in the behavior of ə, with respect to the ə/ɛ alternation (note 4).

These contrast with the purely sequential analyses found in e.g. Grammont (1894, 1914/1961), Fouché (1959), Dell (1973/1980/1985), Domingue (1974), Malmberg (1976), Lyche (1978, 1979), and Spence (1982).[16] None of these studies – even Dell's, which still offers after 25 years the most complete analysis and description to date – entirely captures the complexity of the data. But my point here is to show that substantial progress *cannot* be made within a syllable-based approach.

2.2.1. PULGRAM (1961)

All the syllabic proposals are based on the principle of exhaustive syllabification of the string of segments. Schwa is required whenever the surrounding consonants cannot be properly syllabified without it; it provides an additional nucleus to which the consonants can attach. But authors differ on the definition of a possible syllable in French. For Pulgram (1961)[17], all consonant sequences that are attested pre-pausally (word-finally) and post-pausally (word-initially) form acceptable codas and onsets, respectively (although Pulgram did not specifically use these terms). Therefore, domain-internally, a schwa must appear where its omission would produce a consonant cluster that cannot be decomposed into a permissible word-final (pre-pausal) sequence followed by a permissible word-initial (postpausal) sequence. Otherwise, schwa is considered optional, depending on style and other factors.

The empirical weaknesses of this early syllabic treatment were soon noticed; see Dauses (1973) and Morin (1982). The most obvious shortcoming is that it widely overgenerates, as it predicts schwa omission in consonantal contexts in which it is impossible. Pulgram's proposal is expected to account for all the cases of obligatory schwa in the table above, but its performance in this respect is quite weak. All cases of obligatory schwa at word-internal junctures (first three morphological contexts in table 3) are actually predicted to be grammatical without schwa by Pulgram's rule. Yet a schwa always appears: 1. before a consonant-initial derivational suffix when the stem ends in two or more consonants (25); 2. before future and conditional endings (other than 1st/2nd plural conditional) with verbal stems ending in obstruent+sonorant sequences (26); 2. before 1st/2nd plural conditional endings with all consonant-final verbal stems (27).

[16]Verluyten (1982, 1985a, 1985b) also develops a rhythmic account of the behavior of schwa, which I will not discuss here.

[17]Weinrich's (1961) proposal was essentially identical, although not explicitely expressed in syllabic terms. Weinrich (1961) is a modified version of Weinrich (1958), produced in response to Baldinger's (1958) criticism.

(25) OBLIGATORY SCHWA BEFORE DERIVATIONAL SUFFIXES:

a.	*justement*	'justly'	[ʒystə̲mã] *[ʒystmã]	(UR: /ʒyst+mã/)
b.	*garderie*	'kindergarden'	[gardə̲ri] *[gardri]	(UR: /gard+ri/)
c.	*propreté*	'cleanliness'	[prɔprə̲te] *[prɔprte]	(UR: /prɔpr+te/)

(26) OBLIGATORY SCHWA BEFORE FUTURE AND CONDITIONAL ENDINGS:

a.	*doublerai*	'double+FUT.1SG'	[dublə̲re] *[dublre]	(UR: /dubl+re/)
b.	*entrerai*	'enter+FUT.1SG'	[ãtrə̲re] *[ãtr(r)e]	(UR: /ãtr+re/)

(27) OBLIGATORY SCHWA BEFORE 1ST/2ND PLURAL CONDITIONAL ENDINGS:

a.	*gâterions*	'spoil+COND.1PL'	[gatə̲rjõ] *[gatrjõ]	(UR: /gat+rjõ/)
b.	*fumeriez*	'smoke+COND.2PL'	[fymə̲rje] *[fymrje]	(UR: /fym+rje/)
c.	*garderiez*	'keep+COND.2PL'	[gardə̲rje] *[gardrje]	(UR: /gard+rje/)

In all these examples, the schwaless outputs are predicted to be acceptable by Pulgram's law since they contain a permissible word-final sequence followed by a possible word-initial one.[18] For example, the group [stm] in (25) can be decomposed into the word-final cluster [-st] (e.g. *liste* 'list' [list]) followed by word-initial [m-]. In some cases the sequence can even be decomposed in two ways. In (25b), [rdr] can be decomposed as [-rd]+[r-] or [-r]+[dr-] ([-rd] as in *garde* [gard]; [dr-] as in *dru* [dry]). The basic problem for Pulgram is that in all the forms in (25)-(27), the stem itself corresponds to a possible word. These stem-final clusters are therefore always permissible word-final sequences. The suffix-initial consonant(s) are also always acceptable word-initially. Therefore these consonant clusters can always be decomposed according to Pulgram's rule, the syllable boundary corresponding to the morphological one.

There are two other contexts for obligatory schwa: at clitic boundaries and morpheme-internally. Here Pulgram's law accounts only for a subset of the obligatory cases. Take the following examples of mandatory schwa in clitic groups:

(28) OBLIGATORY SCHWA IN CLITIC GROUPS:

a.	*Philippe me salut*	'P. greets me'	[filipmə̲saly]	(UR: /filip m=saly/)
b.	*Philippe le salut*	'P. greets him'	[filiplə̲saly]	(UR: /filip l=saly/)

The absence of schwa would yield the sequences [pms] and [pls]. Schwa insertion is predicted by Pulgram in the first case, since [pms] is not decomposable into a word-final sequence followed by a word-initial one: [-pm] and [-ms] are not attested word-

[18]Note that many of the ungrammatical forms below are acceptable in other varieties, e.g. Saint-Etienne French (Morin 1983).

finally and word-initially, respectively. But Pulgram's law does not lead us to expect schwa epenthesis in (28b), since [pls] is decomposable into [-pl] + [s-].

Overgeneration is the most obvious weakness of Pulgram's approach. But it also undergenerates, in that it predicts schwa to be obligatory in contexts where it is only optional. It does so phrase-initially, as in the examples in (24), repeated below:

(24) OPTIONAL SCHWA AFTER PHRASE-INITIAL CONSONANTS:

a.	*le salut*	'the greeting'	/l=saly/	[l(ə̲)saly]
b.	*te fais pas de bile*	'don't worry'	/t=fɛ pa d=bil/	[t(ə̲)fɛpadbil]
c.	*demande-la*	'request it'	/dəmãd la/	[d(ə̲)mãdla]
d.	*je suis*	'I am'	/ʒ=sɥi/	[ʒə̲sɥi] [ʃsɥi]

Domain-initially, schwa is expected to occur if its omission would produce a cluster that is not a permissible onset. The omission of schwa in these examples yields the sequences [ls], [tf], [dm] and [ʃsɥ], which are not found word-initially in the lexicon. So they should not constitute acceptable onsets and the forms in (24) should be ungrammatical without schwa. Pulgram actually discusses comparable examples, and concludes that these clusters ought to be listed among the permissible onsets, to the extent that they are attested post-pausally. This account seems to fall into circularity: schwa omission is considered possible because it yields clusters that are possible onsets, but the permissibility of these onsets is itself determined only on the basis of schwa omission in these forms. This cannot be an explanation.

2.2.2. SUBSEQUENT ANALYSES

Subsequent syllabic analyses tried to develop a more restrictive theory, which would eliminate the important overgeneration problem encountered by Pulgram's approach (Morin 1974; Bouchard 1981; Anderson 1982; Noske 1988[19], 1993, 1996; Tranel 1987a). This was done by restricting the notion of possible syllables in French and limiting the resyllabification possibilities across boundaries or deleted underlying schwas. These analyses differ in various aspects, but a unified presentation is possible. I start with the most restrictive approach, one that contains all the necessary ingredients to predict schwa insertion/retention in all the contexts

[19]I will not consider Noske (1982), but only its revised French version (1988). Noske (1982) allows schwa to be absent before derivational suffixes preceded by two consonants (e.g. *burlesquement* [byrlɛskmã]). These pronunciations are very generally rejected by speakers of the relevant variety and are based on some scattered and inconsistent pronunciations found in pronunciation dictionaries, in particular Juilland (1965). These forms were correctly removed from the later French version of this article (1988), and the analysis revised accordingly. See Morin (1987a) for insightful comments on these and other problematic data.

where it is indeed obligatory. As this system turns out to be too restrictive in other contexts, we will see how it can be relaxed or amended to improve its empirical adequacy. I conclude, however, that the modifications that have to be integrated into the system are such that they in essence deprive the syllable of its usefulness and motivation. There is then no argument for adopting an analysis based on syllable well-formedness conditions over one that only refers to sequences of elements – segments and boundaries.

2.2.2.1. Step 1: the most restrictive approach

The correct theory of schwa must be able to derive all the cases of obligatory schwa insertion/retention (see table 3). In order to do so, it has been proposed that it should include the two assumptions in (29).

(29) TWO ASSUMPTIONS THAT ACCOUNT FOR CASES OF OBLIGATORY SCHWA:
   a. French allows only one coda consonant. Complex onsets are tolerated (Bouchard 1981; Anderson 1982; Noske 1988, 1993, 1996).
   b. Consonants cannot resyllabify across a boundary or deleted schwa (Morin 1974; Bouchard 1981; Anderson 1982; Tranel 1987a).

The conditions on syllable well-formedness in (29a), in particular the fact that complex codas are prohibited, entail that any sequence of three consonants $C_1C_2C_3$ can only be syllabified $C_1.C_2C_3$, provided C_2C_3 is a permissible onset. What constitutes a permissible onset is not entirely clear, but in any case, stop+liquid (except /tl, dl/) and /f/+liquid clusters have to be included into the set of acceptable onsets, with the possible addition of /s/ before the cluster.

Condition (29b) disallows resyllabification of consonants across a boundary or deleted schwa.[20] It is implemented in different ways by Morin, Bouchard, Anderson, or Tranel, but the effect is essentially the same, that of preventing resyllabification. From (29b) it follows that in an underlying sequence /VC_1-C_2V/ where "-" indicates any boundary, C_1 cannot associate with C_2 to form a complex onset and has to be syllabified as a coda with the preceding vowel. The same holds for an input /$VC_1əC_2V$/ if /ə/ deletes. When the boundary or the underlying schwa is preceded by two consonants, the conjunction of (29a) and (29b) makes the sequence unsyllabifiable. Consider an input /VC_1C_2*C_3V/ (/C_1C_2-C_3V/ or /$VC_1C_2əC_3V$/). Both outputs *[$VC_1C_2.C_3V$] and *[$VC_1.C_2C_3V$] are excluded, the first one by the ban

[20]This condition actually only applies when the boundary is followed by a consonant. Consonants do resyllabify to the right across a boundary when followed by a vowel, e.g. *une idée* 'an idea' /yn ide/ would surface as [y.ni.de].

on complex codas (29a), the second one by the no-resyllabification constraint (29b). If we assume in addition that consonantal syllabic nuclei are prohibited in French, there is no available syllabification for C_2 in sequences of the type /VC_1C_2*C_3V/ without schwa in the designated site, which is obligatory to provide C_2 with a nucleus to attach to.

Let us see more specifically the effect of the assumptions in (29) on the behavior of schwa. I list below all the contexts in which schwa is obligatory. There are five of them; the last three are just repetitions of data in (25)-(27) discussed in the context of Pulgram's proposal.

(30) OBLIGATORY SCHWA MORPHEME-INTERNALLY:

a.	*une demande*	'a request'	/yn dəmɑ̃d/	[yndə̲mɑ̃d]
b.	*sept melons*	'seven melons'	/sɛt məlɔ̃/	[sɛtmə̲lɔ̃]

(31) OBLIGATORY SCHWA AT CLITIC BOUNDARIES:

a.	*Annick le salut*	'A. greets him'	/anik l=saly/	[aniklə̲saly]
b.	*Philippe te conduit*	'P. drives you'	/filip t=kɔ̃dɥi/	[filiptə̲kɔ̃dɥi]

(25′) OBLIGATORY SCHWA BEFORE DERIVATIONAL SUFFIXES:

a.	*justement*	'justly'	/ʒyst+mɑ̃/	[ʒystə̲mɑ̃]
b.	*garderie*	'kindergarden'	/gard+ri/	[gardə̲ri]
c.	*propreté*	'cleanliness'	/prɔpr+te/	[prɔprə̲te]

(26′) OBLIGATORY SCHWA BEFORE FUTURE AND CONDITIONAL ENDINGS:

a.	*doublerai*	'double+FUT.1SG'	/dubl+re/	[dublə̲re]
b.	*entrerai*	'enter+FUT.1SG'	/ɑ̃tr+re/	[ɑ̃trə̲re]

(27′) OBLIGATORY SCHWA BEFORE 1ST/2ND PLURAL CONDITIONAL ENDINGS:

a.	*gâterions*	'spoil+COND.1PL'	/gat+rjɔ̃/	[gatə̲rjɔ̃]
b.	*fumeriez*	'smoke+COND.2PL'	/fym+rje/	[fymə̲rje]
c.	*garderiez*	'keep+COND.2PL'	/gard+rje/	[gardə̲rje]

The assumptions in (29) correctly and straightforwardly predict the obligatory presence of schwa in the output in the first four cases. Their input is of the form /VC_1C_2-C_3V/ (31, 25′, 26′) or /$VC_1C_2əC_3V$/ (30), which, as shown above, are unsyllabifiable without schwa. I illustrate in (32) with the examples in (30a) and (25′b) how exhaustive syllabification cannot be achieved without the insertion or retention of schwa. I obviously assume that repair strategies other than vowel insertion, in particular consonant deletion, are unavailable for independent reasons.

(32) HOW (29) PREDICTS SCHWA INSERTION / RETENTION:

	Input	*Possible outputs*	*Comment*
a.	/yn dəmãd/	*[yn.dmãd]	Excluded by (29b): [d] cannot resyllabify across a deleted /ə/
		*[ynd.mãd]	Excluded by (29a): [nd] is not allowed as a complex coda
		*[yn.d.mãd]	Consonantal nuclei are not allowed
		[yn.də̲.mãd]	OK
b.	/gard+ri/	*[gar.dri]	Excluded by (29b): [d] cannot resyllabify across a boundary
		*[gard.ri]	Excluded by (29a): [rd] is not allowed as a complex coda
		*[gar.d.ri]	Consonantal nuclei are not allowed
		[gar.də̲.ri]	OK

Notice that the first output in (32a) – *[yn.dmãd] – could be excluded without the assumption concerning resyllabification (29b). The sequence [dm], it can be argued, does not form a possible onset. So even if the [d] were allowed to resyllabify with the following [m], we would not obtain an acceptable output. The same cannot be said, however, of the first output in (32b): *[gar.dri], with resyllabification of the [d], is a perfectly acceptable form, like *perdrix* 'partridge' [pɛr.dri]. Yet schwa cannot be omitted here. It is for cases like these that the assumption (29b) is crucially needed.[21]

We still have to discuss the case of the 1st/2nd plural conditional endings (27'). The relevant underlying sequences here are of the form /(C)C+rjV/. With stems ending in a two consonant-cluster, like *gard-* in (27'c), schwa insertion is derived in the same way as in (32) above. But what about stems ending in only one consonant, like *gât-* and *fum-* in (27'a-b)? Here it is not clear that schwa insertion is predicted by the assumptions in (29). The input is of the form /VC+rjV/. The stem-final consonant is automatically licensed in coda position. The fate of the output [VC.rjV] then rests entirely on the status of [rj] as a possible onset. If [rj] is assumed to be an acceptable onset, nothing so far rules out forms like *[fym.rje] (27'b) and *[gat.rjɔ̃] (27'a) and schwa insertion is not predicted. To derive obligatory schwa insertion in these cases, let us assume that [rj] is *not* a possible onset. This is not an implausible

[21]Noske (1988) actually takes [gardri] for *garderie* to be grammatical, and more generally all outputs [-C.Or-] for underlying /CO+r/ (where O=obstruent). This opinion is clearly not shared by other researchers, e.g. Dell, Morin, Tranel, to name just a few, including myself. The obligatory presence of schwa between two consonants and consonant-initial derivational suffixes is a well-established fact and I will disregard Noske's claim.

assumption. It is supported by the fact that this sequence occurs word-initially – for instance in *rien* 'nothing' [rjɛ̃] – but not word-internally after a consonant *[VCrjV].[22] The initial /r/ in /rjɛ̃/ would then be considered extrasyllabic (see following section), and in a word like *parier* 'to bet' [par.je], the syllable boundary would be put between the two consonants. Extrasyllabic consonants being allowed only at domain edges, an output like *[fymrje] (27'b) cannot be properly syllabified. The schwa inserted at the morphological boundary then provides a coda for the /r/ to go into [fy.mə̲r.je].[23]

We have now derived by means of the two assumptions in (29) all the cases of obligatory schwa in table 3. This represents a substantial improvement over Pulgram's analysis, which predicted schwa to be optional in all these examples. A theory based on (29) and the requirement of exhaustive syllabification, however, is too restrictive, as it also predicts schwa to be obligatory in contexts where it is not. Schwa is expected to occur in *any* sequence of the form /CC*C/, that is all the contexts in the rightmost column in table 3. Yet there are four contexts in which schwa may be omitted in certain forms: before future/conditional endings (other than 1st/2nd plural conditional), at clitic boundaries, at word boundaries, and morpheme-internally. We also saw in (24) that schwa insertion is not required phrase-initially, even when the resulting initial sequence of consonants can hardly be considered an acceptable onset, like [ls] (24a) or [ʃsɥ] (24d). Exhaustive syllabification then predicts obligatory schwa insertion, contrary to facts. For these cases the assumptions in (29) offer no solution and do not fare better than Pulgram's (1961) proposal. Let us now see how the theory can be relaxed to accomodate these cases.

2.2.2.2. Step 2: allowing for extrasyllabicity

Allowing for extrasyllabic consonants at edges of prosodic constituents provides the obvious solution to many of the cases where schwa is incorrectly required to be obligatory. As can be seen in table 3 and in the examples below,

[22]Except with a geminate /r/, as in *verriez* 'see+COND.2PL', pronounced [vɛrrje] (or [vɛrje]).

[23]Noske (1982, 1988) suggests that /rj/ *is* a possible onset, but that /Crj/ is not. To rule out forms like *[gatrjɔ̃] for *gâterions* (27'a), he proposes that obstruent-liquid sequences are always tautosyllabic. As a result the syllabification [ga.trjɔ̃] is excluded because [trj] is not a possible onset, and [gat.rjɔ̃] is out because the sequence [tr] cannot be broken by a syllable boundary. Hence the presence of schwa [gatə̲rjɔ̃]. The tautosyllabicity requirement for obstruent-liquid clusters can be questioned, however. According to my intuition, a form like *hanterait* 'haunt+COND.3SG' [ãt.rɛ] (UR: /ãt+rɛ/) has the indicated syllabification and contrasts with *entrait* 'enter+IMPERFECT.3SG' [ã.trɛ] (UR: /ãtr+ɛ/). With stems ending in a non-obstruent consonant like *fumeriez* (27'b), Noske offers a slightly different solution to rule out *[fym.rje], which does not involve a tautosyllabicity requirement between the /r/ and the preceding consonant. I leave it aside. But note that a uniform solution for all 1st/2nd plural conditional forms would certainly be preferable.

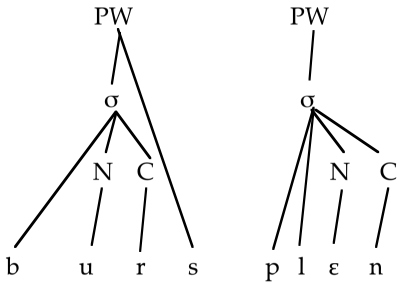
schwa is never obligatory at word boundaries, although in some contexts, as in (33c), the pronunciation with schwa can be considered highly preferable (see section 2.3.2 regarding such examples).

(33) OPTIONAL SCHWA AT WORD BOUNDARIES:

a.	*acte pénible*	'painful act'	/akt penibl/	[akt(ə)penibl]
b.	*bourse pleine*	'full purse'	/burs plɛn/	[burs(ə)plɛn]
c.	*rythme sauvage*	'wild rhythm'	/ritm sɔvaʒ/	[ritm(ə)sɔvaʒ]

These examples straightforwardly follow if we assume that consonants not admitted in the coda are licensed by extrasyllabicity word-finally. I presented in section 1.2.1.1. various approaches to extrasyllabicity and the way extrasyllabic consonants are ultimately licensed. For the sake of expliciteness I assume that extrasyllabic consonants word-finally attach directly to the prosodic word. The schwaless output in (33b) would then have the representation in (34):

(34) EXTRASYLLABICITY OF WORD-FINAL CONSONANTS:



The optionality of schwa in most future and non-1st/2nd plural conditional forms (35) could be accounted for by assimilating the boundary to a word level one. These verbal endings may be analyzed as some kind of word-level affix, contrasting with derivational suffixes (cf. the mandatory schwa in *garderie* [gardə̲ri]). The stem-final consonant would then be allowed to be extrasyllabic, as in (34) above.[24]

[24]Table 3 contains future/conditional forms in which I consider schwa to be obligatory, e.g. *doublerai* 'double+FUT.1SG' [dublə̲re] *[dublre]. Given the proposed correspondence between the future/conditional and word boundaries, one may wonder why schwa is not always optional in the future/conditional as I have assumed it is at word boundaries. This assumption should actually be qualified somewhat. In very close syntactic contexts, like adjective+noun groups, schwa can be considered almost obligatory with certain consonant sequences, precisely those that obligatorily trigger schwa insertion in the future/conditional. These are sequences that violate the SSP, as we will see in section 2.3.2. So there may not be a real contrast between word and future/conditional boundaries.

(35) OPTIONAL SCHWA BEFORE FUTURE AND CONDITIONAL ENDINGS:

a.	*garderai*	'keep+FUT.1SG'	/gard+re/	[gard(ə̲)re]
b.	*postera*	'mail+FUT.3SG'	/pɔst+ra/	[pɔst(ə̲)ra]

The same mechanism of extrasyllabicity can be used domain-initially to account for word-initial /rj/ sequences (36a), as we assumed above that this sequence was not a possible onset, and the generally freer distribution of consonants phrase-initially (24). This account of /rj/ extends to other /r/+glide sequences /rɥ, rw/, as in (36b).[25] The representations of the schwaless output in (36a) and (24a) would then be as in (37) and (38). Notice that this leaves unexplained why initial /r/ before a glide can be licensed extrasyllabically at the PW level whereas other initial consonants, like those in (24), can only be so licensed phrase-initially.

(36) OPTIONAL SCHWA WORD-INITIALLY BEFORE /r/+GLIDE SEQUENCES:

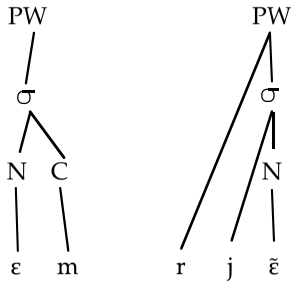
a.	*aime rien*	'like nothing'	/ɛm rjɛ̃/	[ɛm(ə̲)rjɛ̃]
b.	*Patrick Roy*	(name)	/patrik rwa/	[patrik(ə̲)rwa]

(24) OPTIONAL SCHWA AFTER PHRASE-INITIAL CONSONANTS:

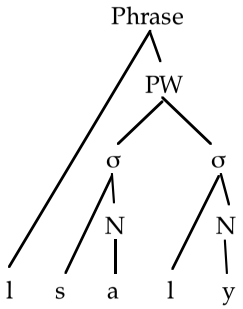
a.	*le salut*	'the greeting'	/l=saly/	[l(ə̲)saly]
b.	*te fais pas de bile*	'don't worry'	/t=fɛ pa d=bil/	[t(ə̲)fɛpadbil]
c.	*demande-la*	'request it'	/dəmɑ̃d la/	[d(ə̲)mɑ̃dla]
d.	*je suis*	'I am'	/ʒ=sɥi/	[ʒə̲sɥi] [ʃsɥi]

[25]This extension requires discussion of an additional point. I mentioned above that there are no word-internal [Crj] sequences. But internal [Crw] and [Crɥ] sequences are found, as in *endroit* 'location' [ɑ̃drwa] and *autrui* 'others' [otrɥi]. The preceding consonant, however, can only be a stop or /f/, that is exactly the consonants that precede /r/ in complex onsets. We adopt the hypothesis that in these words (and others like *surcroît* 'addition' [syr.krwa]) the glide forms a diphthong with the following vowel and is not in onset position (Noske 1982, 1988; Rialland 1986). Crucially, the glide option is not available in words like *roi* 'king' [rwa]. This is consistent with the fact that schwa cannot usually appear before words beginning with an /OrG/ sequence: *Patrick Droit* [pa.trik.drwa] *[patrikə̲drwa] contrasts with *Patrick Roy* [pa.trik.r.wa] [pa.tri.kə̲r.wa] (36b). In the first example the word-initial sequence [dr] is fully syllabified in the onset, and [w] in the nucleus; in the second case [w] is in the onset and [r] is extrasyllabic.

(37) EXTRASYLLABICITY OF WORD-INITIAL /r/ FOLLOWED BY A GLIDE:



(38) EXTRASYLLABICITY OF PHRASE-INITIAL CONSONANTS:



Allowing for extrasyllabicity significantly increases the empirical adequacy of the syllabic approach to the distribution of schwa based on the assumptions in (29). The main elements of the system developed so far can be summarized as follows:

(39) MAIN ELEMENTS OF THE SYLLABIC APPROACH:
- a. French allows only one coda consonant. Complex onsets are tolerated.
- b. Consonants cannot resyllabify across a boundary or deleted schwa.
- c. Extrasyllabic consonants are allowed word-finally.
- d. Extrasyllabic consonants are allowed phrase-initially (and word-initially in /r/+glide sequences).

All the cases where schwa is obligatory are accounted for, as well as its freer behavior word-finally and phrase-initially. There remains, however, an important body of data that is, I believe, truly problematic for the syllabic analysis. These involve clitics and morpheme-internal schwas. The proposal summarized in (39) excludes pronunciations that are well attested and for which I do not see a reasonable solution. These are presented and discussed in the coming section.

2.2.2.3. Problematic cases: clitics and morpheme-internal schwas

Consider the following clitic boundaries, in which epenthesis fails to apply (40), and polysyllabic morphemes, in which the underlying schwa in the first syllable deletes (41). All these outputs contain sequences of 3 or 4 consonants, in which the middle consonant(s) cannot be licensed with the mechanisms in (39), by direct syllabification or through extrasyllabicity. These consonants are underlined in the examples. For these examples I have not given all the possible pronunciations but only those that are problematic for the system described in (39). For the example in (40d), there are actually no fewer than four such possibilities.

(40) NO SCHWA EPENTHESIS AT CLITIC BOUNDARIES IN /C C=C/ CONTEXTS:
- a. *chef de la gare* /ʃɛf d=la=gar/ [ʃɛfd̲lagar]
  'master of the station'
- b. *Paul se rasait* /pɔl s=razɛ/ [pɔls̲razɛ]
  'P. was shaving'
- c. *(il) faut que je la vois* /fo k=ʒ=la=vwa/ [fokʒ̲lavwa]
  'I have to see her'
- d. *tu veux que je te le dise* /ty=vø k=ʒ=t=l=diz/ i. [tyvøkəʃt̲lədiz]
  'you want me to say it to you' ii. [tyvøkʃt̲ələdiz]
  iii. [tyvøkʃt̲əldiz]
  iv. [tyvøkʃt̲lədiz]
- e. *tu crois qu'il faut que je fasse tout?* (from Rialland 1986)
  'you think that I have to do everything?'
  /ty=krwa k=il=fo k=ʒ=fas tu/ [tykrwakilfokʃfastu]

(41) SCHWA DELETION IN TINITIAL SYLLABLES IN /C CəC/ CONTEXTS:

a.	*sept fenêtres*	'seven windows'	/sɛt fənɛtr/	[sɛtf̲nɛtr]
b.	*une chemise*	'a shirt'	/yn ʃəmiz/	[ynʃmiz]
c.	*tu devenais*	'you were becoming'	/ty=dəvənɛ/	[tyd̲vnɛ]
d.	*Jacques devrait (partir)*	'J. should (leave)'	/jak dəvrɛ/	?[jakd̲vrɛ]

Readers familiar with the facts on schwa may notice that some of these outputs, or similar ones, have not been unanimously accepted in the literature. The pronunciation given in (41c), for instance, is rejected by Anderson (1982) and Noske (1982, 1988, 1993, 1996). The latter also declares (41d) unacceptable. Tranel (1987a) contrasts *la fenêtre* [lafnɛtr] and *une fenêtre* [ynf̲ənɛtr]. He does not explicitely reject [ynfnɛtr], which is parallel to (41a), as a possible pronunciation for *une fenêtre*, but his discussion may implicitely suggest that. A similar contrast is given by Fischer (1980).

I do not believe the judgments given in (40)-(41) are problematic. Supporting evidence for the examples in (40) and (41) is not hard to find, and the judgments reported in the preceding paragraph will be discussed in section 2.2.3. The form in (40a) appears in Lyche & Durand (1996) (see also Charette 1991), one identical to (40d-iv) in Neidle (1979). (40e) comes from Rialland (1986). The contrast between [lafnɛtr] and [sɛtfnɛtr] or [ynfnɛtr], with schwa deletion in all cases, is real in that deletion is more likely in the first form, where *fenêtre* follows a vowel-final determiner. But the other two are certainly not impossible, and this is made clear in e.g. Dell (1973/1980/1985), whose pronunciation is in general rather conservative, Morin (1978), Charette (1991), or Lyche & Durand (1996). All statistical studies of spontaneous or monitored speech also show abundant examples of comparable clusters involving clitics or morpheme-initial syllables with an underlying schwa: Dauses (1973); Bazylko (1976); Malécot (1976); Léon (1987); Gadet (1997) (see also van Eibergen (1992) and van Eibergen & Belrhali (1994) for similar examples in Grenoble French).

Granting the grammaticality of the examples in (40)-(41), let us now see their implications for a syllabic approach to the distribution of schwa. The underlined consonants cannot be licensed if one adopts the assumptions in (39). To show this I will use the example in (40e), [tykrwakilfokʃfastu]. This output contains a cluster [kʃf], in which the middle [ʃ] is problematic. There are three possibilities for its licensing, which all fail.

- First, it cannot be licensed as a coda because codas in French may contain no more than one consonant (39a), and the coda preceding [ʃ] is already exhausted by [k].

→ Hence the ungrammaticality of *[...okʃ.fa...].

- Second, it cannot resyllabify with the following consonant [f] and form a complex onset with it because resyllabification across a boundary is prohibited (39b).

→ Hence the ungrammaticality of *[...ok.ʃfa....]

- Third, it cannot be licensed by phrase-initial or word-final extrasyllabicity because it does not appear in one of these positions.

→ Hence the ungrammaticality of *[...ok.ʃ.fa...]

A schwa should therefore automatically be inserted to license [ʃ], but this is not the case. The same reasoning applies to all the other cases. The last output in (40d-iv) is even more dramatic, as it contains a four-consonant cluster in which the two middle ones cannot be licensed in the preceding coda, the following onset, or through extrasyllabicity.

I do not see what additional assumptions or amendments could save these and other comparable examples. One could relax assumption (39b) that prohibits

resyllabification across a boundary or deleted schwa. The underlined consonants would then be allowed to resyllabify to the right and form complex onsets with the following consonants.[26] This solution will simply not work. In each of the clusters which the unlicensed consonant is part of in (40) and (41), the last two consonants do not form a legitimate onset. Consider again the [kʃf] sequence in (40d). I believe the most liberal assumptions about the set of permissible onsets in French would not include [ʃf] among them. In other sequences in (40)-(41), perhaps [lsr] in (40b) or [nʃm] in (41b), the last two consonants could be more reasonably accepted as complex onsets (i.e. [sr] and [ʃm]). This would allow the middle fricative to be licensed by forming a complex onset with the following segment. But this would not change the nature of the problem.

Extending the domain of extrasyllabicity by allowing it to apply to the unlicensed consonants in (40) and (41) will obviously not work either. It is hard to see how we could constrain extrasyllabicity in such a way that it could apply in certain segmental contexts but not in others, in order to get the necessary distinction between obligatory and optional schwas at clitic boundaries and morpheme-internally. For example, let us allow the syllabification [sɛt.f.nɛtr] for (41a), repeated in (42a), with an extrasyllabic [f] attached directly to the following prosodic word. Then what rules out the equivalent syllabification *[sɛt.d.mɑ̃d] in (42b), with an extrasyllabic [d]? Yet this representation must be excluded since the form is unacceptable (or at best quite marginal) without schwa. The same reasoning applies to (40a), repeated in (42c), versus (42d). If the [d] of [ʃɛf.d.la.gar] is extrasyllabic, why can't *the same [d]* be also extrasyllabic, or only marginally so, in the similar form in (42d) ??[ʃɛf.d.sa.gar]?[27]

(42) SEGMENTALLY-BASED CONTASTS IN THE ACCEPTABILITY OF SCHWA OMISSION:

a.	*sept fenêtres*	'seven windows'	/sɛt fənɛtr/	[sɛtfnɛtr]
b.	*sept demandes*	'seven requests	/sɛt dəmɑ̃d/	*[sɛtdmɑ̃d]
c.	*chef de la gare*	'master of the station'	/ʃɛf d=la=gar/	[ʃɛfdlagar]
d.	*chef de sa gare*	'master of his station'	/ʃɛf d=sa=gar/	??[ʃɛfdsagar]

I doubt that extrasyllabicity can provide a viable and well-motivated solution to the forms in (40)-(41). For these schwaless outputs to be grammatical, then, the

[26]This would obviously create a problem for the forms for which this assumption was crucially needed, like *garderie* in (32b), but suppose there is an alternative way to force schwa insertion in such cases.

[27]It has also been suggested that some of the unsyllabifiable consonants in (40) and (41) are in fact syllabic and occupy the nucleus of the syllable, e.g. Bouchard (1981), Rialland (1986). But the contexts in which consonants may become syllabic have not been defined. Again, if the [d] is syllabic in (42c), it should also be in (42d).

consonant clusters they contain have to be exhaustively syllabified. The only way to achieve this is by adopting a more permissive definition of a possible syllable in French. This brings us back to Pulgram's (1961) proposal, in which *all* attested word-initial and word-final sequences form acceptable onsets and codas. We saw why this approach was not restrictive enough. But the main point here is that even this highly liberal characterization of a well-formed syllable cannot generate the forms in (40)-(41). The clusters which the underlined (unsyllabifiable) consonants are part of cannot be decomposed into an attested coda-onset sequence. Consider again the [kʃf] sequence in (40d): [kʃ] is not an attested word-final sequence, [ʃf] not an attested word-initial one. Even Pulgram, then, predicts schwa to be obligatory here. This contrasts with the otherwise overgenerating power of his proposal. The conclusion I draw from this discussion is that analyses based on exhaustive syllabification are bound to undergenerate the attested facts, that is predict schwa to be obligatory where it is not, as in (40)-(41).

2.2.3. SCHWA AND VARIABILITY

A general weakness of syllabic treatments which I have not yet mentioned is their failure to account for the omnipresent and inherent variability of the process of schwa insertion/deletion. They offer a rule that determines when schwa is obligatory, but they are silent on the much more numerous cases where schwa is not obligatory. They generally assume that, if not required, schwa is optional in all the positions in which it could in principle be found (that is at every juncture flanked on each side by a consonant and when an underlying schwa is posited). This assumption is unsatisfactory for at least two reasons. First, I consider schwa to be excluded in many contexts, at least under normal linguistic circumstances. These contexts comprise the C-C environment word-internally (43a-b) and at word boundaries (43c), as well as the C-CC environment at word boundaries with some sequences of consonants (43d). These contexts should be described and distinguished from the domain of optional schwas.

(43) /C-C(C)/ CONTEXTS WHERE SCHWA IS NORMALLY EXCLUDED:
Before derivational suffixes:
a. *fruiterie* 'fruit store' /frɥit+ri/ [frɥitri] *[frɥitə̲ri]
Before future/conditional endings (other than 1st/2nd plural cond):
b. *gâterai* 'spoil+FUT.1SG' /gat+re/ [gatre] *[gatə̲re]
At word boundaries:
c. *attaque pénible* 'painful attack' /atak penibl/ [atakpenibl] *[atakə̲penibl]
d. *attaque frontale* 'frontal attack' /atak frɔ̃tal/ [atakfrɔ̃tal] *[atakə̲frɔ̃tal]

Second, within this optional domain we find all degrees of likelihood and naturalness for the presence of a schwa, from the very marginal to the almost obligatory. As Cornulier (1975: 105) puts it: "A chaque instant, il existe entre l'élision obligatoire et l'impossible, une infinité mouvante de degrés qu'il est absurde de quantifier en quelques nombres entiers. Tel est le continu qui échappe, par essence, à la réduction à une combinatoire abstraite de phonèmes discrets et alignés." This continuum is based in part on independent phonological and morphological factors (disregarding the sociolinguistic ones), and any theory of schwa should identify and integrate them.[28]

I believe it is in part the failure to recognize this variability that has led to judgments marking as ungrammatical some of the forms in (40) and (41) above. Recall for example that (41c) is rejected by Anderson (1982) and Noske (1982, 1988, 1993, 1996), who also declares (41d) unacceptable. The interpretation of such judgments brings us to two major generalizations about the distribution of schwa, which I call the *loi des deux consonnes* (after Leray 1930) and the "law of alternating schwas". These have become commonplaces of the literature on this topic, and it is worthwhile to see their effect on the distribution of schwa, where they come from, and how they are and should be interpreted.

The *loi des deux consonnes* states that a schwa is pronounced in every potential site (i.e. boundary or underlying schwa) that is preceded by two consonants. So inputs of the form /CC*C/ surface as [CCəC]. The law of alternating schwa is just a subcase of the *loi des deux consonnes*: it states that in a series of potential sites separated by one consonant, a schwa is pronounced in at least every other site. So in inputs like /C*C*C*C.../, schwa is not omitted in two consecutive sites.[29] It is easy to see that the law of alternating schwas follows from the *loi des deux consonnes*. Consider any sequence of two potential sites in a row /C*C*C/. If schwa is omitted in the first one, which is indicated by the underlined gap, the second one is necessarily preceded by two consonants, as shown in the form [C_C*C]. The *loi des deux consonnes* then predicts that schwa cannot be omitted in the second site as well.

These pronunciation laws are described in the classic sources on the pronunciation of "Standard" French, e.g. Grammont (1914/1961) and Fouché (1959).

[28]As we will demonstrate in more detail below, Pulgram (1961: 307-308) is wrong when he writes: "The choice in the optional cases, however, is not determined by distributional factors, but has to do with the style employed by the speaker (...)."

[29]Considering all schwas underlying, these generalizations transpose as follows: schwa surfaces if preceded by more than one consonant; in sequences of consecutive schwas separated by one consonant (CəCəCə...), at least every other schwa is pronounced.

But it is clear that they should be interpreted as tendencies rather than absolute laws. First, what is often overlooked about these sources is that they are in large part written for foreigners who want to acquire a correct pronunciation of French. The intention is not to describe every grammatical form in French but the rules of an average correct pronunciation (see Morin 1987a). As Fouché (1959: iv) writes: "Loin de nous la pensée que telle ou telle prononciation passée sous silence ne soit pas la bonne. Mais on ne commettra pas de faute en s'en tenant à celles qui sont notées ici." It is indeed true that if one adopts a distribution of schwa that obeys the *loi des deux consonnes*, the resulting pronunciation always sounds appropriate and natural among educated speakers. It represents an average careful pronunciation. But one should not conclude that forms that do not conform to the *loi des deux consonnes* are unacceptable or unattested. Second, Grammont and Fouché themselves mention a number of counterexamples to their generalizations, which have been surprisingly disregarded in later works. Dell's (1973/1980/1985) work is similar in that it designs a system that basically enforces these two "laws", but also cites exceptions, which he does not integrate into his analysis.

Even though I believe the status of the two laws as tendencies is quite clear in Grammont or Fouché, one can observe a temptation in phonological analyses to interpret them as absolute rules and consider all "deviant" forms as ungrammatical (at least in careful speech). This dichotomization of the data based on the *loi des deux consonnes* is apparent, for instance, in Selkirk (1978), Anderson (1982), and Noske (1993). The clearest example is found in Anderson (1982: 542), who cites the sentence in (44) with four consecutive sites for schwa, three clitic boundaries followed by an underlying schwa. In each site schwa may or may not be pronounced, which yields sixteen possible outputs. Eight of them, those in the left column, obey the *loi des deux consonnes* in that a schwa is pronounced in at least every other site. The eight outputs in the right column violate it.

(44) *envie de te le demander* 'desire to you it ask' /ãvi d=t=l=dəmãde/

Conform to the *loi des 2 consonnes*		Violate the *loi des 2 consonnes*	
a.	[ãvi dətələdəmãde]	i.	*[ãvi dət_l_dəmãde]
b.	[ãvi dətələd_mãde]	j.	??[ãvi dətəl_d_mãde]
c.	[ãvi dətəl_dəmãde]	k.	[ãvi d_t_lədəmãde]
d.	[ãvi dət_lədəmãde]	l.	*[ãvi d_t_l_dəmãde]
e.	[ãvi d_tələdəmãde]	m.	[ãvi d_t_ləd_mãde]
f.	[ãvi dət_ləd_mãde]	n.	??[ãvi d_təl_d_mãde]
g.	[ãvi d_təl_dəmãde]	o.	*[ãvi dət_l_d_mãde]
h.	[ãvi d_tələd_mãde]	p.	*[ãvi d_t_l_d_mãde]

Anderson claims that only the outputs that conform to the *loi des deux consonnes* are grammatical. He then comments: "Of course, not all eight possible pronunciations are equally likely. Nonetheless, all are PHONOLOGICALLY possible, as opposed to the inadmissibility of any pronunciation with two consecutive schwas deleted." Things are not so clear cut, however. I indicate in (44) possible acceptability judgments for the eight pronunciations that violate the *loi des deux consonnes*. Four of them are indeed impossible (i, l, o, p). Two of them may not be completely impossible but certainly marginal (j, n). But crucially, those in (44k) and (44m) are quite acceptable. In my Montréal French idiolect, the pronunciation [ãvidtl̪dmãde] (44m), with schwa omitted in two consecutive sites, is probably in fact the most natural pronunciation of this sentence. I conclude that there is no justification for considering the *loi des deux consonnes* as an absolute phonological factor in the distribution of schwa.

We can now understand the origin of the ungrammaticality judgments assessed by Anderson and Noske to some of the forms in (40) and (41). We readily see that these examples all contradict the *loi des deux consonnes*: in each case schwa fails to appear in a position that is preceded by two consonants. I do not exclude the possibility that the *loi des deux consonnes* really is absolute for some speakers (who I do not know), hence these authors's judgments. But I would rather interpret their judgments as stemming from a certain polarization and idealization of the data, which favors the ungrammaticality judgments attributed to all forms that disobey the *loi des deux consonnes*.[30]

More generally, any theory constrained in such a way that it is impossible to depart from the *loi des deux consonnes* and the law of alternating schwas is on the wrong track. The syllabic approach presented in section 2.2.2.1, based on the assumptions in (29a) (no complex codas) and (29b) (no resyllabification across boundaries and deleted schwas) is such a theory. These two assumptions, as we have seen, necessarily predict that a schwa appears at any potential site for schwa that is preceded by two consonants. In an input /C_1C_2*C_3/, C_2 cannot be properly syllabified in the preceding coda (29a) or the following onset (29b) and requires an additional vowel to be licensed. And dismissing forms not conforming to the *loi des deux consonnes* as part of a different, sub-standard, dialect is certainly not a solution. The distribution of schwa is highly variable. There is a continuum of acceptability and frequency of schwa omission/insertion, and nowhere can we establish clear

[30] I believe this polarization may be partly related to the fact that phonological theory has generally not felt comfortable with variability. The search for clear patterns can certainly be associated with an observed tendency, on the part of analysts, to attempt (consciously or not) to limit and reduce variation.

borders between what could be considered standard and non-standard patterns. I believe an acceptable theory of the distribution of schwa has to derive these preferences; there is no point in idealizing the facts.

2.2.4. A FLEXIBLE APPROACH TO SYLLABLE WELL-FORMEDNESS?

Acknowledging the variability of the distribution of schwa and the need for more flexibility, Morin (1974), Cornulier (1975), Tranel (1987a, 1999, 2000) and, to some extent, Bouchard (1981), suggest that the full range of facts cannot be generated with a rigid definition of the French syllable. It follows from their suggestion that the two following assumptions, which were implicit in the previous discussion, have to be dropped: 1. the definition of a possible syllable depends on the patterns independently attested in the language, and 2. this definition is fixed across prosodic and morphological contexts. That is, we have to adopt a flexible notion of the syllable and define it on the basis of criteria other than the phonotactic patterns observed in the lexicon. This is expressed in the following quotes:

> Much of the burden of the analysis ultimately rests on an adequate account of syllable structure in French, in particular on a detailed understanding of allowed onsets and codas. The possible content of these syllable constituents may differ word-internally and at word's edge, within words and across words, in different syntactic contexts, in different styles, across dialects, and across speakers. The variability typically observed in so-called 'schwa deletion' is rooted in these variations (...). (Tranel 1987a: 859-860)

> Le fait qu'entre les emplois obligatoires et les emplois interdits d'e, il existe des emplois plus ou moins évitables ou imposés reflète le fait qu'entre une séquence impossible et une séquence très facile à syllaber, toutes les nuances sont concevables. (Cornulier 1975: 115)

> Un schwa (...) peut tomber si la syllabe précédente est non saturée.
> Une syllabe fermée est en général saturée, sauf dans certains cas qui font intervenir la nature des ajouts consonantiques, des frontières et des segments voisins, de la tonique, de sa position dans l'énoncé (position finale absolue ou non), etc. (Morin 1974: 83 and 88)

An analysis based on a flexible approach to the syllable and context-dependent syllable well-formedness, however, remains to be developed. The authors cited above did not go beyond mere suggestions, exhaustively contained in the preceding quotes. In more recent work, Tranel (1999, 2000), working in Optimality Theory, offers the first glimpse of what a flexible-syllable analysis of the distribution of schwa would look like. He resorts to universal syllable well-formedness conditions, and analyzes a very limited set of facts about schwa in terms of a "universal hierarchy of complex onset/coda goodness", without recourse to a French-specific definition of the syllable. This hierarchy is determined by only one factor: the Sonority Sequencing Principle. The SSP states, for instance, that [sp-] is a better onset than [lp-]; this accounts for the fact that schwa omission, although possible in both cases, is more acceptable in *ce panneau* 'this panel' [spano] than in *le panneau* 'the panel' [lpano] phrase-initially. A more complete account would have to include many more factors. To see what kind of other elements it would contain, consider again the two pairs of examples in (42), repeated below.

(42) SEGMENTALLY-BASED CONTASTS IN THE ACCEPTABILITY OF SCHWA OMISSION:

a.	*sept fenêtres*	'seven windows'	/sɛt fənɛtr/	[sɛtfnɛtr]
b.	*sept demandes*	'seven requests	/sɛt dəmɑ̃d/	*[sɛtdmɑ̃d]
c.	*chef de la gare*	'master of the station'	/ʃɛf d=la=gar/	[ʃɛfdlagar]
d.	*chef de sa gare*	'master of his station'	/ʃɛf d=sa=gar/	??[ʃɛfdsagar]

These examples contain one possible site where schwa could surface: the underlying schwa in (42a-b) and the first clitic boundary in (42c-d). Schwa omission yields a three-consonant cluster, underlined in the phonetic representation. This cluster has to be properly syllabified if the form is to be acceptable. This is possible for (42a) and (42c), which are perfectly grammatical, but not for (42b) and (42d). In each case the potentially unsyllabifiable consonant is the middle one ([f] in (42a), [d] in the other three cases), since the first and last consonants automatically occupy the preceding coda and the following onset, respectively. The clusters in (42a-b) only differ in the nature of the middle obstruent: a fricative [f] in (42a), a stop [d] in (42b). Since only [f] is syllabifiable here, our theory would presumably have to contain a statement like "fricatives are more easily syllabified than stops between two consonants". As for the sequences in (42c-d), they contrast in the identity of the third consonant: [l] in (42c), [s] in (42d). A possible conclusion, which our analysis would also have to incorporate, is that "stops are more easily syllabified before a liquid than before an obstruent."

Other similar contrasts could be examined and the relevant difference integrated into statements on possible syllabifications, or relative ease of syllabification. This approach could certainly be made to work. But my objection to it is that it makes the syllable meaningless. Such statements, including the SSP, can be formulated independently of the syllable and their only use in French would be to

account for the behavior of schwa. The advantages of the syllable then become unclear. In fact, the syllabic rules proposed for the contrasts in (42) – "fricatives are more easily syllabified than stops between two consonants" and "stops are more easily syllabified before a liquid than before an obstruent" – follow straightforwardly from two of the sequential generalizations we have established in the preceding chapter: stops, more than other consonants, want to appear next to a vowel, and so do consonants that are relatively similar to an adjacent segment. This explains why [d] is more likely to trigger schwa insertion than [f] (42b vs. 42a) and why it is more likely to do so before another obstruent, a relatively similar segment, than before a liquid, a more contrasting one (42d vs. 42c). More generally, I believe a large portion of the data on the distribution of schwa can be accounted for with the generalizations proposed for the Hungarian, English, and Icelandic deletion patterns examined in chapter 1, and I do not see what additional work the syllable could do. These generalizations concern 1. the role of adjacent vowels, 2. the SSP, 3. the greater vulnerability of stops, 4. the desirability of contrast, 5. the continuancy value of the segment following a stop, and 6. the effect of the adjacent prosodic boundary. I discuss each of these factors in turn in section 2.3.

2.3. SEQUENTIAL GENERALIZATIONS

2.3.1. ADJACENCY TO VOWELS

Generalization 1: Consonants want to be adjacent to a vowel, and preferably followed by a vowel.

The distribution of schwa is obviously conditioned by the desirability for consonants to be adjacent to a vowel. This will be demonstrated by looking at the various contexts in which schwa can appear, and showing that adjacency to vowels affects its distribution in systematic ways. First, underlying schwas are never found next to a vowel, as noted earlier. Second, schwa cannot be inserted in a position that is already adjacent to a vowel; see the data in (3) above. That is, in contexts C-V, V-C, and V-V, where "-" indicates any boundary, epenthesis never takes place. The reason is that epenthesis would not affect the position of consonants with respect to adjacent vowels: a prevocalic consonant C-V would just remain prevocalic if schwa were added (CəV); likewise for V-C and V-V.

Things become interesting with potential sites that are flanked by consonants on both sides.[31] I distinguish three cases, as in table 3: /VC*CV/, /VCC*CV/, and /VC*CCV/. In the first case, both consonants are adjacent to a vowel; the other two contain a sequence of three consonants in which the middle one is not adjacent to any vowel. We therefore expect schwa to be more likely to appear in the last two contexts than in the first one, since it serves to provide every consonant with a flanking vowel. This is indeed the case. As a first generalization, one can observe by looking at table 3 that schwa is never required in a /VC*CV/ context, that is in a position where the surrounding consonants are either followed or preceded by a vowel. It is only in /VCC*CV/ and /VC*CCV/ sequences that schwa insertion/retention may be obligatory.

Let us look now at each morphological context separately, and see how adding a consonant on either side of the site affects the likelihood of schwa. The relevant data are given in the table below, which indicates for each combination of a morphological context and a segmental context whether schwa is excluded, optional, or obligatory, with an example taken from table 3.

The effect systematically goes in the expected direction: in each morphological context moving from /VC*CV/ to /VCC*CV/ or from /VC*CV/ to /VC*CCV/, that is from the second to the third column, results in an increased likelihood of schwa. The difference is usually qualitative: from excluded or optional in /VC*CV/ schwa becomes optional or obligatory in /VC*CCV/ or /VCC*CV/, at least for a subset of the possible combinations of consonants. In two cases, at clitic boundaries and morpheme-internally, there is no qualitative difference in the likelihood of schwa between /VC*CV/ and /VC*CCV/ sequences: schwa is just optional in both contexts.[32] We will see, however, that there is a clear frequency effect: schwa more readily appears in sequences of three consonants.

[31] Recall that there is no utterance-initial or utterance-final epenthesis in the variety under consideration. This can be explained in terms of the strength of the prosodic boundary. This aspect of the data is investigated in section 2.3.6; until then I limit my attention to utterance-internal positions.

[32] One obvious question is: What distinguishes clitics and morpheme-internal positions, where schwa is optional in /VC*CV/, from the other contexts, where it is normally excluded if there is only one consonant on each side? The fact that morpheme-internal schwas are always optional is to be related to the underlying status of schwa in this context. Underlying schwas surface more readily than epenthetic ones in the same environment. As for clitic boundaries, I suggest that the presence of schwa in these positions is favored, independently of the segmental constraints, by the desirability for every morpheme to conform to a minimal CV form.

Table 4:
Likelihood of schwa in /VC*CV/ vs. /VCC*CV/ and /VC*CCV/

Context	VC*CV	VC*CCV - VCC*CV		
Before derivational suffixes	*excluded* (5) /frɥit+ri/→[frɥitri]	C*CC	N/A	
		CC*C	*obligatory*	(15) /gard+ri/→[gardəri]
Before future/cond endings	*excluded* (6) /gat+re/→ [gatre]	C*CC	*obligatory*	(10) /gat-rje/→[gatərje]
		CC*C	*optional*	(17) /gard+re/→[gard(ə)re]
			obligatory	(16) /dubl+re/→[dubləre]
At clitic boundaries	*optional* (7) /ani l=saly/→[anil(ə)saly]	C*CC	*optional*	(11) /ani l=grɔ̃dɛ/→[anil(ə)grɔ̃dɛ] /plɛ̃ d=psikɔlɔg/→[plɛ̃d(ə)psikɔlɔg]
		CC*C	*optional*	(20) /ɛstɛr l=saly/→[ɛstɛrl(ə)saly]
			obligatory	(19) /anik l=saly/→[anikləsaly]
At word boundaries	*excluded* (8) /atak penibl/→[atakpenibl]	C*CC	*optional*	(13) /ɛm rjɛ̃/→[ɛm(ə)rjɛ̃]
			excluded	(12) /atak frɔ̃tal/→ [atakfrɔ̃tal]
		CC*C	*optional*	(21) /akt penibl/→ [akt(ə)penibl]
Morpheme-internally	*optional* (9) /la=fənɛtr/→[laf(ə)nɛtr]	C*CC	*optional*	(14) /la=səkretɛr/→[las(ə)kretɛr]
		CC*C	*optional*	(23) /yn fənɛtr/→ [ynf(ə)nɛtr]
			obligatory	(22) /yn dəmɑ̃d/→[yndəmɑ̃d]

For the last three contexts – at clitic and word boundaries and morpheme-internally – one may nevertheless observe an asymmetry between /VC*CCV/ and /VCC*CV/, the latter favoring schwa insertion/retention more than the former. At clitic boundaries and morpheme-internally, schwa may be obligatory in the sequence /VCC*CV/ but not /VC*CCV/. At word boundaries, schwa insertion is always optional in /VCC*CV/ but is normally excluded with some combinations of /VC*CCV/, as it normally is in /VC*CV/. This asymmetry has led most authors, since Grammont (1914/1961), to claim that the distribution of schwa really depends on the number of preceding consonants.[33] Under this view, the behavior of the 1st/2nd plural conditional endings, which triggers obligatory schwa in the context /VC*CCV/, is treated as an exception. I believe it should not be and that the emphasis put on the number of preceding consonants led to certain contrasts based on the number of following consonants (/VC*CV/ vs. /VC*CCV/) being overlooked.

[33]Only Fouché (1959) notices the effect of the following segments, as he distinguishes between the CC*C and CC*CC contexts at word boundaries, schwa being generally absent in the first case but present in the second. If schwa deletes in CC*C, it also does in C*CC, since this context is generally less favorable to schwa.

First, Charette (1991) notes a stronger tendency to pronounce a schwa in the initial syllable of polysyllabic morphemes when it is *followed* by a consonant cluster /CəCCV/ (45), as opposed to when it is followed by only one consonant /CəCV/ (46).

(45) UNDERLYING SCHWA IN /CəCCV/:

a.	*secrétaire*	'secretary'	/səkretɛr/
b.	*secret*	'secret'	/səkrɛ/
c.	*regret*	'regret'	/rəgrɛ/
d.	*degré*	'degree'	/dəgre/
e.	*chevreuil*	'roe deer'	/ʃəvrœj/
f.	*depuis*	'since'	/dəpɥi/
g.	*besoin*	'need'	/bəzwɛ̃/

(46) UNDERLYING SCHWA IN /CəCV/:

a.	*seconde*	'second'	/səgɔ̃d/
b.	*semaine*	'week'	/səmɛn/
c.	*demande*	'request'	/demɑ̃d/
d.	*repas*	'meal'	/rəpa/
e.	*cheveu*	'hair'	/ʃəvø/

This tendency is confirmed in Hansen's (1994) study on the frequency of schwa in morpheme-initial syllables. Among the 25 most frequent words containing a schwa in their initial syllable in Hansen's spoken corpus, there are 17 words with the sequence /CəCV/ and 8 with the sequence /CəCCV/. The average rate of schwa retention is 59% for /CəCCV/ words like those in (45), as opposed to only 34% for /CəCV/ ones (46).[34] Unfortunately, I know of no comparable numbers in contexts other than morpheme-internally where schwa is always at least optional.

Second, a schwa is more likely to appear at a clitic boundary in the context /...V C_1=C_2C_3V.../ than in the context /...V C_1=C_2V.../, that is preceding two rather than one consonant, at least with most combinations of C_2 and C_3. Consider the following data. In all cases schwa can be omitted, but speakers' intuitions indicate that omission is much more likely in (48), where the clitic is followed by only one consonant, than in (47), where the clitic is followed by a word-initial cluster, e.g. [ps], [pn] or [sp]. In the latter case omission of schwa yields a consonant not adjacent to a vowel, in contrast to the former. Thus, adjacency to a vowel holds for both /VC=CCV/ and /VCC=CV/.

[34]Interestingly the words in (45), except for *depuis*, have all been reanalyzed with a stable vowel in Québec French, at least in my own idiolect, so that the initial vowel never deletes.

(47) SCHWA AT CLITIC BOUNDARIES IN /V C*CCV/ CONTEXTS:

a.	*plein de psychologues*	/plɛ̃ d=psikɔlɔg/	[plɛ̃d(ə)psikɔlɔg]
	'full of psychologists'		
b.	*plein de pneumologues*	/plɛ̃ d=pnømɔlɔg/	[plɛ̃d(ə)pnømɔlɔg]
	'full of chest specialists'		
c.	*plein de spéléologues*	/plɛ̃ d=speleɔlɔg/	[plɛ̃d(ə)speleɔlɔg]
	'full of speleologists'		
d.	*plein de Srilankais*	/plɛ̃ d=srilɑ̃kɛ/	[plɛ̃d(ə)srilɑ̃kɛ]
	'full of people of Sri Lanka'		

(48) SCHWA AT CLITIC BOUNDARIES IN /V C*CV/ CONTEXTS:

a.	*plein de neurologues*	/plɛ̃ d=nørɔlɔg/	[plɛ̃d(ə)nørɔlɔg]
	'full of neurologists'		
b.	*plein de pédiatres*	/plɛ̃ d=pedjatr/	[plɛ̃d(ə)pedjatr]
	'full of pediatricians'		

The same effect can be found at word boundaries, with the difference that a schwa in the segmental context /VC-CV/ is marked, except under strong emphasis.

(49) SCHWA AT WORD BOUNDARIES IN /VC*CCV/ VS. /VC*CV/ CONTEXTS:

a.	*lutte psychologique*	/lyt psikɔlɔʒik/	[lyt(ə)psikɔlɔʒik]
	'psychological battle'		
b.	*truc mnémotechnique*	/tryk mnemotɛknik/	[tryk(ə)mnemotɛknik]
	'mnemotechnic trick'		
c.	*lutte sensationnelle*	/lyt sɑ̃sasjɔnɛl/	[lyt(??ə)sɑ̃sasjɔnɛl]
	'sensational battle'		
d.	*truc mirobolant*	/tryk mirɔbɔlɑ̃/	[tryk(??ə)mirɔbɔlɑ̃]
	'wonderful trick'		

As the reader has probably already noticed, I have not used in (47) and (49) word-initial stop+liquid or /f/+liquid clusters. These indeed appear to behave more like single consonants at clitic and word boundaries, and contrast with basically all the other attested word-initial clusters: fricative+stop (47c), stop+fricative (47a, 49a), stop+nasal (47b), nasal+nasal (49b), and fricative+liquid (other than /fr, fl/) (47d). A more systematic comparison of all the initial clusters is needed, but my point here is simply to show the potential effect of the consonants following the boundary. The reasons for the distinct behavior of initial stop+liquid (except /tl, dl/) and /f/+liquid clusters remain to be clarified, but I believe important factors are the enhancing effect of the word-initial position, as schwa appears less likely in /C*CC/ than in

/CC*C/ only if the middle consonant is word-initial, and contrast. The favored sequences, those that do not need the presence of schwa, tend to show a big constrast in manner of articulation and avoid homorganicity ([fl] being better than [sl], [kl]/[gl]/[pl]/[bl] being better than [tl]/[dl]). How this interacts with the status of /r/ (see the following section) is unclear. This is an issue I leave for future research, which I believe would be enlightened by a detailed study of segmental overlap in these various sequences.

I have shown in this section that the behavior of schwa is driven by the desirability for consonants to be adjacent to a vowel. Schwa is generally omitted when it is not required to meet this condition. Priviledged contexts for the appearance of schwa are therefore triconsonantal clusters, in which the middle consonant is in need of a flanking vowel. But not all such clusters trigger schwa insertion/retention, and it is in these /CCC/ contexts that the phonological constraints on the behavior of schwa are most apparent. The discussion will now focus on the identification of these factors.

2.3.2. THE SONORITY SEQUENCING PRINCIPLE

Sonority Sequencing Principle: Sonority maxima correspond to sonority peaks.

The SSP appears to be a major factor in the distribution of schwa. A consonant quite systematically triggers schwa insertion if trapped between two consonants that are less sonorous. I use the sonority scale given in (3) in chapter 1: obstruents (O) < nasals (N) < liquids (L) < glides (G). Recall from section 1.2.2. in chapter 1 that I adopt a sequential version of the SSP, according to which violations only occur when a consonant that is not a permissible sonority peak corresponds to a (local) sonority maximum in the string of segments. In other words, such a consonant triggers a SSP violation if its adjacent segments are all less sonorous. It follows that the SSP can only be violated domain-internally in clusters of three consonants or more, and at domain edges in clusters of two consonants or more. For example, a sequence [VklmV] violates the SSP because [l] is more sonorous than both [k] and [m]; [l] constitutes in this case a local sonority maximum. A word-final [Vkl#] sequence also violates the SSP since [l] is more sonorous than [k], its only neighboring segment. But [VkmlV] obeys the SSP because none of these consonants is a local maximum, sonority increasing from [k] to [l].

Before we see the effect of the SSP, however, an important digression on the nature of French /r/ is necessary. I consider /r/ to be underlyingly unspecified in manner of articulation. These specifications are established in context, with a major

distinction between prevocalic positions and elsewhere. This includes in particular three contexts: postvocalically (e.g. *partir* 'leave' [partir]), word-finally after an obstruent (e.g. *mettre* 'put' [mɛtr]), and word-initially before a glide /j, ɥ, w/ (e.g. *roi* 'king' [rwa]). Prevocalic /r/ behaves like an obstruent, specified as [-sonorant]; /r/ in the other contexts is more variable but preferably acts like an approximant, more precisely a glide, which I specify as [+vocoid] (see (32) in chapter 1).[35] This is in accordance with Simon (1967), cited in Rialland (1994), who suggests that postvocalic /r/ is a glide.[36] Context-dependent specification of segments is also proposed for the American English /l/ by Espy-Wilson (1992), who consider it to be [+consonantal] prevocalically but [-consonantal] postvocalically.

The phonetic facts (which, however, need to be investigated further) are certainly consistent with this dual nature of /r/. This phoneme is standardly classified as a liquid, but its articulation in French varies between a fricative, a trill, a glide, and even a vowel. Focusing only on the variants articulated in the velar/uvular region, which are those used in modern Parisian French, one can at least distinguish, based on Tranel's (1987b) description, a pharyngeal approximant[37], a uvular trill, a uvular fricative, and a uvular approximant. Lodge (1987), looking at the different realizations of /r/ in a corpus of speakers from Brittany, distinguishes the fricatives [χ, ʁ], the approximant [ʁ̞], a vocalized [ɤ], and even a null realization Ø. The chosen realization in a given context depends in part on the surrounding segments, but it seems that one major generalization emerges: /r/ tends to be stronger and more consonantal (more fricated) in prevocalic position, and weaker elsewhere (see for example the spectrograms in Rialland 1986).[38] The phonetic

[35]The factors that determine the exact realization of /r/ in non-prevocalic contexts are not entirely clear, but the SSP is certainly one of them. In certain contexts, /r/ can be strengthened to an obstruent to avoid SSP violations, in particular phrase-initially and -finally, e.g. *repasser* 'pass again' /r+pase/ → [χpase], *la poutre* 'the beam' /la=putr/ → [laputχ]. I will only be concerned with domain-internal contexts in this section, but a more detailed analysis of the behavior of French /r/ is necessary.

[36]It has also frequently been proposed that American English /r/ is a glide, e.g. by Harris (1994), Reynolds (1994), and Guenter (2000).

[37]This is a non-standard variant; "it is almost always voiced and does not generally include any friction noise" (Tranel 1987b: 142).

[38]I make the hypothesis that this reflects the degree of constriction of /r/: a narrower constriction prevocalically, a wider one in other contexts. This is consistent with the general tendency for consonants to involve a tighter constriction in prevocalic position (see section 3.1.1). The contrast between prevocalic and non-prevocalic articulations, however, appears to be more extreme for liquids than for nasals and obstruents, probably because they are inherently more variable. The frequent vocalization of post-vocalic liquids crosslinguistically reflects this situation. See for instance Espy-Wilson (1992) for a discussion of the acoustic properties of liquids and glides in American English in different contexts, and a comparison between nasals and liquids on pages 745-746.

transcriptions for /r/ given in Lodge (1987) are consistent with this characterization: his instances of prevocalic /r/ are all fricatives [χ, ʁ] (e.g. *trembler* 'tremble' [tχɑ̃ble]; *réduire* 'reduce' [ʁedɥiʁ̞]), whereas /r/ in other positions varies between fricatives, approximants, vowels, and Ø (50).

(50) REALIZATIONS OF POSTVOCALIC /r/:

a.	Fricative:	*faire*	'make'	[feʁ]
b.	Approximant:	*réduire*	'reduce'	[ʁedɥiʁ̞]
c.	Vowel:	*venir*	'come'	[vəniɤ]
d.	Ø	*quatorze*	'fourteen'	[katɔːz]

The low level of consonantality of /r/ in postvocalic position is also supported by a perceptual experiment I have conducted, which involves $C_1VC_2(C_3)$ syllables in which C_3 is a stop stripped from its release burst and C_2 is any consonant that may appear before a stop word-finally in French [p,k,f,s,m,n,ŋ,l,ʁ] (Côté 2000b). Six French speakers listened to 432 such syllables and had to determine whether C_3 was present and, if so, identify it. The results show that C_3 is systematically correctly detected and identified when C_2 is /r/, but less so when C_2 is another consonant. This suggests that postvocalic /r/ behaves more than other consonants like a vocalic element, after which stops are reliably identified. This is consistent with its being a glide in this position.

The variable nature of /r/ explains its behavior with respect to sonority. When it comes to assessing violations of the SSP, /r/ patterns with obstruents prevocalically but otherwise acts like an approximant. The effects of the SSP are most apparent in two contexts: at clitic boundaries and morpheme-internally. Consider clitics first. In (51), we have subject-clitic-verb sequences containing underlying three-consonant clusters in which the middle element is more sonorous than both its flanking consonants. Such sequences violate the SSP and are systematically avoided by the insertion of schwa at the clitic boundary. The schwaless pronunciation is unacceptable. In (52)-(54), I minimally modify the clusters in (51) so as to remove the SSP violations; we observe that schwa insertion is variable in these forms. In (52) and (53), I replace the first and last consonant, respectively, with a more sonorous one. We obtain clusters of decreasing and increasing sonority, respectively, which do not violate the SSP. In contrast with (51), schwa omission is acceptable. In (54) I replace the middle consonant in the clusters in (51) with an obstruent, either /t/ (2nd person sg. object clitic) or /s/ (reflexive clitic). Obstruents being the least sonorous segments, the SSP cannot be violated with obstruents in cluster-medial position. As a result, (54b-c) are unproblematic without schwa. (54a) involves independent factors: the cluster [stʃ] is marginally acceptable because stops are disfavored between two

obstruents (see next section). But it is still better than the cluster [smʃ] in (51a) which violates the SSP. Had I chosen the clitic /s/ instead of /t/, we would have obtained a [ssʃ] cluster, which contains an undesirable sequence of fricatives.

(51) SCHWA IN /C_1C_2=C_3/ WHERE C_2 IS MORE SONOROUS THAN C_1 AND C_3:

a. *[smʃ]	*Alice me chantait ça*	/alis m=ʃãtɛ sa/	
	'A. sang that to me'	[alismə̲ʃãtɛsa]	*[alismʃãtɛsa]
b. *[plm]	*Philippe le montrait bien*	/filip l=mɔ̃trɛ bjɛ̃/	
	'P. showed it well'	[filiplə̲mɔ̃trɛbjɛ]	*[filiplmɔ̃trɛbjɛ]
c. *[pmr]	*Philippe me rasait*	/filip m=razɛ/	
	'P. shaved me'	[filipmə̲razɛ]	*[filipmrazɛ]

(52) OPTIONAL SCHWA IN /C_1C_2=C_3/ SEQUENCES OF DECREASING SONORITY:

a. [jmʃ]	*Camille me chantait ça*	/kamij m=ʃãtɛ sa/	[kamij(ə̲)ʃãtɛsa]
	'C. sang that to me'		
b. [rlm]	*Albert le montrait bien*	/albɛr l=mɔ̃trɛ bjɛ̃]	[albɛrl(ə̲)mɔ̃trɛbjɛ̃]
	'A. showed it well'		
c. [rmr]	*Albert me rasait*	/albɛr m=razɛ/	[albɛrm(ə̲)razɛ]
	'A. shaved me'		

(53) OPTIONAL SCHWA IN /C_1C_2=C_3/ SEQUENCES OF INCREASING SONORITY:

a. [smj]	*Alice me jodlait ça*	/alis m=jɔdlɛ sa/	[alism(ə̲)jodlɛsa]
	'A. yodeled this to me'		
b. [plw]	*Philippe le ouatait bien*	/filip l=watɛ bjɛ̃/	[filipl(ə̲)watɛbjɛ̃]
	'P. waded it well'		

(54) OPTIONAL SCHWA IN /C_1C_2=C_3/ WHERE C_2 IS AN OBSTRUENT:

a. ?[stʃ]	*Alice te chantait ça*	/alis t=ʃãtɛ sa/	?[alistʃãtɛsa]
	'A. sang that to you'		
b. [psm]	*Philippe se montrait bien*	/filip s=mɔ̃trɛ bjɛ̃/	[filipsmɔ̃trɛbjɛ̃]
	'P. showed himself well'		
c. [psr]	*Philippe se rasait*	/filip s=razɛ/	[filipsrazɛ]
	'P. shaved (himself)'		

Notice in particular the behavior of /r/. In (51c) it patterns like the cluster-final /ʃ/ in (51a), i.e. as an obstruent. Were the prevocalic [r] in (51c) a liquid, we would predict optional schwa insertion, as in (53), rather than obligatory schwa. The cluster-initial /r/ in (52b-c) is postvocalic and behaves like the approximant /j/ in (52a). Likewise, were the postvocalic /r/ an obstruent in (52b-c), we would expect obligatory schwa insertion, as in (51).

A similar but only partial demonstration can be made with underlying schwas morpheme-initially. In (55a-c) we have adjective-noun sequences which contain an underlying sequence /C_1C_2əC_3/ in which C_2 is more sonorous than both C_1 and C_3. To avoid a violation of the SSP, schwa must be retained. In (55d), C_2 is /r/, which makes the case a bit more complex. If schwa deletes, /r/ is not prevocalic. Its prefered articulation is then that of a glide, which leads to a violation of the SSP. Schwa is then expected to surface. But the fricative pronunciation of /r/ is not excluded, although it seems to require some emphasis. With a fricative [r] we get a cluster that conforms to the SSP, so the presence of an intervening vowel is not required. This explains that schwa omission seems to be marginally acceptable in this form, unlike those in (55a-c).

(55) SCHWA IN /C_1C_2əC_3/ WHERE C_2 IS MORE SONOROUS THAN C_1 AND C_3:

a. *[smz]	*la douce mesure*	/la dus məzyr/	
	'the sweet measure'	[ladusmə̲zyr]	*[ladusmzyr]
b. *[kls]	*à chaque leçon*	/a ʃak ləsɔ̃/	
	'at each lesson'	[aʃaklə̲sɔ̃]	*[aʃaklsɔ̃]
c. *[mls]	*la même leçon*	/la mɛm ləsɔ̃/	
	'the same lesson'	[lamɛmlə̲sɔ̃]	*[lamɛmlsɔ̃]
d. ??[lrp]	*le seul repas*	/lə sœl rəpa/	
	'the only meal'	[ləsœlrə̲pa]	??[ləsœlrpa]

We can now try to modify these clusters so as to remove the SSP violations, as we did in (52)-(54). The relevant contrasts are harder to establish with morpheme-internal schwa than at clitic boundaries, however. We can change the initial consonant in (55a-c) to /r/, a more sonorous consonant. We obtain the forms in (56) which are acceptable without schwa.[39] But making the last consonant C_3 more sonorous than C_2 gives rise to independent problems.[40] We can however change C_2 to an obstruent. This automatically makes the cluster conform to the SSP, and schwa can easily be omitted, as shown in (57).

[39]We cannot do much to the form in (55d) to avoid a violation of the SSP. Since C2=/r/ and /r/ preferably acts like a glide in interconsonantal position, we almost invariably get a SSP violation if schwa deletes, since glides are the most sonorous segments. Only another glide in C1 or C3 would allow us to escape the SSP, but sequences composed of a glide and /r/ are highly disfavored for independent reasons, as we will see in section 2.3.5.2.

[40]We cannot choose /r/, which would behave like an obstruent in this position. Glides are not found as the post-schwa consonant in words of the form /CəC.../. We are left with /l/ instead of /z/ in (55a) but we obtain a nasal+lateral sequence which is also independently disfavored.

(56) OPTIONAL SCHWA IN /C_1C_2əC_3/ SEQUENCES OF DECREASING SONORITY:

a.	?[rmz]	*la dernière mesure*	/la dɛrnjɛr məzyr/
		'the last measure'	[ladɛrnjɛrmə̲zyr] ?[ladɛrnjɛrmzyr]
b.	[rls]	*la pire leçon*	/la pir ləsɔ̃/
		'the worst lesson'	[lapirl(ə̲)sɔ̃]

(57) OPTIONAL SCHWA IN /C_1C_2əC_3/ WHERE C_2 IS AN OBSTRUENT:

a.	[spl]	*la douce pelouse*	/la dus pəluz/
		'the sweet lawn'	[ladusp(ə̲)luz]
b.	[ksm]	*à chaque semaine*	/a ʃak səmɛn/
		'at each week'	[aʃaks(ə̲)mɛn]

Let us now look at the contexts other than at clitic boundaries and morpheme-internally. Two of them are immune to the effect of the SSP. At derivational suffix boundaries, three-consonant sequences are never observed on the surface, since schwa insertion is automatic when such sequences arise underlyingly. The SSP is therefore irrelevant in this context, given that it can only be violated domain-medially in sequences of at least three consonants. As for forms involving the 1st/2nd plural conditional endings /-rjɔ̃, rje/, they never violate the SSP because /r/ is not more sonorous than /j/.

We are left with two contexts: before future and conditional endings other than /-rjɔ̃, rje/ and at word boundaries. In both of them the SSP plays an active role in eliminating schwaless outputs that violate it. The sequences that violate the SSP are all of the form C_1C_2-C_3, where C_1C_2 is a morpheme- or word-final cluster in which C_2 is more sonorous than C_1. Clusters of this form are composed of obstruent+/m/, obstruent+/l/, and obstruent+/r/ sequences.

In the future/conditional endings /-rV/, the prevocalic /r/ behaves like an obstruent. When these suffixes attach to stems ending in a obstruent+sonorant clusters, the SSP is violated because the middle sononant is surrounded by two less sonorous obstruents. Schwa insertion is therefore obligatory (58).

(58) OBLIGATORY SCHWA BEFORE FUTURE AND CONDITIONAL ENDINGS WITH OBSTRUENT+SONORANT STEMS:

a.	*[blr]	*doublerai*	/dubl+re/
		'double+FUT.1SG'	[dublə̲re] *[dublre]
b.	*[smr]	*fantasmerai*	/fɑ̃tasm+re/
		'have fantasies+FUT.1SG'	[fɑ̃tasmə̲re] *[fɑ̃tasmre]

At word boundaries, we have to look separately at obstruent+/m/ and obstruent+/l, r/ clusters. O+/m/+C sequences behave as expected. When the final consonant is less sonorous than /m/ (i.e. when it is an obstruent), the SSP is violated and it is only marginally acceptable to omit the schwa at the boundary (59). We can change the word following the boundary so that its initial consonant will be less sonorous than /m/. We obtain the clusters like /sm-l/ in (60a) and /tm-j/ in (60b). The SSP is respected and schwa can be more freely omitted in these phrases.

(59) SCHWA IN /ON-O/ CLUSTERS AT WORD BOUNDARIES:

a.	??[smp]	*le tourisme parisien*	/l=turism parizjɛ̃/
		'the Parisian tourism'	[ləturismə̲parizjɛ̃] ??[ləturismparizjɛ̃]
b.	??[tmk]	*le rythme colombien*	/l=ritm kɔlɔ̃bjɛ̃/
		'the Colombian rhythm'	[ləritmə̲kɔlɔ̃bjɛ̃] ??[ləritmkɔlɔ̃bjɛ̃]

(60) SCHWA IN /ON-L/ AND /ON-G/ CLUSTERS AT WORD BOUNDARIES:

a.	[sml]	*le tourisme libanais*	/l=turism libanɛ/
		'the Lebanese tourism'	[ləturism(ə̲)libanɛ]
b.	[tmj]	*le rythme yougoslave*	/l=ritm jugɔslav/
		'the Yugoslav rhythm'	[ləritm(ə̲)jugɔslav]

With word-final O+/l,r/ clusters, the situation is less clear. In a /Or-C/ or /Ol-C/ cluster, the SSP is violated when the final C is less sonorous than /r/ or /l/. A couple of relevant examples are given in (61)[41]; the marginality of the schwaless output parallels that observed in (59). Now, if we replace the cluster-final consonant with a glide, we eliminate the SSP violation and expect schwa to be omitable. This prediction is only partially borne out. The examples in (62) are better than those in (61) but not as good as those in (60). Their marginality is probably to be attributed to an independent constraint against consonant+liquid+glide sequences. See section 2.3.5.2.

[41] About the forms in (61), I have to mention that there is some uncertainty in the literature over whether schwa is obligatory in OL-C contexts at word boundaries. At least since Dell (1973/1980/1985), it is standard to consider that it is, but several authors claim otherwise: Bazylko (1981) contrasts *autrefois* 'formerly' [otrə̲fwa] and *autre fois* 'other time' [otrfwa], Zwanenburg (1968) opposes *humblement* 'humbly' [œ̃blə̲mɑ̃] and *humble mentalité* 'humble mentality' [œ̃blmɑ̃talite]. See also Grammont (1894: 76), Fouché (1959: 96), Malmberg (1975: 76). Corpus studies (Laks 1977; Chevrot, Beaud & Varga, to appear; Chevrot & Côté, in progress) also provide several examples of OL sequences in pre-consonantal position, without schwa insertion. I therefore take schwa to be marginally possible, although it is normally present (and possibly obligatory for some speakers). The strength of the prosodic boundary in the OL-C sequence certainly plays a role, the weaker the boundary, the more likely it is that schwa be inserted. More on the effect of the prosodic boundary in section 2.3.6.

(61) SCHWA IN /OL-O/ AND /OL-N/ CLUSTERS AT WORD BOUNDARIES:

a.	??[klp]	*mon oncle paternel*	/mɔ̃=ɔ̃kl patɛrnɛl/
		'my paternal uncle'	[mɔ̃nɔ̃klə̲patɛrnɛl] ??[mɔ̃nɔ̃klpatɛrnɛl]
b.	??[trm]	*les quatre musées*	/lɛ=katr myze/
		'the four museums'	[lɛkatrə̲myze] ??[lɛkatrmyze]

(62) SCHWA IN /OL-G/ CLUSTERS AT WORD BOUNDARIES:

a.	?[klj]	*mon oncle yougoslave*	/mɔ̃=ɔ̃kl jugɔslav/
		'my Yugoslav uncle'	[mɔ̃nɔ̃klə̲jugɔslav] ?[mɔ̃nɔ̃kljugɔslav]
b.	?[trɥ]	*les quatre huissiers*	/lɛ=katr ɥisje/
		'the four ushers'	[lɛkatrə̲ɥisje] ?[lɛkatrɥisje]

I have shown in this section that the SSP is an inviolable constraint in French, except marginally at word boundaries. It motivates the insertion or retention of schwa in contexts where its omission would yield a violation of this principle. Crucial to this conclusion is our analysis of /r/ as a fricative in prevocalic position but normally an approximant in other segmental contexts, notably postvocalically.

2.3.3. THE SPECIAL STATUS OF STOPS

Generalization 2:	Stops want to be adjacent to a vowel, and preferably followed by a vowel.

As in all the deletion patterns described in the preceding chapter, stops must be distinguished from other consonants in that they show a greater propensity to trigger schwa insertion or block schwa deletion when they find themselves trapped between two consonants. This tendency, already mentioned in Grammont (1894) and Leray (1930), can be illustrated at clitic and word boundaries as well as morpheme-internally. A full comparison can only be made with fricatives, mainly because interconsonantal sonorants are disfavored or banned in this position for independent reasons, mainly the SSP, but also constraints against sequences of certain sonorant combinations, which will be discussed below.

Compare the data in (63) and (64). They all consist in an underlying sequence /...VC##CəCV.../, with a prenominal modifier ending in a consonant followed by a noun with an underlying schwa in its first syllable. Deletion of the schwa generates a sequence of three consonants. The clusters in (63) and (64) differ only in the identity of the medial consonant: a stop in (63), a fricative in (64). Whether the preceding consonant is a lateral (c), a nasal (b), or an obstruent (a), deleting the underlying

schwa is a marked option when the medial consonant is a stop (63), but yields quite natural outputs with fricatives (64).

(63) OBLIGATORY SCHWA IN /C_1C_2əC_3/ WHERE C_2 IS A STOP:

a.	*[sdm]	*la douce demie*	/la=dus dəmi/
		'the sweet half'	[ladusdə̲mi] *[ladusdmi]
b.	*[mdm]	*la même demande*	/la=mɛm dəmɑ̃d/
		'the same request'	[lamɛmdə̲mɑ̃d] *[lamɛmdmɑ̃d]
c.	*[ldm]	*la seule demeure*	/la=sœl dəmœr/
		'the only residence'	[lasœldə̲mœr] *[lasœldmœr]

(64) OPTIONAL SCHWA IN /C_1C_2əC_3/ WHERE C_2 IS A FRICATIVE:

a.	[tsm]	*dix-sept semaines*	/dis(s)ɛt səmɛn/	[dis(s)ɛts(ə̲)mɛn]
		'seventeen weeks'		
b.	[mʃm]	*la même chemise*	/la=mɛm ʃəmiz/	[lamɛmʃ(ə̲)miz]
		'the same shirt'		
c.	[lfn]	*la seule fenêtre*	/la=sœl fənɛtr/	[lasœlf(ə̲)nɛtr]
		'the only window'		

The same contrast can be observed at clitic boundaries. The examples in (65) and (66) consist in a subject+object clitic+verb sequence containing an underlying three-consonant cluster. Again, these clusters contrast only on whether the middle consonant is a stop (65) or a fricative (66). Unlike the examples in (63) with underlying schwas, those involving a stop at a clitic boundary are not unacceptable, but certainly marginal; the contrast with the clusters with fricatives in (66) is clear, as these are perfectly natural without schwa.

(65) SCHWA MORE LIKELY IN /C_1C_2=C_3/ WHERE C_2 IS A STOP:

a.	?[stm]	*Alice te mentait*	/alis t=mɑ̃tɛ/	[alistə̲mɑ̃tɛ]	?[alistmɑ̃tɛ]
		'A. lied to you'			
b.	?[ntm]	*Aline te mentait*	/alin t=mɑ̃tɛ/	[alintə̲mɑ̃tɛ]	?[alintmɑ̃tɛ]
		'A. lied to you'			
c.	?[ltm]	*Emile te mentait*	/emil t=mɑ̃tɛ/	[emiltə̲mɑ̃tɛ]	?[emiltmɑ̃tɛ]
		'E. lied to you'			

(66) SCHWA LESS LIKELY IN /C_1C_2=C_3/ WHERE C_2 IS A FRICATIVE:

a.	[tsm]	*Annette se mentait*	/anɛt s=mɑ̃tɛ/	[anɛts(ə̲)mɑ̃tɛ]
		'A. lied to herself'		
b.	[nsm]	*Aline se mentait*	/alin s=mɑ̃tɛ/	[alins(ə̲)mɑ̃tɛ]
		'A. lied to herself'		

c. [lsm] *Emile se mentait* /emil s=mãtɛ/ [emils(ə̲)mãtɛ]
'E. lied to himself'

At word boundaries, schwa is never obligatory and less likely in any segmental context than at other boundaries. The contrast between stops and fricatives is less apparent but can probably be observed in the relative frequency of schwa in contexts /C_1C_2-C_3/ where C_2 is a stop vs. a fricative. For example, the intuition is undoubtedly that schwa is more likely to appear in *casque noir* 'black helmet' /kask nwar/ than in *taxe noire* 'black tax' /taks nwar/.

Interestingly, the conjunction of the SSP, the greater resistance of stops to surface between consonants and the tendency to avoid sequences of sonorant consonants (see below) results in fricatives having a privileged status in cluster-medial position, and generally in positions with no adjacent vowels. In a $C_1C_2C_3$ sequence, only with fricatives in C_2 will the sequence necessarily escape major constraints. Stops are disfavored in this position because they want, more than other consonants, to appear next to a vowel; sonorants are banned if surrounded by less sonorous consonants because this would violate the SSP; in addition, as we will see below, certain sequences of sonorant consonants tend to be avoided. In contrast, having fricatives in C_2 cannot result in a violation of the SSP nor in undesirable sonorant clusters.[42]

The marked preference for fricatives within clusters has been noticed several times in the context of the behavior of schwa, especially by phoneticians (Grammont 1894, 1914/1961; Leray 1930; Fouché 1959; Rialland 1986). Malécot (1976: 99) confirms this tendency in his statistical analysis of a corpus of natural speech. He counted the percentage of schwa omission in clitics in utterance-initial position, that is in the context /C_1=C^nV.../. He obtained the numbers in (67). When the clitic corresponds to a fricative, schwa was not pronounced approximately half of the time, e.g. in *je vais* 'I go' /ʒ=vɛ/. By contrast stops and liquids in C_1 triggered schwa insertion quite systematically, e.g. *que ça* 'only that' /k=sa/ or *le bus* 'the bus' /l=bys/. The first example involves a stop that precedes another obstruent, the second one violates the SSP. This demonstrates that fricatives are much more easily tolerated than other consonants in contexts where there are no adjacent vowels.

[42] I believe this explanation for the special status of fricatives in the distribution of schwa carries over to their privileged position cross-linguistically at word edges and cluster-internally. It applies most particularly to strident fricatives, which carry the strongest internal cues.

(67) PERCENTAGE OF SCHWA OMISSION IN /C_1=C^nV/ UTTERANCE-INITIALLY:
a. C_1 is a stop: 4%
b. C_1 is a fricative: 44%
c. C_1 is a liquid: 0% (Malécot 1976)

2.3.4. STOPS FOLLOWED BY A [-CONTINUANT] SEGMENT

Generalization 3: Stops that are not followed by a [+continuant] segment want to be adjacent to a vowel, and preferably followed by a vowel.

The continuancy value of the following segment is crucial in cluster simplification in Hungarian (section 1.2.3.1): stops delete only if followed by a [-continuant] consonant. We could expect the distribution of schwa to also be sensitive to the identity of the segment following a cluster-medial stop. The effect of this factor seems to be overall rather limited, but is clearly detected in at least one context, morpheme-internally. Consider words that start with the sequence /C_1əC_2.../, in which C_1 is a stop. When these words appear in post-consonantal position, the schwa in the initial syllable is more likely to be dropped if C_2 is [+continuant] than if it is [-continuant]. This is illustrated by the examples in (68) and (69), where the a. and b. examples contrast in the nature of C_2: a labial nasal in (68a, 69a) vs. a labial fricative in (68b, 69b). In (68) we have suject+verb sequences, in (69) adjective+noun ones (see Lyche & Durand 1996 for similar examples). Schwa more easily deletes in the first structure, but we observe in both cases a clear contrast: schwa is more readily omitted if this results in a stop being followed by a [+continuant] rather than a [-continuant] segment.

(68) SCHWA IN SUBJECT+VERB /C##C_1əC_2/ SEQUENCES WHERE C_1 IS A STOP:
a. *Aline demeure ici* /alin dəmœr isi/ ??[alindmœrisi]
'A. lives here'
b. *Aline devait y aller* /alin dəvɛ i=ale/ [alindvɛjale]
'A. had to go there'

(69) SCHWA IN ADJ+NOUN /C##C_1əC_2/ SEQUENCES WHERE C_1 IS A STOP:
a. *les mêmes demandes* /lɛ=mɛm dəmãd/ *[lɛmɛmdmãd]
'the same requests'
b. *les mêmes devinettes* /lɛ=mɛm dəvinɛt/ ?[lɛmɛmdvinɛt]
'the same riddles'

2.3.5. SIMILARITY TO ADJACENT CONSONANTS

Generalization 4: Consonants that are relatively similar to a neighboring segment want to be adjacent to a vowel, and preferably followed by a vowel.

The distribution of schwa is affected by contrast between adjacent consonants. In a $C_1C_2C_3$ sequence, the presence of shared features between C_2 and its neighboring segments favors schwa insertion/retention. Alternatively, the presence of a contrast between a consonant and its adjacent segment facilitates its surfacing in interconsonantal position, without the need for schwa epenthesis to provide it with an adjacent vowel. The process is most sensitive to contrast/similarity in manner of articulation, while place seems to play a marginal role, which I will not discuss.

Recall from the discussion of Hungarian that I adopt Clements's (1990) major class features to classify consonants: [sonorant], [approximant], [vocoid]. We obtain the following feature specifications for the different classes of consonants. In a complete system we need an additional feature to distinguish between stops and fricatives; I briefly discuss this issue in chapter 4. Recall that non-prevocalic /r/ is considered a glide and is by definition [+vocoid].

(70) CLEMENTS'S (1990) MAJOR CLASS FEATURES:

	Obstruents	Nasals	Liquids	Glides
Sonorant	–	+	+	+
Approximant	–	–	+	+
Vocoid	–	–	–	+

It appears that the major part of the work is accomplished by the feature [vocoid]. On the one hand, the presence of a contrast in this feature clearly facilitates the omission of schwa. On the other hand, sequences of [+vocoid] consonants ([r] and glides) are disfavored. Other features are also active, but their effect is more subtle and limited than that of the feature [vocoid]. A tendency to avoid sequences of [+approximant] consonants, for instance, can be detected. This crucially concerns sequences of [l]+glides (as clusters containing [r] and glides are already covered by the constraint against [+vocoid] segments). I discuss first the effect of a contrast in [vocoid], then that of sequences of [+vocoid] consonants, with an extension to [+approximant].

2.3.5.1. Contrast in [vocoid]

Numerous authors have noticed the special status of /r/ in the distribution of schwa. In all contexts consonants are more easily tolerated in interconsonantal position if the preceding consonant is /r/ than if it is a lateral, a nasal, or an obstruent (Delattre 1951; Dauses 1973; Dell 1973/1980/1985, 1977; Domingue 1974; Morin 1974; Tranel 1987b; Spa 1988; van Eibergen 1992). This special status should be extended to include at least the glide [j]; the other glides [w, ɥ] are not found in the relevant position. I suggest, then, that the correct generalization is that a consonant is less likely to trigger schwa insertion/retention if it contrasts in the feature [vocoid] with the preceding segment. This is expressed below:

(71) CONTRAST IN [VOCOID] AND THE BEHAVIOR OF SCHWA:
A consonant that contrasts in the feature [vocoid] with the preceding segment is less likely to trigger schwa epenthesis/retention.

This effect is best illustrated with a stop in cluster-medial position (since fricatives are freely allowed in this position and sonorants subject to independent constraints; see section 2.3.3). The data in (72) show that schwa is optional when a stop at a clitic boundary is preceded by a glide, /j/ or /r/. These examples contrast with those given in (65) and repeated below, where the stop is preceded by a different consonant, the rest of the context being identical.

(72) STOPS PRECEDED BY A GLIDE AT CLITIC BOUNDARIES:

a.	[jtm]	*Camille te mentait* 'C. lied to you'	/kamij t=mãtɛ/	[kamijt(ə̲)mãtɛ]
b.	[rtm]	*Albert te mentait* 'A. lied to you'	/albɛr t=mãtɛ/	[albɛrt(ə̲)mãtɛ]

(65) STOPS PRECEDED BY A NON-GLIDE AT CLITIC BOUNDARIES:

a.	?[stm]	*Alice te mentait* 'A. lied to you'	/alis t=mãtɛ/	[alistə̲mãtɛ]	?[alistmãtɛ]
b.	?[ntm]	*Aline te mentait* 'A. lied to you'	/alin t=mãtɛ/	[alintə̲mãtɛ]	?[alintmãtɛ]
c.	?[ltm]	*Emile te mentait* 'E. lied to you'	/emil t=mãtɛ/	[emiltə̲mãtɛ]	?[emiltmãtɛ]

The same opposition is found with underlying schwas in word-initial syllables. The data in (63) above and repeated here showed that in the context /...VC_1##C_2əC_3V.../, schwa is obligatorily retained if C_2 is a stop preceded by a

consonant and followed by a [-continuant] segment. If C_1 is a glide, however, schwa omission becomes clearly more acceptable (73).

(73) STOPS PRECEDED BY A GLIDE IN /C_1C_2əC_3/:

a.	?[rdm]	*la pire demie* 'the worst half'	/la=pir dəmi/	[lapirdə̲mi] ?[lapirdmi]
b.	[rdm]	*pour demander* 'to request'	/pur dəmãde/	[purd(ə̲)mãde]

(63) STOPS PRECEDED BY A NON-GLIDE IN IN /C_1C_2əC_3/:

a.	*[sdm]	*la douce demie* 'the sweet half'	/la=dus dəmi/ [ladusdə̲mi] *[ladusdmi]
b.	*[mdm]	*la même demande* 'the same request'	/la=mɛm dəmãd/ [lamɛmdə̲mãd] *[lamɛmdmãd]
c.	*[ldm]	*la seule demeure* 'the only residence'	/la=sœl dəmœr/ [lasœldə̲mœr] *[lasœldmœr]

As is usually the case, the point is more difficult to illustrate at word boundaries, because schwa can be more freely omitted in this position than in any other. Yet one can feel that schwa is less likely to be inserted in the context /C_1C_2##C_3/ if C_1 is a glide. Compare the two examples in (74) which differ in the quality of C_1: a glide in (74a) vs. a fricative in (74b). Schwa can be considered optional in both cases but the intuition is that it is more likely to appear in (74b).

(74) STOPS PRECEDED BY A CONSONANT AT WORD BOUNDARIES

a.	[rdm]	*le garde mentait* 'the guard lied'	/l=gard mãtɛ/	[ləgard(ə̲)mãtɛ]
b.	[skm]	*le masque mentait* 'the mask lied'	/l=mask mãtɛ/	[ləmask(ə̲)mãtɛ]

This intuition is supported by a study conducted by Dell (1977). Dell constructed a series of sentences containing sequences of the type /...C_1C_2##C_3.../, with different combinations of C_1 and C_2 and in three different syntactic structures: adjective+noun (ex. *modeste vendeur* 'modest seller'), noun+adjective (ex. *cordes volées* 'stolen ropes'), and subject+verb, as in (74). In all the sentences C_3=/v/. These sentences were presented to 11 speakers, in a test designed so that the relevant portion of the sentences was uttered 3 times by each speaker. The percentage of utterances in which schwa was present was calculated for each segmental and syntactic context. The results are clear: in each syntactic context, schwa is more often omitted if C_1 is a glide than if it is an obstruent, with C_2 being a stop. The relevant

statistics are provided below: each number indicates the percentage of utterances in which schwa was pronounced, for a given syntactic context and combination of C_1 and C_2. The numbers are significantly higher for all the obstruent+stop combinations in (75a) than the /r/+stop ones in (75b), in the same syntactic context. The differences observed among the syntactic contexts will be discussed in section 2.3.6.

(75) FREQUENCY OF SCHWA IN VARIOUS SYNTACTIC AND SEGMENTAL CONTEXTS (Dell 1977):

	C_1C_2	Adj+Noun	Noun+Adj	Subj+Verb
a.	sk	81	60	15
	kt	78	60	12
	st	78	18	6
b.	rd	30	21	0
	rt	42	3	0
	rb	30	12	0

2.3.5.2. Agreement in [+vocoid]

The preceding section has shown that a consonant that contrasts in the feature [vocoid] with the preceding segment can more easily surface in interconsonantal position without the support of an epenthetic schwa. This section is devoted to the opposite situation, when a consonant shares the same value for this feature with a neighboring segment, specifically the positive value. Two adjacent segments that share the specification [+vocoid] are relatively similar and want more than other consonants to surface next to a vowel. Agreement in [+vocoid] then favors schwa epenthesis. This is expressed in (76), which follows from the generalization 4 given at the outset of this section.

(76) AGREEMENT IN [+VOCOID] AND THE BEHAVIOR OF SCHWA:
A consonant that agrees in the feature [+vocoid] with a neighboring segment wants to be adjacent to a vowel and is therefore more likely to trigger schwa epenthesis/retention.

This explains the behavior of schwa with the 1st/2nd plural conditional endings /-rjõ, -rje/. As already noticed several times, schwa insertion is obligatory in this context with consonant-final verbal stems. The representative examples in (27) are repeated below.

(27) SCHWA OBLIGATORY BEFORE 1ST/2ND PLURAL CONDITIONAL ENDINGS:

a.	*gâterions*	'spoil+COND.1PL'	/gat+rjɔ̃/	[gat‿ərjɔ̃]
b.	*fumeriez*	'smoke+COND.2PL'	/fym+rje/	[fym‿ərje]
c.	*garderiez*	'keep+COND.2PL'	/gard+rje/	[gard‿ərje]

The /r/ of the suffix is not prevocalic and is specified as [+vocoid]. So is the glide /j/. Both consonants agree in [+vocoid] and therefore need to be adjacent to a vowel. /j/ necessarily meets this condition since it is followed by /e/ or /ɔ̃/, but /r/ is the potentially offending segment. When the suffix comes after a consonant-final stem, /r/ is trapped between two consonants. Schwa is then inserted to meet the requirement that a consonant that agrees in [+vocoid] with an adjacent segment surfaces next to a vowel, following (76).

The constraint in (76) is also active at word boundaries, although in this context agreement in [+vocoid] only triggers schwa insertion optionally. The relevant context arises when a word beginning in a /r/+glide sequence follows one ending in a consonant. Examples were given in (36), repeated below. No other word-initial cluster is as likely to trigger epenthesis at word boundaries.

(36) OPTIONAL SCHWA WORD-INITIALLY BEFORE /r/+GLIDE SEQUENCES:

a.	*aime rien*	'like nothing'	/ɛm rjɛ̃/	[ɛm(‿ə)rjɛ̃]
b.	*Patrick Roy*	(name)	/patrik rwa/	[patrik(‿ə)rwa]

Historically, it seems that the constraint in (76) was more general and applied to sequences of consonants that agreed in the feature [+approximant] rather than [+vocoid]. That is, it targeted not only glides but also liquids, namely /l/.[43] So not only were sequences C+/r/+glide actively avoided by schwa insertion/retention, as in contemporary French, but also sequences C+/l/+glide. The constraint against such clusters prevented schwa deletion morpheme-internally in words like *Richelieu* (proper name) [riʃ‿əljø] *[riʃljø]. Since these internal schwas have stabilized and are obligatorily pronounced in modern French, I assume that they have been reanalyzed as stable vowels: /riʃœljø/. This constraint is also the source of now morphologized alternations between [œ] and Ø in derivational paradigms (see note 4). For example, the word *bourrelet* 'pad, horse-collar' [burlɛ], in which no vowel is pronounced between [r] and [l], contrasts with the related word *bourrelier* 'harness-maker' [burœlje] *[burlje], with a stable [œ] which is the contemporary reflex of a historic schwa that did not delete to prevent a violation of the constraint against C+/l/+glide sequences.

[43] Historically it may be that /r/ was specified [+approximant, -vocoid], like /l/ and unlike the non-prevocalic modern /r/.

Such sequences are no longer synchronically actively avoided. In contrast with the examples in (36), words that start with a sequence /l/+glide (/lw-, lj-, lɥ/, e.g. *lieu* 'location' /ljø/, *loi* 'law' /lwa/, *lui* 'him' /lɥi/) do not normally trigger schwa insertion when preceded by a consonant, as shown in (77).

(77) NO SCHWA WORD-INITIALLY BEFORE /l/+GLIDE SEQUENCES:

a.	*donne-lui*	'give him'	/dɔn lɥi/	[dɔnlɥi]
b.	*grande loi*	'great law'	/grɑ̃d lwa/	[grɑ̃dlwa]

There is no suffix that starts with the sequence /l/+glide, so no direct comparison can be made with the data in (27). But C+/l/+glide sequences arise in 1st/2nd plural imperfect or subjunctive forms of verbs with a stem ending in an /-rl/ sequence, e.g. *parliez* 'speak+IMP/SUBJ.2PL' /parl+je/ [parlje]. Such forms freely surface with a C+/l/+glide sequence, which is not repaired by schwa insertion or glide vocalization, as the 1st/2nd plural conditional forms in (27) (see note 13 on glide vocalization in these forms).

Segments that agree in [+approximant] but not in [+vocoid] (e.g. /l/ and glides) are necessarily less similar than segments that share the specification [+vocoid] (e.g. /r/ and glides). Consonants that only agree in [+approximant] should therefore be less susceptible to triggering schwa epenthesis than consonants that agree in [+vocoid]. The historical development, which restricted the sequences to be avoided to C+/r/+glide corresponds to a move toward less strict requirements over the minimum amount of contrast that is desired in sequences of consonants. The relative undesirability of C+/l/+glide clusters may still however have a marginal effect in /...C_1C_2-C_3.../ contexts, where the boundary is a clitic or a word one. In the discussion on the role of the SSP, I provided the data in (60b) and (62a), repeated below. The underlying clusters contained in these nominal phrases crucially differ on whether the medial consonant is a nasal (60b) or a lateral (62a). Neither of these clusters violates the SSP; yet schwa insertion is more clearly prefered over its omission in the second example than in the first one. This contrast could result from the remote effect of a constraint against C+/l/+glide sequences, which is irrelevant in (60b). A similar contrast can be observed at clitic boundaries, between (53a) and (78).

/C_1C_2-C_3/ AT WORD BOUNDARIES WITH C_3=GLIDE AND C_2=/l/ VS. NASAL:

(60)	b.	[tmj]	*le rythme yougoslave*	/l=ritm jugɔslav/
			'the Yugoslav rhythm'	[ləritm(‿ə)jugɔslav]
(62)	a.	?[klj]	*mon oncle yougoslave*	/mɔ̃=ɔ̃kl jugɔslav/
			'my Yugoslav uncle'	[mɔ̃nɔ̃klə‿jugɔslav] ?[mɔ̃nɔ̃kljugɔslav]

/C_1C_2=C_3/ AT CLITIC BOUNDARIES WITH C_3=GLIDE AND C_2=/l/ VS. NASAL:

(53)	a.	[smj]	*Alice me jodlait ça*	/alis m=jɔdlɛ sa/
			'A. yodeled this to me'	[alism(ə)jodlɛsa]
(78)		?[slj]	*Alice le jodlait bien*	/alis l=jɔdlɛ bjɛ̃/
			'A. yodeled it well'	[alislə̲jodlɛbjɛ̃] ?[alisljodlɛbjɛ̃]

2.3.6. PROSODIC BOUNDARIES

Generalization 5: Consonants that are not at the edge of a prosodic domain want to be adjacent to a vowel, and preferably followed by a vowel.

The distribution of schwa is sensitive to the strength of the prosodic boundary, if any, that is adjacent to the consonants that lack a flanking vowel. The higher the prosodic boundary, the more easily a consonant may survive without an adjacent vowel, the less likely schwa epenthesis/retention is. The prosodic hierarchy I adopt goes from the Prosodic Word (PW) up to the Utterance (U). I assume that constituents below the PW level belong to a separate hierarchy (Selkirk 1986; Zec 1988; Inkelas 1989). Intermediate levels between the PW and the U include the Phonological Phrase (PP) and the Intonational Phrase (IP) (e.g. Inkelas & Zec 1995). For French, I follow Selkirk (1986) and de Jong (1990, 1994), who have proposed that the PP is split between a Small and a Maximal Phonological Phrase (SPP, MPP). This is summarized in (79).

(79) PROSODIC HIERARCHY:

U
|
IP
|
MPP
|
SPP
|
PW

We have already seen several illustrations of the effect of the prosodic structure on the behavior of schwa, although I have not focused on this aspect of the data so far. First, the same sequence of consonants may obligatorily trigger schwa insertion word-internally but it may be tolerated across a PW boundary. In other words, a consonant in the same segmental context may be allowed to surface without an adjacent vowel only when preceded or followed by a PW boundary. The

two pairs of examples in (80) contain the same underlying sequences [stm] and [rdr]. In the first example, the middle consonant [t] or [d] is followed by a word-internal suffix and is not adjacent to any relevant prosodic boundary. Schwa insertion is obligatory. In the second example, the stop is followed by a PW boundary and in both cases schwa omission becomes possible (but not obligatory).

(80) EFFECT OF A FOLLOWING PW BOUNDARY ON THE BEHAVIOR OF SCHWA:

a.	[stm]	*justement*	'justly'	/ʒyst+mã/	[ʒystə̲mã]
		le juste ment	'the just lies'	/l=ʒyst mã/	[ləʒyst(ə)]$_{PW}$ mã]
b.	[rdr]	*la garderie*	'the kindergarden'	/la=gard+ri/	[lagardə̲ri]
		le garde rit	'the guard laughs'	/l=gard ri/	[ləgard(ə)]$_{PW}$ ri]

Likewise, we have just seen in the preceding section that C+/r/+glide sequences are banned across a PW-internal morpheme boundary (27b) but permitted in the phrasal domain (36a). That is, a consonant that agrees in the feature [+vocoid] with an adjacent segment requires a flanking vowel when no prosodic boundary is present, but not when it is preceded by a PW boundary. This contrast is illustrated below with the sequence [mrj] in a 2nd plural conditional form (81a) and verb+object sequence (81b).

(81) EFFECT OF A PRECEDING PW BOUNDARY ON THE BEHAVIOR OF SCHWA:

b.	*aimeriez*	'like+COND.2PL'	/ɛm+rje/	[ɛmə̲rje]
a.	*aime rien*	'like nothing'	/ɛm rjɛ̃/	[ɛm $_{PW}$[(ə)rjɛ̃]

The phrase-initial position has also been presented as a privileged one for the licensing of consonants. See the data in (24) and the discussion of phrase-initial extrasyllabicity in section 2.2.2.2. In (82) I provide an illustration of the phrase-initial effect with an underlying sequence /Vn##dəmV.../. In (82a) the [d] is preceded by a PW boundary and schwa retention is obligatory. In (82b) a stronger boundary separates the [n] from the following [d], which may now surface without the support of its lexical schwa. It has not been made clear what phrasal level (SPP, MPP, IP, U) is endowed with additional licensing possibilities; as we will see below, the effects are cumulative, from the PW to the U, but I use an IP boundary in (82b), which is a likely one in this dislocation context.

(82) EFFECT OF A PRECEDING IP VS. PW BOUNDARY ON THE BEHAVIOR OF SCHWA:

a.	*une demande*	'a request'	/yn dəmɑ̃d/	[yn $_{PW}$[də̲mɑ̃d]
b.	*Anne, demande-la*	'A., ask for it'	/an dəmɑ̃d la/	[an $_{IP}$[d(ə̲)mɑ̃dla]

The three cases just presented involve a two-way contrast between internal and peripheral positions of some prosodic domain. This appears to be a simplification or an idealization of the facts. The effects of the prosodic structure are rather cumulative: the stronger the adjacent boundary, the more easily a consonant may surface without the support of an adjacent vowel. The cumulativity of edge effects is probably the most interesting result of Dell's (1977) study on the frequency of schwa insertion in different segmental and syntactic contexts, cited in section 2.3.5.1.

Recall that Dell (1977) compares the frequency of schwa insertion in adjective+noun, noun+adjective, and subject+verb sequences of the form /...C_1C_2##C_3.../. He found that, for any given cluster, vowel insertion is most frequent in adjective+noun sequences, less frequent in noun+adjective ones, and least likely in subject+verb structures. Percentages for a subset of the clusters tested were provided in (75). These results can be directly transposed in prosodic terms, using elements of the prosodic structure of French proposed by Selkirk (1986) and de Jong (1990, 1994). Adjective+noun sequences form a SPP, the adjective being followed only by a PW boundary: adj $]_{PW}$ noun. Noun+adjective sequences form a MPP, the noun being followed by a SPP boundary: noun $]_{SPP}$ adj. Subjects are separated from the predicate by at least a MPP boundary: subj $]_{MPP}$ verb. What we have is a $C_1C_2]C_3$ sequence with C_2 being followed by an increasingly stronger prosodic boundary. Schwa omission is optional in all these cases, but its likelihood correlates with the strength of the adjacent boundary.

This generalization extends to both lower and higher prosodic boundaries. If C_2 is followed by no (relevant) prosodic boundary, e.g. at a word-internal morpheme juncture, schwa epenthesis is more likely than in adj+noun sequences; it is even often obligatory. At the other end of the hierarchy, we can have C_2 followed by a stronger IP boundary. IP boundaries are found, for example, between dislocated elements and the rest of the sentence. Here schwa omission becomes categorical (therefore necessarily less likely than with a MPP boundary): epenthesis is excluded and all consonant clusters are tolerated on the surface.

Let us now illustrate with a specific example the correlation between the likelihood of schwa omission, or the extent to which consonants are allowed to appear without an adjacent vowel, and the strength of the following prosodic boundary. The segmental context is held constant. In (83) we have the sequence ...kt] m..., with [t] followed by an increasingly stronger boundary, from Ø (no boundary) to IP. When [t] is followed by a null boundary, e.g. inside a clitic sequence like *que te moucher* (83a), it requires the support of an adjacent vowel, hence

epenthesis. If it is followed by an IP-boundary, no epenthesis takes place (83e). With a weaker following boundary – MPP, SPP, PW – [t] may surface in interconsonantal position but schwa insertion is also an option, used with decreasing frequency as we go up the prosodic hierarchy (83b-d).

(83) EFFECT OF THE FOLLOWING BOUNDARY ON THE BEHAVIOR OF SCHWA:

[kt]$_i$ m], with i ∈{ Ø, PW, ...IP}

cluster more easily tolerated ↓	a. C_2]Ø	*tu fais que te moucher*	'you only blow your nose'
		/ty=fɛ k=t=muʃe/	*[tyfɛktmuʃe] [tyfɛk(ə)t(ə)muʃe]
	b. C_2]$_{PW}$	*infecte manteau*	'stinking coat'
		/ɛ̃fɛkt mɑ̃to/	[ɛ̃fɛkt(ə)mɑ̃to]
	c. C_2]$_{SPP}$	*insecte marron*	'brown insect'
		/ɛ̃sɛkt marɔ̃/	[ɛ̃sɛkt(ə)marɔ̃]
	d. C_2]$_{MPP}$	*l'insecte mangeait*	'the insect was eating'
		/l=ɛsɛ̃kt mɑ̃ʒɛ/	[lɛ̃sɛkt(ə)mɑ̃ʒɛ]
	e. C_2]$_{IP}$	*l'insecte, mets-le là*	'the insect, put it there'
		/l=ɛ̃sɛkt mɛlœla/	*[lɛ̃sɛktəmɛlœla] [lɛ̃sɛktmɛlœla]

The same hierarchy can be established for preceding rather than following boundaries. Holding the segmental context to [...ktf...], we can have [t] preceded by an increasingly stronger boundary. I assume that clitics form a prosodic word with the word they attach to. So clitic junctures do not correspond to any prosodic boundary. The clitic /t/ embedded inside a clitic group, as in (84a), is therefore preceded by a null prosodic boundary. In this context the cluster [ktf] is not tolerated on the surface and epenthesis is obligatory. In a subject+object clitic+verb structure, the clitic is preceded by a MPP boundary (84b); following a dislocated element, [t] is preceded by an IP boundary (84c). In both cases schwa is optional at the clitic boundary, but it is more likely to be omitted when the preceding consonant is adjacent to a stronger boundary IP.

(84) EFFECT OF THE PRECEDING BOUNDARY ON THE BEHAVIOR OF SCHWA:

[k $_i$[t f], with i ∈{ Ø, PW, ...IP}

cluster more easily tolerated ↓	Ø[C_2	*tu fais que te faire mal*	'you only hurt yourself'
		/ty=fɛ k=t=fɛr mal/	*[tyfɛktfɛrmal] [tyfɛk(ə)t()fɛrmal]
	$_{MPP}$[C_2	*Jean-Luc te fait mal*	'J. hurts you'
		/ʒɑ̃lyk t=fɛ mal/	[ʒɑ̃lykt(ə)fɛmal]
	$_{IP}$[C_2	*Jean-Luc, te fais pas mal!*	'J., don't hurt yourself!'
		/ʒɑ̃lyk t=fɛ pa mal/	[ʒɑ̃lykt(ə)fɛpamal]

2.4. CONCLUSIONS

The French schwa illustrates forcefully the shortcomings of the syllabic approach. The distribution of schwa is subject to an extremely complex interaction of factors, and the syllable seems unable to provide meaningful generalizations or reveal any order in this apparent jungle. The sequential generalizations proposed in the previous chapter provide more insight in the process of vowel deletion and epenthesis in French and constitute the main segmental factors in the behavior of schwa: the desirability for consonants, in particular stops, to be adjacent to a vowel, the Sonority Sequencing Principle, the role of contrast and prosodic boundaries, and, for stops, the effect of the continuancy value of the following element.

These segmental factors interact with each other in complex ways. As a general rule, factors facilitating the licensing of consonants in the absence of an adjacent vowel (contrast, strong prosodic boundary, non-stop consonants, etc.) have a cumulative effect on the likelihood of schwa insertion and retention: the more such factors are present, the less probable schwa insertion/retention is. The formalism developed in the following chapter can account for these aspects of the distribution of schwa, as well as for the inherent variability of the process. But a complete and integrated analysis of the behavior of this vowel involves additional factors, notably morphological, lexical, and rhythmic. A discussion of these factors and the way they interact with segmental ones is beyond the scope of this dissertation, so I do not undertake here a complete formal account of the French schwa, which I leave for future work.