NATURAL LANGUAGE STUDIES No. 11

COMPUTER EXPERIMENTS IN GENERATIVE PHONOLOGY: LOW-LEVEL FRENCH PHONOLOGY

Second Edition

by

Yves Ch. Morin*

edited by

Kenneth C. Hill

April, 1979

DEPARTMENT OF LINGUISTICS
THE UNIVERSITY OF MICHIGAN

Ann Arbor, Michigan 48109

UNIVERSITY OF MICHIGAN DEPARTMENT OF LINGUISTICS

Available NATURAL LANGUAGE STUDIES

NLS 1 Charles W. Peck. An acoustic investigation of the intonation of American English. 1969. (Reprinted 1976.)

NLS 2* Michael H. O'Malley. An experimental evaluation of several linguistic hypotheses. 1969.

NLS 3 Yves Ch. Morin. Computer experiments in transformational grammar, French I. 1969.

NLS 4* André-Pierre Benguerel. Some physiological aspects of stress in French. 1970.

NLS 6* Michael H. O'Malley, Rollan Shank & Dale Smith. What does a morpheme spitter spit: a computational study. 1971.

NLS 9 Joyce Friedman & Yves Ch. Morin. Phonological grammar tester: description. 1971.

NLS 10* Yves Ch. Morin & Joyce Friedman. Phonological grammar tester: underlying theory. 1971.

NLS 11 Yves Ch. Morin. Computer experiments in generative phonology: low-level French phonology. Second edition. 1979.

NLS 12 Michael F. Stewart. A logical basis for nouns, adjectives, and verbs. 1971. (Reprinted 1975.)

NLS 13 Peter R. Bono. Adaptive procedures for automatic document retrieval. 1972.

NLS 14* Steven Jay Herman. The right ear advantage for the processing of linguistic stimuli. 1974.

NLS 15 David Paul Gordon. A developmental study of the semantics of factivity in the verbs 'know', 'think', and 'remember'. 1974. (Reprinted 1976.)

NLS 16 Kenneth H. Abrams. Real-time sentence processing. 1974.

NLS 17* Ralph E. Cooley. Phonetic aspects of communicative competence in primary school boys. 1974.

NLS 18 Diane L. V. Feagans. The comprehension by young children of some temporal and spacial linguistic structures. 1974.

NLS 19 Rainer von Königslöw. A cognitive process model of person evaluation and impression formation based on a computer simulation of natural language processing. 1974.

NLS 20 Jeffrey Michael Feldman. Little voices inside: the influence of articulation on oral and silent reading rate. 1975.

NLS 21 James Stanton Bare. Phonetics and phonology in Pāṇini: the system of features implicit in the *Aṣṭādhyāyī*. 1976. (Reprinted 1980.)

NLS 22* Margaret Kahn. Borrowing and variation in a phonological description of Kurdish. 1976.

NLS 23* Jared Bernstein. Vocoid psychoacoustics, articulation and vowel phonology. 1976.

NLS 24* Howard Rodney Martin. The prosodic and paralinguistic analysis of dramatic speech: a practical system. 1977.

*These volumes are currently out of print but may be reprinted if enough requests for them are received.

COMPUTER EXPERIMENTS IN GENERATIVE PHONOLOGY: LOW-LEVEL FRENCH PHONOLOGY

Second Edition

by

Yves Ch. Morin

edited by

Kenneth C. Hill

Department of Linguistics
1076 Frieze Building
University of Michigan
Ann Arbor, Michigan 48109

First published in September 1971 by the Department of Computer and Communication Sciences Phonetics Laboratory.

Second edition, retyped with corrections, April 1979.

ACKNOWLEDGMENT

This research was supported in part by the National Science Foundation under Grant GS-2271.

We wish to acknowledge with gratitude the many helpful comments from Kenneth Hill, whom we found an ever-willing listener and a sharp critic of our analysis.

ABSTRACT

This report presents a description of the low-level phonology of a type of Parisian French and its computer implementation on the phonological grammar tester described by Friedman and Morin.

The study concentrates mainly on the problem of interaction and adaptation between segments in context. The segments are characterized in terms of their phonetic features within the framework proposed by Ladefoged in *Linguistic phonetics* and the interactions between segments are described in terms of phonological rules in the format for generative phonology described by Chomsky and Halle in *The sound pattern of English*.

TABLE OF CONTENTS

TABLE OF CONTENTS (Concluded)

LIST OF TABLES

INTRODUCTION

This report describes a low-level phonology of French and gives, as an appendix, a computer implementation of the corresponding phonological grammar.

Low-level phonology concentrates primarily on the problems of interaction and adaptation of segments in context rather than on the problems of phonological alternation observed in morphologically related words. This distinction is somewhat arbitrary, as the reader will notice that, for instance, schwa deletion is related to epenthetic release --in particular, schwa deletion never takes place in the initial syllable of a word if this would create a cluster of consonants subject to epenthetic release, or that we infer the distribution of mid vowels and glides in words from the analysis of alternations observed in morphologically related words.

The segments are characterized in terms of their phonetic features within the framework proposed by Ladefoged (1967) in *Linguistic Phonetics*. The interactions between segments are described in terms of phonological rules in the format for generative phonology described by Chomsky and Halle (1968) in *The Sound Pattern of English*.

This description of French is based primarily on our own speech, which can be characterized as being one type of Parisian French; in particular, we observe the complete neutralization between anterior a and posterior ɑ, between rounded œ̃ and unrounded ɛ̃, and between front rounded œ and schwa ə, which are distinguished in orthoëpic French. We shall explicitly mention any reference to any other types of French.

In Chapter 1, we describe the set of segments found in French and their classification in terms of phonetic features. Chapter 2 introduces some of the characteristics of French prosody mentioned in the subsequent chapters. Chapter 3 is a taxonomic description of word structure; this chapter is meant more as an exposition than as a systematic account of the types of consonant clusters found in French. A systematic account is of little interest since there appear to be many gaps in the distribution of consonant clusters which can only be attributed to historical accidents. Some gaps appear to be perfectly acceptable, e.g., the French lexicon contains no word ending in skr, although it contains aspre [aspr] 'asper' and astre [astr] 'star'; in Chapter 8 we show how some historical gaps have been recently filled in French. Chapter 4 is a study of transitions between subsequent segments and more particularly of releases between consonants; this allows us to account for the nasalization of unreleased stops preceded by a nasalized vowel. Chapter 5 gives a description of the adjustments of the vocal tract made in anticipation of subsequent motions (rounding, nasalization, voicing, ...). Chapter 6 gives a description of the vowel system of French and more particularly of mid vowel alternations. Chapter 7 gives a description of glide formation and of the distribution of glides. In the Appendix, we present a computer implementation of this description of French on the phonological grammar tester described in Friedman & Morin 1971.

CHAPTER 1

INVENTORY OF SEGMENTS AND PHONETIC FEATURES OF FRENCH

1.1 INVENTORY

1.1.1 Vowels

oral vowels: i y e ø ɛ œ a ɔ o u

nasalized vowels: ɛ̃ ɑ̃ ɔ̃

See Table 1 for a contrastive display of French vowels.

1.1.2 Consonants

oral stops: p b t d k g

nasal stops: m n ɲ ŋ

spirants: f v s z ʃ ʒ

liquids: l r

See Table 2 for a contrastive display of French conconants.

1.1.3 Glides

j ɥ w

See Table 3 for a contrastive display of French glides.

1.2 PHONETIC FEATURES

We analyze the segments of French in terms of several phonetic parameters: (1) the air flow tract, (2) manner of articulation, (3) place of articulation, (4) strength, (5) sonority, and (6) syllabicity.

1.2.1 Air Flow Tract: Oral-Nasal

During the utterance of a segment, the velum, or soft palate, may be either raised or lowered. Once raised, the velum forms a velic closure in the upper pharynx, forcing the air flow to pass through the oral tract. Once lowered, the velum allows the air to flow through both the oral and the nasal tract. We refer to the sounds produced with a lowered velum as *nasal* or *nasalized* sounds, the others as *oral* sounds. The nasal sounds of French can be consonants: m, n, ɲ, and ŋ, or vowels: ɛ̃, ɑ̃, and ɔ̃.

1.2.2 Manner of Articulation

We distinguish three levels of stricture to describe the manner of articulation: *stops, fricatives,* and *approximants.*[1]

---

[1]We follow here Ladefoged's terminology and definition (1967:28-36, 80-83).

TABLE 1

CONTRASTIVE DISPLAY OF FRENCH VOWELS

[i]	[vi]	vie	'life'	[vil]	ville	'town'	[sil]	cil	'eyelid'
[y]	[vy]	vue	'view'						
[e]	[ve]	v	'v-shaped'						
[ø]	[vø]	voeu	'wish'	[vøl]	veule	'weak'			
[ɛ]	[vɛ]	vais	'go'	[vɛl]	vêle	'to bear (a calf)'	[sɛl]	selle	'saddle'
[œ]				[vœl]	veulent	'want'	[sœl]	seul	'alone'
[a]	[va]	va	'goes'	[val]	valent	'are worth'	[sal]	salle	'room'
[ɔ]				[vɔl]	vol	'flight'	[sɔl]	sol	'sole'
[o]	[vo]	veau	'calf'				[sol]	saule	'willow'
[u]	[vu]	vous	'you'				[sul]	saoule	'drunk (fem.)'
[ɛ̃]	[vɛ̃]	vin	'wine'						
[ã]	[vã]	vent	'wind'						
[õ]	[võ]	vont	'go'						

TABLE 2

CONTRASTIVE DISPLAY OF FRENCH CONSONANTS

[p]	[pɔ̃]	pont	'bridge'	[pi]	pis	'worse'	[pã]	pan	'flap'
[b]	[bɔ̃]	bon	'good'	[bi]	bis	'grey-brown'	[bã]	banc	'bench'
[m]	[mɔ̃]	mon	'my'	[mi]	mis	'put'	[mã]	ment	'lies'
[t]	[tɔ̃]	ton	'your'				[tã]	temps	'weather'
[d]	[dɔ̃]	don	'gift'	[di]	dit	'said'	[dã]	dent	'tooth'
[n]	[nɔ̃]	non	'no'	[ni]	ni	'neither'			
[k]	[kɔ̃]	con	'idiot'	[ki]	qui	'who'	[kã]	camp	'camp'
[g]	[gɔ̃]	gon	'hinge'	[gi]	gui	'mistletoe'	[gã]	gand	'glove'
[ɲ]	[ɲɔ̃]	gnon	'bruise'						
[f]	[fɔ̃]	fond	'bottom'	[fi]	fi	'fie'	[fã]	faon	'fawn'
[v]	[vɔ̃]	vont	'go'	[vi]	vie	'life'	[vã]	vent	'wind'
[s]	[sɔ̃]	son	'sound'	[si]	scie	'saw'	[sã]	sang	'blood'
[z]							[zã]	zan	'licorice'
[ʃ]				[ʃi]	chie	'defecates'	[ʃã]	chant	'song'
[ʒ]	[ʒɔ̃]	jonc	'rush'	[ʒi]	gît	'lies'	[ʒã]	gens	'people'
[r]	[rɔ̃]	rond	'round'	[ri]	riz	'rice'	[rã]	rang	'rank'
[ŋ]	[kãpiŋ]	camping	'camping'						
[ɲ]	[siɲ]	signe	'sign'						

TABLE 3

CONTRASTIVE DISPLAY OF FRENCH GLIDES

[j]	[sjɛ]	sciait	'sawed'		[sjɛ̃]	sien	'his'
[ɥ]	[sɥɛ]	suait	'sweated'		[sɥɛ̃]	suint	'grease (of wool)'
[w]	[swɛ]	souhait	'wish'		[swɛ̃]	soin	'care'

Stops correspond to sounds made by the complete closure of two articulators in the oral tract. In the production of stops, therefore, the oral tract is narrowed to prevent air flow through the mouth. In oral stops, the air flow is momentarily completely interrupted: p, b, t, d, k, and g. In nasal stops, the air flow is diverted through the nasal tract: m, n, ɲ, and ŋ.

Fricatives correspond to the sounds made by the narrowing of two articulators so as to produce a turbulent airstream; the obstruction of the two articulators for fricatives is narrower than the obstruction corresponding to glides. The class of sounds includes the spirants f, v, s, z, ʃ, and ʒ and the liquids r and l.

Approximants correspond to sounds made by the approximation of two articulators without producing a turbulent airstream. This class of sounds includes the glides j, ɥ, and w and the vowels. The relations between vowels must be, in turn, characterized in terms of their auditory height, which has the four values high: i, y, and u, mid-high: e, ø, and o, mid-low: ɛ, ɛ̃, œ, ɔ, and ɔ̃, and low: a and ã.

1.2.3 Place of Articulation

We distinguish three main types of segments according to the type of mobile articulators involved in the production of sounds: *labial* sounds, when the mobile articulators are either the lower lip or both lips, *lingual* sounds when the mobile articulator is the tongue, and *labial-lingual* sounds which are simultaneously labial and lingual.

1.2.3.1 *Labial sounds.* In labial sounds, the two articulators are either both lips: p and b or the lower lip and the lower edge of the upper front teeth: f and v.

1.2.3.2 *Lingual sounds.* Lingual sounds are either *dental,* when the two articulators are the tip of the tongue and the back of the upper front teeth: t, d, s, z, and l, or *nondental.* The exact place of articulation of nondental sounds depends on the sound itself. The articulation of the stops k and g can be either *palatal* or *velar* depending on the nature of the following segment. The articulation of the spirants ʃ and ʒ is *prepalatal.* The articulation of j is *palatal.* The articulation of r may be *dental, velar,* or *uvular,* depending on the dialect of French; in my speech it varies between *velar* and *uvular.*

The exact point of articulation of nondental lingual segments is not contrastive, except for glides and vowels where *palatal* (front) and *velar* (back) approximants are contrastive and also in some dialects, including mine, the palatal and velar nasals ɲ and ŋ.

1.2.3.3 *Labial-lingual.* The glides ɥ, w and the vowels y, ø, œ, ɔ, o, and u are simultaneously labial and lingual. All are nondental and contrast with respect to their articulation: ɥ, y, ø, and œ are palatal, w, u, o, and ɔ velar.

1.2.4 Strength

Prevocalic spirants and oral stops contrast with respect to voicing. It can be observed that strength, rather than voicing, is a distinctive feature for spirants and oral stops: tense p, t, k, f, s, and ʃ are voiceless in prevocalic position and lax b, d, g, v, z, and ʒ voiced in prevocalic position. In nonprevocalic position this is not always the case.

1.2.5 Sonority

Sonorant sounds are the sounds for which spontaneous voicing is possible: they are the nasals m, n, ɲ, and ŋ, the liquids l and r and all the approximants. Nonsonorant sounds are referred to as *obstruents*.

1.2.6 Syllabicity

Syllabic sounds are the segments constituting syllabic peaks. All vowels are syllabic.

1.2.7 Laterality

In many dialects, the two liquids l and r can be distinguished as being, respectively, dental and nondental; in some dialects, however, both are dental and therefore, we must use another characteristic to distinguish the two liquids, namely, laterality, l being lateral and r nonlateral in all dialects.

1.3 CLASSIFICATION

Table 4 is a classification of the sounds found in my speech.

1.4 MULTI-VALUED PHONEMIC REPRESENTATION

We characterize a segment by the value of its phonetic parameters. When a phonetic parameter takes only two values, we assign the values + and - to these two values; for instance, the phonetic parameter *nasal* takes only two values; thus an oral segment is specified as [-nasal] and a nasal segment as [+nasal]. When a phonetic parameter takes several values, we assign integer values to the characteristic positions of this parameter; for instance, the phonetic parameter *stricture* is assigned the values 1, 2, and 3 for stops, fricatives, and approximants, respectively.[1]

These values appear in Table 5.

[1]Cf. Ladefoged 1967:67-88.

TABLE 4

CLASSIFICATION OF THE SOUNDS OF FRENCH

			labial	lingual			
				1 dental	2 prepalatal	3 palatal	4 velar
1	Stop						
	oral	tense	p	t			k
		lax	b	d			g
	nasal	(sonorant)	m	n		ɲ	ŋ
2	Fricative						
	obstruent	tense	f	s	ʃ		
		lax	v	z	ʒ		
	sonorant	lateral		l			
		non-lateral					r
3	Approximant						
	non-syllabic		ɥ w			j ɥ	w
	syllabic	high	y u			i y	u
		mid-high	ø o			e ø	o
		mid-low	œ ɔ			ɛ œ (ɛ̃)	ɔ (ɔ̃)
		low					a (ɑ̃)

TABLE 5

MULTI-VALUED PHONEMIC COMPOSITION OF FRENCH SEGMENTS

	i	y	u	e	ø	o	ɛ	œ	ɔ	a	ɛ̃	ɔ̃	ɑ̃	j	ɥ	w	r	l	p	b	m	f	v	t	d	n	s	z	ʃ	ʒ	ɲ	k	g	ŋ
syllabic	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
sonorant	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	+	-	-	-	-	+	-	-	-	-	+	-	-	+
labial	-	+	+	-	+	+	-	+	+		-	+		-	+	+			+	+	+	+	+						+	+				
labial stricture		3	3		3	3		3	3			3			3	3			1	1	1	2	2						3	3				
lingual	3	3	4	3	3	4	3	3	4		3	4		3	3	4	4	1						1	1	1	1	1	2	2	3	4	4	4
lingual stricture	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2						1	1	1	2	2	2	2	1	1	1	1
tense																			+	-		+	-	+	-		+	-	+	-		+	-	
nasal	-	-	-	-	-	-	-	-	-	-	+	+	+						-	-	+			-	-	+					+	-	-	+
lateral																	-	+																
high	+	+	+	+	+	+	-	-	-	-	-	-	-																					
mid	-	-	-	+	+	+	+	+	+	-	+	+	-																					

CHAPTER 2

STRESS AND INTONATION

2.1 UNEMPHATIC STRESS

For the study of stress distribution in French, a sentence may be analyzed as a sequence of phrases, each phrase being in turn analyzed as a sequence of atonic and tonic words.

(1) S → $(Ph)^n$

Ph → $(At)^n(Ton)^m$

At → preposition, article, atonic clitic

Ton → noun, adjective, verb, adverb, tonic clitic[1]

For instance, the sentence **Pierre regarde un gros matou angora** 'Peter looks at a big angora tom cat' is divided into three phrases **Pierre**, **regarde**, and **un gros matou angora**:

(2) $[[[\textbf{Pierre}]_{Ton}]_{Ph}\ [[\textbf{regarde}]_{Ton}]_{Ph}$

$[[\textbf{un}]_{At}\ [\textbf{gros}]_{Ton}\ [\textbf{matou}]_{Ton}\ [\textbf{angora}]_{Ton}]_{Ph}]_{S}$

The primary stress falls on the last syllable of each phrase, and the secondary stress, on the last syllable of each tonic word, unless it already has a primary stress[2]:

(3) **Pièrre regàrde un grós matóu angorà**

However, a syllable with a secondary stress immediately before another stressed syllable (primary or secondary stress) is deaccentuated:

(4) **Pièrre regàrde un grós matou noìr**
'Peter looks at a big black tom cat'

Deaccentuation also takes place when there is an intervening schwa between two consecutive syllables:

(5) **Pièrre regàrde la grósse fenêtre noìre**
'Peter looks at the big black window'

Monosyllabic tonic words, therefore, always cause the deaccentuation of a previous tonic word belonging to the same phrase and can be referred to

---

[1]This analysis is tentative: it is likely that the expression **le chat de Pierre** should be analyzed as a single phrase, in which case the expression for *Ph* could be $((At)^n(Ton)^m)^p$.

[2]We use ` for primary stress and ´ for secondary stress.

as deaccentuating words. A deaccentuating word followed by another deaccentuating word belonging to the same phrase, in turn loses its stress[1]:

(6) **Pièrre regàrde le gros chat noìr**
'Peter looks at the big black cat'

2.2 INTONATION IN SIMPLE DECLARATIVE SENTENCES

If we distinguish four levels of pitch in a sentence: 1, 2, 3, and 4 (level 1 corresponding to the lowest pitch and level 4 to the highest), the distribution of pitch level in a simple declarative sentence is determined by the stress pattern of the sentence:

(a) A syllable with a primary stress receives either a pitch level 1 or 4; level 1 when it is in the last phrase of the sentence, level 4 otherwise.

(b) A syllable with a secondary stress receives a pitch level 3.

(c) A nonstressed syllable receives either a pitch level 2 or 3. (We shall always represent them with pitch level 2 in our description.)

For example, the distribution of pitch levels in sentence (3) is as follows:

(7) 4 2 4 2 3 2 3 2 2 1
Pièrre regàrde un gròs matòu angorà

A deaccentuated syllable keeps its pitch level 3, unless it is followed by a syllable with pitch level 1, in which case it may optionally either keep its pitch level 3, or decrease it to 2:

(8) 2 3 4 2 2 4 2 1
La table ròonde a été volée
'The round table has been stolen'

(9) a. 4 2 4 2 3 2 1
Pièrre regàrde la table ròonde

b. 4 2 4 2 2 2 1
Pièrre regàrde la table ròonde
'Peter looks at the round table'

2.3 EMPHATIC STRESS

A tsnic word may receive an emphatic stress, in addition to the word stress discussed above, on its first syllable if it begins with a conso-

---

[1]This analysis of stress placement is basically Grammont's (1954:105-11). Grammont does not distinguish secondary stress from primary stress, but makes a similar distinction showing that only certain stressed syllables may be deaccentuated: 'la désaccentuation ne s'accomplit que si le monosyllabe et le mot qui le précède font partie du même élément rythmique' (1954:108). We shall see that we need to distinguish the two types of stress for intonation as well.

nant, or on either the first or the second syllable if it begins with a vowel:

(10) a. Quelle cànàille 'What a crook'

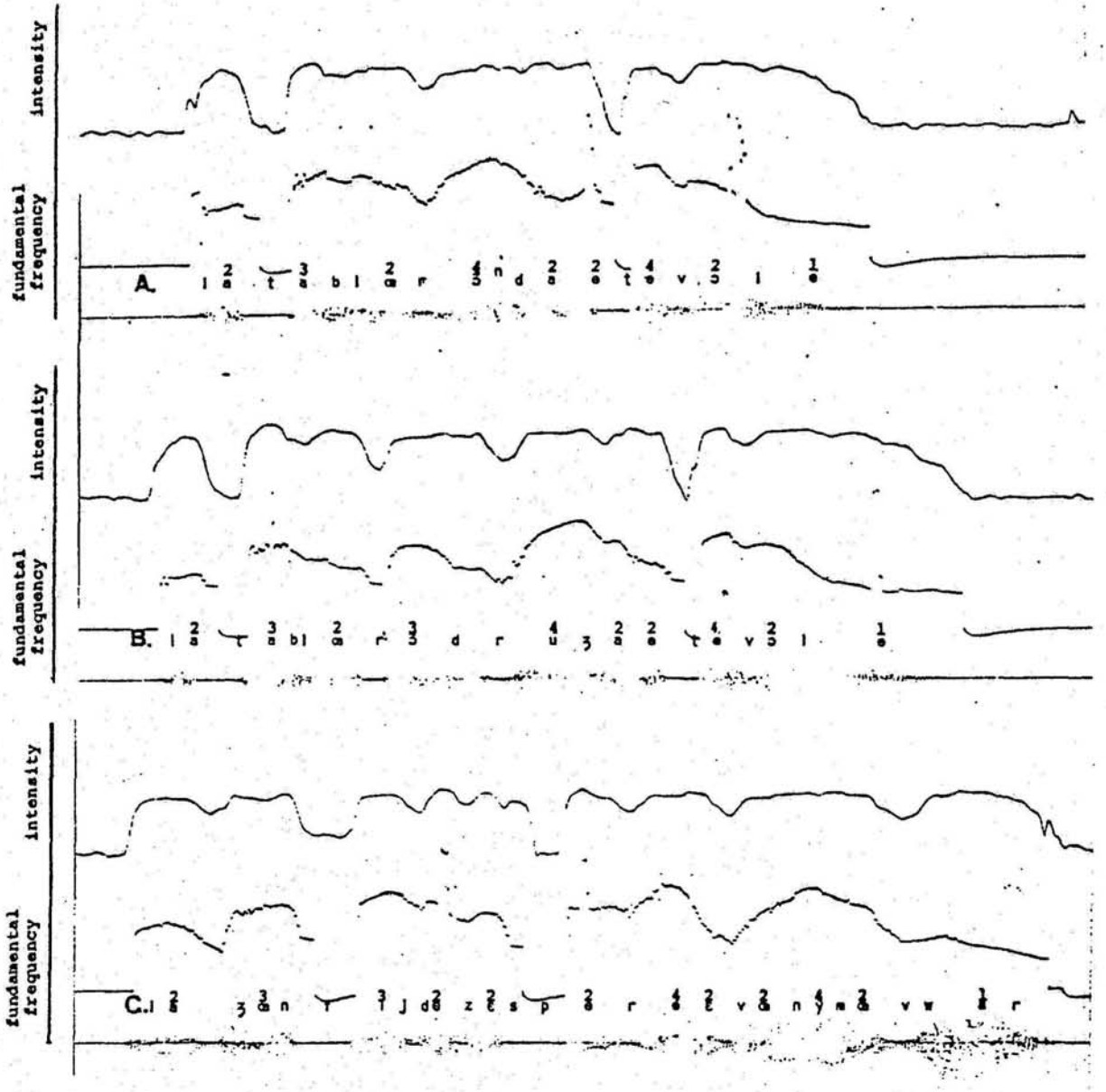
b. C'est ìncroyàble 'It's unbelievable'

c. C'est incròyàble "

The pitch level in a syllable with emphatic stress is 1 in sentence-final position, or 4 in all other places.

(11) a. ^{2}Quelle ^{4}càn^{1}aille 'What a crook'

b. ^{2}Quel ^{1}pòrc 'What a pig'



A. La table ronde a été volée
The round table has been stolen

B. La table ronde rouge a été volée
The red round table has been stolen

C. La jeune fille désespérée est venue me voir
The sad young girl came to see me

Figure 1. Intonation contour in simple declarative sentences.

CHAPTER 3

DISTRIBUTION OF SPEECH SOUNDS IN WORDS

In this chapter we make an inventory of the sequences of segments which may occur in words.[1]

3.1 WORDS WITHOUT VOWELS

There are a few interjections which do not contain any vowels:

(1) [pft] shows indifference or spitefulness

[ʔm] shows unwillingness or doubt

[kss] incites to fight

[pst] gets the attention of someone

[ʃʃt] incites silence

[(p)ss] in college slang, indicates disapproval

[(b)zz] in college slang, indicates approval

[tsts] or [$\overrightarrow{\text{ts}}\overrightarrow{\text{ts}}$][2] indicates skepticism, perplexity or disapproval

[ff] or [$\overrightarrow{\phi}\overrightarrow{\phi}$] indicates apprehension

The fact that some sounds are found only in interjections, ingressive $\overrightarrow{\text{ts}}$, $\overrightarrow{\text{f}}$ and $\overrightarrow{\phi}$, or bilabial $\overrightarrow{\phi}$, and that some of these interjections have alternate pronunciations with a vowel when they are used within sentences, e.g., **pfut** [pfyt] for [pft], **chut** [ʃyt] for [ʃʃt] and **hum** [ʔœm] for [ʔm], indicates that interjections form an autonomous system within the language and does not commit us to include them in our analysis.

3.2 EXTENSIONS

We observe three distinct types of consonant clusters depending upon whether they are in initial, intervocalic or final position in a word. We observe more particularly (a) that sonorants may be followed by another consonant only in intervocalic and final position, as if they were part of the vocalic nucleus rather than part of the consonantal nucleus; and (b) that liquids may be found after any nonsonorant consonant, in which case they appear as extensions of nonsonorant consonants. We shall analyze the distribution of segments in terms of possible extensions.

---

[1]Due to historical developments, not all sequences of sounds which are now possible can be found in the French lexicon. In Chapter 8 we show how new words have been recently introduced which fill some of the historical gaps.

[2]The arrow $\rightarrow$ indicates ingressive air stream.

(2) a. eau [o] 'water'
aile [ɛl] 'wing'
air [ɛr] 'air'
âme [am] 'soul'
âne [an] 'donkey'
b. Elme [ɛlm] (proper name)
arme [arm] 'weapon'
urne [yrn] 'ballot box'
c. hymne [imn] 'hymn'
hurle [yrl] 'yells'
ail [aj] 'garlic'

The restrictions on vocalic extension appear to be that

(a) clusters of three or more sonorants
(b) clusters of two identical sonorants
(c) clusters consisting of a nasal stop followed by a liquid
(d) the cluster [lr]
(e) the cluster [nm]
(f) the cluster [ln]

are not allowed as extensions of vowels. The strength of these constraints goes from strong to weak, the last constraint being weak enough to allow such borrowings as Lincoln [linkɔln], in spite of the articulatory difficulty in pronouncing the two homorganic sonorants ln. Only extensions which contain one sonorant, as in (2a), appear frequently before word-final consonants; extensions which contain a liquid followed by a nasal, as in (2b), appear only in a few borrowed names, e.g. Arnt [arnt]; extensions which contain a glide, two nasals or two liquids, as in (2c), may appear before another consonant only intervocalically, e.g., feuilleter [fœjte] 'to browse' or parlera [parlra] 'will speak'.

3.2.2 Consonantal Extensions

Oral stops and spirants may always be followed by a liquid in initial, intervocalic, and final positions (cf. Tables 7 to 11; note, however, the absence of word-final sr, zr, ʃr, and ʒr clusters). Sonorants, on the other hand, are never followed by liquids in word-initial position. In sentences, reductions may bring together an initial sonorant followed by a liquid; in this case, it appears that the initial sonorant acquires some vocalic property, thus behaving more properly as a vowel than as a consonant.

(3) le regarde pas! [l̥rœgardpa] 'don't look at him!'
reluque moi ça! [r̥lykmwasa] 'look at that!'
me répond pas! [m̥repɔ̃pa] 'don't answer me!'
ne répond pas! [n̥repɔ̃pa] 'don't answer!'

TABLE 6 - VOCALIC EXTENSIONS

	∅	[r]	[l]	[n, m]	clusters
∅	[pa] **pas** 'step'	[par] **part** 'share'	[pal] **pale** 'blade'	[pan] **panne** 'breakdown' [pam] **pâme** '(he) swoons'	[parm] **Parme** (town) [karn] **carne** 'meat' [palm] **palme** 'palm' [parl] **parle** 'speak' [imn] **hymne** 'hymn' [paj] **paille** 'straw'
--f	[if] **if** 'yew'	[sɛrf] **serf** 'serf'	[gɔlf] **golf** 'golf'		
--s	[as] **as** 'ace'	[urs] **ours** 'bear'	[vals] **valse** 'waltz'	[bins] **binse** 'mess' [brams] **Brahms** (name)	[bœrns] **Burns** (name)
--sk	[kask] **casque** 'helmet'		[vɔlsk] **Volsk** (town)	[minsk] **Minsk** (town) [ɔmsk] **Omsk** (town)	
--k	[bãk] **banque** 'bank'	[bark] **barque** 'boat'	[talk] **talc** 'talcum'		
--br	[õbr] **ombre** 'shadow'	[arbr] **arbre** 'tree'			
--t	[õt] **honte** 'shame'	[pɛrt] **perte** 'loss'	[alt] **halte** 'stop'	[sprint] **sprint** 'sprint'	[arnt] **Arnt** (name)
--st	[ɛst] **est** 'east'	[vɛrst] **verste** 'verst'			[ɛrnst] **Ernst** (name)
--ts	[ɛrzats] **ersatz** 'ersatz'	[kwarts] **quartz** 'quartz'	[sɛlts] **Selts** (place)		
--kr	[sykr] **sucre** 'sugar		[sepylkr] **sépulcre** 'vault'		

TABLE 7 - EXTENSIONS OF [p]

	∅			[s]			[ʃ]		
∅	[pa]	pas	'step'	[spat]	spath	'spar'	[ʃpil]	schpile	'nice'
	[apa]	appât	'bait'	[aspɛ]	aspect	'aspect'	[ɔʃpo]	hochepot	'stew'
	[ap]	happe	'snaps'	[asp]	aspe	'winder for silk'			
[f]	[pfyt]	pfut	(interj.)						
	[obɛrkãpf]	Oberkampf	(street in Paris)						
[s]	[psom]	psaume	'psalm'						
	[rapsɔdi]	rapsodie	'rhapsody'						
	[ʒips]	gypse	'gypsum'						
[ʃ]	[pʃit]	Pchitt	(trademark)						
[r]	[pri]	prix	'price'	[sprat]	sprat	'brisling'	[ʃprut]	schproute	'noise'
	[aprɛ]	apprêt	'finish'	[ɛspri]	esprit	'spirit'			
	[apr]	âpre	'rough'	[aspr]	aspre	'asper'			
[l]	[pla]	plat	'dish'	[splãdid]	splendide	'splendid'			
	[kõplɛ]	complet	'suit'	[ɛsplanad]	esplanade	'parade'			
	[ãpl]	ample	'vast'	[aspl]	asple	'winder for silk'			
[m]	[kãpmã]	campement	'camping'						
[n]	[pnø]	pneu	'tire'						
	[ipnɔz]	hypnose	'hypnosis'	[dispne]	dyspnée	'dyspnœa'			

TABLE 8 - EXTENSIONS OF [t]

	Ø			[s]			[ʃ]		
Ø	[ta]	tas	'hump'	[staʒ]	stage	'stage'	[ʃtimi]	chtimi	'weakling'
	[eta]	état	'state'	[ɔsto]	hosto	'hospital'	[aʃte]	acheter	'to buy'
	[at]	hâte	'hurry'	[ɛst]	est	'east'	[kaʃt]	cach'te	'(he) seals'
[f]									
[s]	[tsar]	tsar	'tsar'						
	[kwartsø]	quartzeux	'quartz-like'						
	[ɛrzats]	ersatz	'ersatz'						
[ʃ]	[tʃɛk]	tchèque	'Czech'						
	[putʃist]	putschiste	'putschist'						
	[putʃ]	putsch	'putsch'						
[r]	[tru]	trou	'hole'	[stri]	strie	'stria'	[ʃtras]	schtrasse	'administration'
	[atrɛ]	attrait	'attraction'	[astral]	astral	'stellar'	[fuʃtra]	fouchtra	(interj.)
	[atr]	âtre	'fireplace'	[astr]	astre	'star'	[fiʃtr]	fichtre	(interj.)
[l]	[tlapsi]	thlapsi	'pennycress'						
	[atlas]	atlas	'atlas'						
	[pɛjɔtl]	peyotl	'peyote'						
[m]	[tmɛz]	tmèse	'tmesis'						
	[atmɔsfɛr]	atmosphère	'atmosphere'						
	[ritm]	rythme	'rhythm'						
[n]	[ɛtnik]	ethnique	'ethnic'						

TABLE 9 - EXTENSIONS OF [k]

	∅			[s]			[ʃ]
∅	[ka]	cas	'case'	[ski]	ski	'ski'	
	[ɛ̃ka]	inca	'Inca'	[kaskad]	cascade	'waterfall'	
	[bãk]	banque	'bank'	[kask]	casque	'helmet'	
[f]							
[s]	[ksɛrɛs]	Xeres	'sherry'				
	[taksi]	taxi	'taxi'				
	[aks]	axe	'axle'				
[ʃ]	[bakʃiʃ]	bakchich	'tip'				
[r]	[kry]	cru	'raw'	[skrib]	scribe	'scribe'	
	[akry]	accru	'increased'	[ɛ̃skri]	inscrit	'enrolled'	
	[ãkr]	encre	'ink'				
[l]	[klu]	clou	'nail'	[skleroz]	sclérose	'sclerosis'	
	[ãklo]	enclos	'paddock'	[ɛsklav]	esclave	'slave'	
	[õkl]	oncle	'uncle'	[myskl]	muscle	'muscle'	
[m]	[kmɛr]	Khmer	(name)				
	[snɛkma]	SNECMA	(acron.)				
	[drakm]	drachme	'drachma'				
[n]	[knut]	knout	'knout'				
	[akne]	acné	'acne'				

TABLE 10 - EXTENSIONS OF [f]

	∅			[s]			[ʃ]		
∅	[fo]	faux	'false'	[sfɛr]	sphère	'sphere'	[ʃfø]	cheveu	'hair'
	[ãfã]	enfant	'child'	[asfalt]	asphalte	'bitumen'	[aʃfe]	achevé	'finished'
	[if]	if	'yew'						
[f]									
[s]	[fsif]	FSIF	(acron.)						
	[aɛfse]	AFC	(acron.)						
[ʃ]									
[r]	[frɛ]	frais	'fresh'	[sfraʒistik]	sphragistique	'sphragistic'			
	[afrɔ̃]	affront	'insult'						
	[ɔfr]	offre	'offer'						
[l]	[flo]	flot	'wave'						
	[ãfle]	enfler	'to swell'						
	[sufl]	souffle	'breeze'						
[m]									
[n]	[fnɛf]	FNEF	(acron.)						
	[afnɔr]	AFNOR	(acron.)						

TABLE 11 - EXTENSIONS OF [s] AND [ʃ]

	[s]			[ʃ]		
Ø	[si]	scie	'saw'	[ʃa]	chat	'cat'
	[asi]	assis	'seated'	[aʃa]	achat	'purchase'
	[as]	as	'ace'	[aʃ]	hache	'axe'
[f]	[sfɛr]	sphère	'sphere'	[ʃfø]	cheveu	'hair'
	[asfalt]	asphalte	'bitumen'	[aʃfe]	achevé	'finished'
[s]						
[ʃ]						
[r]	[srɔm]	SROM	(acron.)	[ʃrapnɛl]	schrapnel	'schrapnel'
	[kasrɔl]	casserole	'saucepan'	[aʃra]	hachera	'will chop'
[l]	[slip]	slip	'underpant'	[ʃlas]	schlass	'knife'
	[desle]	déceler	'to reveal'	[eʃlɔ̃]	échelon	'steps'
[m]	[smala]	smala	'big family'	[ʃma]	Chma	(geogr. name)
	[trãsmi]	transmis	'transmitted'	[koʃmar]	cauchemar	'nightmare'
	[asm]	asthme	'asthma'			
[n]	[snɔb]	snob	'snob'	[ʃnɔk]	schnoque	'schnook'
	[masnɛ]	Massenet	(proper noun)	[piʃnɛt]	pichenette	'tap'

TABLE 12 - SEQUENCES OF EXTENSIONS

	[p,b]	[t,d]	[k,g]	[f,v]
[p,b]		[apt] **apte** 'apt' [apstœnir] **abstenir** 'abstain'	[pskɛnt] **pschent** 'pschent' [ʃapska] **chapska** 'shapska'	
[t,d]		[adʒdar] **Adjdar** (place)	[irkutsk] **Irkutsk** (place)	[dvɔrʒak] **Dvorjak** (name)
[k,g]	[ɛksprime] **exprimé** 'expressed' [ɛkbatan] **Ecbatane** (place)	[ktɔnjɛ̃] **chtonien** 'chthonian' [aktif] **actif** 'active' [akt] **acte** 'act' [dɛkstr] **dextre** 'dexter' [ɛkstrɛm] **extrême** 'extreme'		
[f,v]		[ftalein] **phtaléine** 'phtalein' [aftø] **aphteux** 'aphthous' [aft] **aphte** 'aphtha'	[brɛstlitɔfsk] **Brest-Litowsk** (place)	

3.2.2.1 *Release extension.* We shall say that an oral stop or a spirant has a liquid release when it is followed by a liquid. The only constraint on liquid releases is that the dental liquid l cannot follow the dental stops t and d; this restriction, however, is being weakened by the recent introduction of words such as **thlapsi** [tlapsi] 'penny-cress' and **peyotl** [pejɔtl] 'peyote'.

We observe that all segments which can take a liquid release can also take a nasal release, i.e., be followed by a nasal stop, and that oral stops may take a fricative release, i.e., be followed by a fricative, although releases in f appear very limited.

3.2.2.2 *Onset extensions.* Oral stops may be preceded by s or ʃ, except when they have a fricative or a nasal release. This restriction is not very strong, however, in intervocalic position, as shown by the word **dyspnée** [dispne] 'dyspnœa' and the pronunciation **Krouchtchev** [kruʃtʃɛf] for normal [krutʃɛf].

3.3 WORD STRUCTURE

We can define a word as a vocalic nucleus, optionally followed by any number of nucleic extensions.

3.3.1 Vocalic Nucleus

A vocalic nucleus is a vowel extension optionally preceded by (a) a single consonant or (b) one or two nonsonorant extensions, and optionally followed by one or two nonsonorant extensions:

(4)

eau	[o]	'water'
pot	[po]	'pot'
pro	[pro]	'professional'
paume	[pom]	'palm'
psaume	[psom]	'psalm'
round	[rund]	'round (sport)'
pschent	[pskɛnt]	'pschent'
dextre	[dekstr]	'dexter'

3.3.2 Nucleic Extension

A nucleic extension is a vowel extension optionally preceded by a single consonant and optionally followed by one or two nonsonorant extensions.

(5)

(dextr)al	[(dɛkstr)al]	'dextral'
(parle)ra	[(parl)ra]	'will speak'

3.3.3 Geminates

The above word structure allows geminates in most positions, and in particular wrongly allows geminates in final position since geminates in French appear only prevocalically. They appear intervocalically as a result of derivation:

(6) **honnêteté** [ɔnɛtte] 'honesty'
extrêmement [ɛkstrɛmmã] 'extremely'

or as a result of emphatic stress:

(7) **inimaginable!** [ìnnimaʒinabl] 'unthinkable!'
incroyable! [ɛ̀kkrwajabl] 'unbelievable!'

They appear initially after contraction or as the result of emphatic stress.

(8) [ppa] for [papa] 'father'
[mmã] for [mamã] 'mother'

(9) **menteur!** [mmà tœ̀r] 'liar!'
crapule! [kkràpỳl] 'crook!'

Initial geminates may also appear in sentence-initial position after schwa deletion:

(10) **te tracasse pas** [ttrakaspa] 'don't worry'
me marche pas (sur les pieds) [mmarʃpa] 'don't step (on my feet)'

3.3.4 Glides

The definition of word structure does not allow a glide to follow another consonant in a nucleus. We shall see later that all glides appearing after a consonant in a word must be analyzed as underlying vowels.

CHAPTER 4

SEQUENTIAL ADJUSTMENTS OF SPEECH SOUNDS

In this chapter we study phenomena occurring at the junction between two segments, or between a pause and a segment.

4.1 VOWELS

4.1.1 Onset of Initial Vowels

Initial unstressed vowels have an even beginning as in the following sentences:

(1) **un garçòn est venù** 'a boy came'
Andrè est venù 'André came'

Initial stressed vowels have a stopped beginning,[1] which is often characterized by an initial glottal stop:

(2) **un de plus** [ʔɛ̀dplỳs] 'one more'
Yves est venu [ʔìvɛvnỳ] 'Yves came'
et Pierre et Paul sont venus [ʔèpjɛrʔèpɔl sɔ̃vnỳ] 'both Peter and Paul came'

4.1.2 Onset of Prevocalic Vowels

The transition between an unaccentuated vowel and a following vowel is characterized by a pitch modulation at the junction,[2] which sometimes leads to a creaky voice quality:

(3) **(le park) zoologique** [zɔɔlɔʒik] 'the zoo'
ma Panhard [mapãar] 'my Panhard (car make)'

A stressed vowel preceded by another stressed vowel has a stopped beginning[3]:

(4) **et un de plus** [ʔèʔɛ̀dplỳs] 'and one more'
Tu as vu Anne [tyavỳʔàn] 'you saw Ann'

4.1.3 Offset of Vowels Followed by a Sonorant or a Spirant

The transition between a vowel and a following sonorant or spirant is done without interruption.

---

[1] As defined in Heffner 1964:166
[2] Cf. Grammont 1954:136.
[3] Also observed by Cohen 1962.

4.1.4 Offset of Vowels Followed by an Oral Stop

There is an interruption of the air flow at the transition between an oral vowel and a following oral stop leading to a momentary silence when the stop is voiceless. When the vowel is nasalized, however, the velum remains lowered during part of the occlusion of the stop, thus temporarily directing the air flow through the nasal tract. The air flow stops for a very short period of time just before the release of the stop. This produces some nasal off-glide between a nasalized vowel and a subsequent stop. This phenomenon is easily observed when the nasalized vowel is long, e.g. in final position.

(5) **elle est grande** [ɛlɛgrɑ̃^{n}d] 'she is tall'

elle en a trente [ɛlɑ̃natrɑ̃^{n}t] 'she has thirty of them'

This off-glide is to be distinguished from the nasal consonants found in the speech of southern France.[1] In southern speech, a full nasal consonant, rather than an off-glide, appears after every nasalized vowel, e.g. **grande** [grɑ̃nd] 'tall', **danse** [dɑ̃ns] 'dance', **pain** [pɛ̃ŋ] 'bread'; in some forms of southern speech, nasalized vowels may appear without a following nasal stop in word-final position, e.g. **pain** [pɛ̃].

4.1.5 Offset of Final Vowels

Final vowels normally have even releases, except in a few marginal cases when they have breathed or stopped releases. Breathed releases are observed in sentence-final vowels when the pitch becomes very low.[2]

(6) **il est déjà parti** [ilɛdeʒapartiʰ] 'he already left'

Stopped releases are observed in some interjection-like expressions, e.g. **oui** [wiʔ] 'yes', **non** [nɔ̃ʔ] 'no' (in the so-called 'ton cassant', or chopped speech), **allo** [aloʔ] (used at the beginning of a telephone conversation). The final stop in these words is realized as a glottal stop, a bilabial unreleased stop, or both simultaneously; it is, however, recognized neither as p nor as b.

4.2 CONSONANT RELEASE

As a general rule a final consonant preceded by a segment with a lower level of stricture[3] is followed by a schwa-like unrounded short vowel, which is voiceless when the consonant is voiceless, and whispered when the consonant is voiced:

(7) **sac** [sak°] 'bag' **vague** [vag°] 'wave'

bouche [buʃ°] 'mouth' **rouge** [ruʒ°] 'red'

---

[1] See, for instance, the transcription in Delattre 1949.

[2] Observed by Nyrop 1902:54.

[3] In the multivalued system, this means that the integer representing the stricture is greater, cf. Section 1.4.

We say that a consonant is released when it is followed by a segment with a lower level of stricture. According to this definition, the schwa-like unrounded short vowel appearing after final prevocalic consonants is a release. On the other hand, in the word **abdiquer** [abdike] 'to abdicate', the segment d has the same stricture as b; in this case b is said to be unreleased.

(8) **abdiquer** [ab˺dike]

4.2.1 Vocalic Release

Vocalic release corresponds to the case of consonants followed by vowels in the same word.

(9) **bas** [ba] 'stocking'
chat [ʃa] 'cat'

In some forms of Parisian French,[1] vocalic release of tense stops is not possible before the high vowels, i, e, y, ø, o, and u: an epenthetic aspirated release always appears after a tense stop followed by a high vowel. This epenthetic aspirated release is stronger before front vowels.

(10) **pis** [pʰi] 'worse'
petit [pœtʰi] 'small'

4.2.2 Fricative Releases

Oral stops may be followed by a fricative, and sibilants by a liquid in all positions. Final fricatives following an oral stop do not have a release, which they do have when they follow a vowel:

(11) **gare** [gar°] 'station'
cadre [kadr˺] 'frame'
quatre [katr˺] 'four'

(12) **vache** [vaʃ°] 'cow'
match [matʃ˺] 'match (sport)'
bridge [bridʒ˺] 'bridge (card game)'

Final fricative releases are voiceless after voiceless stops, and whispered after voiced stops.[2]

(13) **cadre** [kadr̬˺] 'frame'
quatre [katr̥˺] 'four'

---

[1] Observed by Fischer-Jørgensen 1969:65.
[2] Fouché 1959:xx and Nyrop 1902:34,44 do not distinguish between voiceless and whispered liquids.

Prevocalic fricative releases are voiced after voiced consonants and voiceless after voiceless consonants, with one exception, however, in my speech: prevocalic l preceded by p or f is voiced.

(14) **cadran** [kadr̬ã] 'dial'
quatrain [katr̬ɛ̃] 'quatrain'
plat [pl̬a] 'dish'

4.2.3 Glide Release

Glide release has most of the same characteristics as fricative release, the main difference being that, with the exception of the nasal consonant ɲ, final consonants cannot have a glide release; for these consonants, glide release appears only prevocalically.

4.2.4 Release of Palatal and Velar Nasals

The underlying nasal consonant n has two allophones: the palatal ɲ before palatal glides[1] and the dental n in all other positions.

(15) **(je) manie** [mani] '(I) handle'
(nous) manions [maɲjõ] '(we) handle'

This is a simple assimilation of n to a following yod. All phonetic ɲ's, however, cannot always be analyzed in this manner because some may occur without a following yod.

(16) a. **(je me) magne** [maɲʲ] '(I) hurry'
b. **(nous nous) magnons** [maɲjõ] '(we) hurry'
c. **(je me) magnerai** [maɲrɛ][2] '(I) shall hurry'

In the paradigm (16) ɲ is followed by a yod only in prevocalic and final positions. Sentence (16c) has another variant (17) with œ between ɲ and r, showing that the presence of a vowel is the conditioning factor for the release of ɲ into j in this paradigm.

(17) **(je me) magnerai** [maɲjœrɛ] '(I) shall hurry'

We analyze the nasal consonant ɲ appearing in (16) as representing an underlying segment ɲ which takes a yod release in prevocalic and final positions.[3]

---

[1]Also observed by Bauche 1929:50.

[2]In this phonetic representation we do not distinguish between ɲ and ŋ. We shall see later that ɲ in **magnerai** is more properly described as velar ŋ.

[3]Heffner 1964:182 also offers this explanation. It appears that in some dialects of French ɲ does not have a yod-release before a vowel; thus the contrast between **gagnons** [gaɲõ] '(we) earn' and **dénions** [deɲjõ] '(we) deny' (I have observed this particular distinction in some forms

(18) ɲ-yod release

$$\emptyset \rightarrow j \;/\; ɲ \_\_ \left\{ \begin{matrix} V \\ \# \end{matrix} \right\}$$

Closer observation of ɲ shows that it has two allophones depending on its release. It is realized as palatal ɲ when it has a palatal release, e.g. (19), and as velar ŋ when it has a velar release, e.g. (20), or has no release, e.g. (21).

(19)	(je)	**baigne**	[bɛɲ^{j}]	'(I) bathe'
		baignade	[bɛɲjad]	'bathe'
(20)		**baignoire**	[bɛŋwar]	'bathtub'
	(je)	**baignerai**	[bɛŋrɛ]	'(I) shall bathe'
(21)		**gagne-pain**	[gaŋpɛ̃]	'means of living'
		peigne-cul	[pɛŋky]	'vile person'

We also find occurrences of velar ŋ in final position of some English (or pseudo-English) borrowings, e.g. (22).

(22)	**marketing**	[markɛtiŋ̚]	'marketing'
	footing	[futiŋ̚]	'jogging'
	dring	[driŋ̚]	'ring of a doorbell'

In these words velar ŋ is unreleased, this being one exception to the general rule stating that postvocalic consonants are released in final position. We may account for the distribution of ɲ and ŋ by analyzing them, respectively, as released and non-released allophones of the same underlying segment: (a) ɲ with a palatal release before vowels, (b) ŋ before r and w, (c) unreleased ŋ before stops, and (d) either ɲ or ŋ in final position where both release and nonrelease are possible.[1]

4.2.5 Glottalic Release

A word-final tense oral stop followed by a stressed vowel becomes ejective.

(23)	a.	**le petit ange**	[lœpœtitɑ̃ʒ]	'the little angel'
	b.	**la petite anse**	[làpœtit'ɑ̀s]	'the little handle'

---

of Franco-Canadian). The yod-release of ɲ has also been observed by Bauche 1929:49 who distinguishes ɲj before a vowel (spelling **gny** in **grognyer** 'to growl') from ɲ before the glide w (spelling **gn-n** in **peign-noir** 'bathrobe').

[1] The ability of nonrelease of final consonants appears to be new in French, most consonants being strongly released in final position. A statistical study by Deyhime 1967:63 shows that 38% of Parisians and overall 10% of Frenchmen do not distinguish [ɲ] and [ŋ] in final position.

In sentence (23a) t phonetically belongs to the word tãʒ and has a vocalic release; in sentence (22b) t phonetically belongs to the word pætit and has a glottalic release.[1]

4.2.6 Epenthetic Release

An epenthetic release may appear between two consecutive stops, for instance, between k and t in the word acte [ak°t°] 'act'. Epenthetic releases are schwa-like short voiceless or whispered vowels similar to releases of final consonants. We now describe the contexts in which we find epenthetic releases.[2]

4.2.6.1 Given a cluster of two consecutive stops in postvocalic position, epenthetic release can occur only when the first of these stops is tense. There cannot be any release when the first stop is nasal or lax.

(24)	**cimetierre**	[simtjɛr]	'graveyard'
	hanneton	[antɔ̃]	'May-locust'.
	manequin	[mankɛ̃]	'model'
(25)	**vodka**	[vɔdka]	'vodka'
	abdiquer	[abdike]	'to abdicate'
	Brandebourg	[brãdbur]	'Brandenburg'
	Bagdad	[bagdad]	'Baghdad'
	flegme	[flɛgm]	'phlegm'

It appears that there can be an epenthetic release only when the first stop is k and when it is preceded by a stressed vowel (word stress or emphatic stress):

(26)	a.	**exact**	[ɛgzàk°t]	'exact'
		drachme	[dràk°m]	'drachma'
		aqueduc	[àk°dỳk]	'aqueduct'
	b.	**arctique**	[àrk°tìk]	'arctic'
		infarctus	[ɛ̃fàrk°tỳs]	'infarct'
(27)		**apt**	[àp˺t]	'apt'
		rythme	[rìt˺m]	'rhythm'

4.2.6.2 When two consecutive stops are in word-initial position, epenthetic release may appear only when the first stop is oral. When

---

[1] Observed by Druand 1936:240-1.

[2] Damourette and Pichon 1911-1927:172-6 indicate that epenthetic release is not always phonetically determined in the high class French of their period, where epenthetic release may help distinguish haquenée [ak°ne] 'hackney' from acné [ak˺ne] 'acne'.

the first stop is nasal, we never observe any epenthetic release. The examples of French words with initial postconsonantal nasal stops are very limited (28); we observe the same phenomenon in the pronunciation by French speakers of foreign proper names (29):

(28) **mnémonique** [mnemɔnik] 'mnemonic'

(29) **Mbadane** [mbadan]
N'Djolé [ndʒɔle]
N'Kongsamba [nkõgsãba]

Epenthetic release takes place after word-initial velars k and g.[1]

(29) **Khmer** [k°mɛr] 'Khmer'
gmelina [g°mœlina] 'gmelina'
knout [k°nut] 'knout'
gnou [g°nu] 'gnu'
chtonien [k°tɔnjɛ̃] 'chthonian'

It appears optionally in the groups tm, pt, pn (30) and never in the groups dm, dn (31).

(30) **tmèse** [tmɛz] 'tmesis'
Ptolémée [ptɔleme] 'Ptolemy'
pneu [pnø] 'tire'

(31) **Dmitri** [ḋmitri] (proper name)
demain [ḋmɛ̃] 'tomorrow'
Dniestre [ḋnjɛstr] (geographic name)

4.2.7 Nasal Weakening of Oral Stops[2]

We observed the existence of nasal off-glides after nasalized vowels followed by a stop which last until the release of the stop. If the stop following a nasalized vowel is not released, the stop becomes acoustically undistinguishable from its corresponding nasal.

(32) a. **somptueux** /sõptɥø/ > [sõmtɥø] 'sumptuous'
b. **symptôme** /sɛ̃ptom/ > [sɛ̃mtom] 'symptom'
c. **Brandebourg** /brãdbur/ > [brãnbur] 'Brandenburg'

---

[1]The pronunciation of stop-initial words must be understood as the citation form. In context, most of the words are preceded by an article.
[2]Some forms of this phenomenon have been previously reported, cf. Nyrop 1902:123 and Schwartz 1930.

For instance, the pronunciation of the consonants in (32a) and in (33) is identical.

(33) **sans me tuer** [sãmtɥe] 'without killing myself'

This phenomenon of nasal weakening does not apply uniformally to lax and tense oral stops.

4.2.7.1 Both lax and tense unreleased stops undergo nasal weakening when they are followed by an oral stop and when this oral stop belongs to the same word, as in (34), is preceded by an unstressed vowel as in (35), or both as in (36).

(34)	**prompte**[1]	/prõpt/	>	[prõmt]	'fast'
	exempte[1]	/ɛgzãpt/	>	[ɛgzãmt]	'exempt'
(35)	**un petit peu**	/ɛ̃+pti+pø/	>	[ɛ̃mtipø]	'a little bit'
	trente-trois	/trãt+trwa/	>	[trãntrwa]	'thirty-three'
(36)	**symptôme**	/sɛ̃ptom/	>	[sɛ̃mtom̀]	'symptom'
	onctueux	/õktɥø/	>	[õŋtɥø]	'unctuous'

A stop does not undergo nasal weakening when it is released and particularly when it is followed by an epenthetic release:

(37) **distincte** [distɛ̃k°t] 'distinct'
onctueux [õ̀k°tɥø̀] 'unctuous'

In (38a) t is weakened to n since **trente** is unstressed; in (38b) and (38c) t has a glottalic release because the preceding syllable is stressed and, therefore, retains its oral character.

(38)	a. **trente-quatre**	/trãt+katr/	[trãnkatr]	'thirty-four'
	b. **trente capres**	/trãt+kapr/	[trãt'kapr]	'thirty capers'
	c. **trente 'quatres'**	/trãt+katr/	[trãt'katr]	'thirty "fours"'

The same difference is observed between (39b) where d is not glottalized, since it is lax, and (39a) where t is glottalized.

(39)	a. **ils ne vendent pas**	/il+nœ+vãd+pa/	>	[ilnœvãnpa]	'they don't sell'
	b. **il ne vente pas**	/il+nœ+vãt+pa/	>	[ilnœvãt'pa]	'there is no wind'

4.2.7.2 The restriction that released stops do not undergo nasal weakening must be relaxed, as it appears that nasal weakening optionally takes place before s and z under the same conditions as above:

---

[1]In some speech the p is not pronounced: **prompte** [prõt], **exempte** [ɛgzãt].

(40)	un psychiatre	/ɛ̃+psikjatr/	>	[ɛ̃msikjatr]	
			or	[ɛ̃psikjatr]	'a psychiatrist'
	un tzigane	/ɛ̃+dzigan/	>	[ɛ̃nzigan]	
			or	[ɛ̃dzigan]	'a gypsy'
	trente-cinq	/trãt+sɛ̃k/	>	[trãnsɛ̃k]	
			or	[trãtsɛ̃k]	'thirty-five'
	assomption	/asɔ̃psjɔ̃/	>	[asɔ̃msjɔ̃]	
			or	[asɔ̃psjɔ̃]	'assumption'
	sanction	/sãksjɔ̃/	>	[sãŋsjɔ̃]	
			or	[sãksjɔ̃]	'punishment'

4.2.7.3 Lax, but not tense, oral stops undergo nasal weakening when they are followed by a nasal stop, and optionally in final position.

(41)	enjambement	/ãʒãb+mã/	>	[ãʒãmmã]	'sleeping over'
	campement			[kãpmã]	'camp'
	commandement	/kɔmãd+mã/	>	[kɔmãnm̀ã]	'command'
	lentement			[lãtmã]	'slowly'
	longuement	/lɔ̃g+mã/	>	[lɔ̃ŋmã]	'lengthy'
	manquement			[mãkmã]	'lack'
(42)	on demande?	/ɔ̃+dmãd/	>	[ɔ̃nmãd]	'shall we ask?'
	on te mande	/ɔ̃+t+mãd/	>	[ɔ̃tmãd]	'they call you'
	un gnou	/ɛ̃+gnu/	>	[ɛ̃ŋnu]	'a gnu'
	un knout	/ɛ̃+knut/	>	[ɛ̃knut]	'a knout'
(43)	trente-neuf	[trãtnœf], *[trãnnœf]			'thirty-nine'
	il tombe	[iltɔ̃b] or [iltɔ̃m̀]			'he falls'
	tout le monde	[tulmɔ̃d] or [tulmɔ̃ǹ]			'everybody'
	il se fringue	[isfrɛ̃g] or [isfrɛ̃ŋ̀]			'he is getting dressed'

Note that when an oral stop is weakened in final position, the corresponding nasal is unreleased, this being the second exception (together with the velar nasal ŋ in English borrowings) to the general rule stating that postvocalic consonants are released in final position.

The weakening of word-final lax oral stops takes place not only in sentence-final position, but also before other words, including vowel-initial words:

(46)	une grande femme	[yngrãdfam] or [yngrãnfam]		'a tall woman'
	une longue soirée	[ynlɔ̃gsware] or [ynlɔ̃ŋsware]		'a long evening'
	une grande amie	[yngrãdami] or [yngrãnami]		'a close friend'

Note the contrast between (47a) and (47b) where the position of the boundary determines the phonetic form of the sentence:

(47) a. **un grand drame** /ɛ̃+grɑ̃+dram/ > [ɛ̃grɑ̃dram], *[ɛ̃grɑ̃nram]
'a great drama'

b. **une grande rame** /yn+grɑ̃d+ram/ > [yngrɑ̃dram], [yngrɑ̃nram]
'a big oar'

CHAPTER 5

SIMULTANEOUS ADJUSTMENT OF SPEECH SOUNDS

5.1 LINGUAL ASSIMILATION

5.1.1 Before Approximant

5.1.1.1 During the utterance of labial stops and fricatives (p, b, m, f, v), the tongue and pharynx, which do not participate in the production of these sounds, anticipate the articulation of the following approximant,[1] thus causing labial stops and fricatives to be palatalized before palatal approximants and velarized before velar approximants.

(1) $[+\text{ labial}] \rightarrow [\alpha\text{ lingual}] \;/\; \_\_ \left|\begin{matrix}3\text{ stricture}\\ \alpha\text{ lingual}\end{matrix}\right|$

This lingual assimilation cannot be represented as (1), where segments are characterized by a single stricture, since the characteristics of p in [pu] **pou** 'lice' would include the characteristics of k. Obviously the lingual stricture in p of **pou** is not the stricture of the stop k but rather the stricture of the approximant u. In other words, we must distinguish two strictures in a segment: the lingual stricture and the labial stricture. This distinction allows the representation of lingual assimilation to be:

(2) lingual assimilation of labial obstruents

$$[\alpha\text{ labial stricture}] \rightarrow \left|\begin{matrix}\beta\text{ lingual}\\ 3\text{ lingual stricture}\end{matrix}\right| \;/\; \_\_ \left|\begin{matrix}\beta\text{ lingual}\\ 3\text{ lingual stricture}\end{matrix}\right|$$

where $\alpha = 1$ or 2

Before initial ʃ, the labial stricture of the lax consonant v may be decreased and become the stricture of an approximant; simultaneously, the lingual stricture acquired by v through lingual assimilation is the stricture of an approximant; as expected, v is realized as a labial-lingual nonsyllabic approximant. More specifically, v is realized as the glide ɥ before a palatal vowel and as the glide w before a velar vowel.

(3)	**cheville**	[ʃœvij, ʃfij, ʃɥij]	'peg'
	cheveux	[ʃœvø, ʃfø, ʃɥø]	'hair'
	chevet	[ʃœvɛ, ʃfɛ, ʃɥɛ]	'bed-side'
	cheval	[ʃœval, ʃfal, ʃɥal]	'horse (sing.)'
	chevaux	[ʃœvo, ʃfo, ʃwo]	'horse (plur.)'

[1] Cf. Grammont 1954:77-8, 81, 85.

In the words of (3), the schwa may optionally be deleted; when this happens v immediately follows ʃ, which causes its relaxation.

(4) v-relaxation

$$v \rightarrow [3 \text{ labial stricture}] \; / \; ʃ \_\_$$

5.1.1.2 A similar phenomenon is observed during the utterance of the back stops k, g, which are respectively palatalized and velarized before palatal and velar vowels:

(5) lingual assimilation of velars

$$\left|\begin{matrix}1 \text{ lingual stricture} \\ 4 \text{ lingual}\end{matrix}\right| \rightarrow [\alpha \text{ lingual}] \; / \; \_\_ \left|\begin{matrix}\alpha \text{ lingual} \\ 3 \text{ lingual stricture}\end{matrix}\right|$$

5.1.2 Between r's

In final clusters rpr, rbr, e.g. in the words (6a), the velar stricture of r is maintained throughout the utterance of p or b:

(6) a. arbre [arbr] 'tree'
marbre [marbr] 'marble'
pourbre [purpr] 'purple'
b. ordre [ɔrdr] 'order'
perdre [pɛrdr] 'to lose'
tartre [tartr] 'tartar'

In final clusters rtr, rdr, however, the velar stricture of r is interrupted during the utterance of t and d,[1] e.g. (6b).

(7) r-adherence

$$[1 \text{ labial stricture}] \rightarrow \left|\begin{matrix}2 \text{ lingual stricture} \\ 4 \text{ lingual}\end{matrix}\right| \; / \; r\_\_r\#$$

5.2 ROUNDING

In this section we analyze the rounding of both vowels and consonants, as these two phenomena are interdependent.

5.2.1 Rounding as Independent from Labiality

All labial vowels are rounded: [y u ø o œ ɔ], and it appears that rounding for vowels is concomitant with labiality. The two features, however, must be kept apart because rounding assimilation of consonants

[1]The final clusters rfr, rvr, rgr, rkr and the clusters of the type lCl, where C is any consonant, are lacking in French. This is only a historical accident, as there does not appear to be any restriction against such clusters.

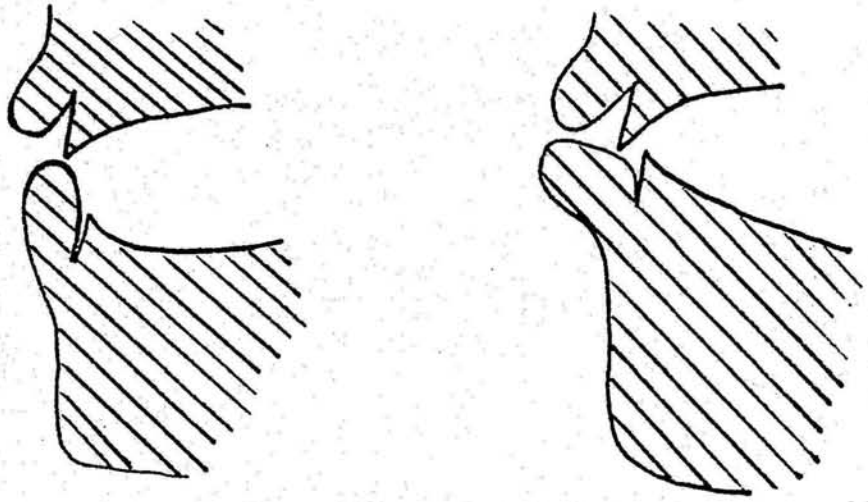
to a following vowel takes place with both labial and lingual consonants; e.g. the consonant p in **pou** [pu] 'lice' is both labial and rounded, the consonant p in **pas** [pa] 'step' is both labial and unrounded.

5.2.2 Two Types of Rounding

There are two types of rounding: (a) a vertical rounding for velar approximants and (b) a horizontal rounding for palatal approximants.[1] In velar approximants the lips move vertically towards each other causing the corners of the lips to be in contact and leaving a narrow slit in the center; the protrusion of the lips for vertical rounding is negligible. In palatal approximants, on the other hand, the lips are closed from the corners toward the center until a small oval gap is left in the center; horizontal rounding is accompanied by strong protrusion of the lips. The protrusion of the lips in palatal labial vowels is responsible for their auditory backness.[2] This difference between the two types of rounding is best observed when they are preceded by labio-dentals as in the words (8) or between i's, as in (9).

(8)	a.	**fou**	[fu]	'mad'	**enfouir**	[ãfwir]	'to bury'
	b.	**fut**	[fy]	'barrel'	**(s')enfuir**	[ãfɥir]	'to escape'

In words (8a) labio-dental contact is made between the upper part of the lower lip against the lower part of the front teeth; in words (8b) the lips protrude, thus requiring a labio-dental contact between the inner lower part of the lower lip and the front teeth.



(a) [f^{w}] (b) [f^{u}]

Figure 2. Articulation of rounded labio-dentals.

---

[1] Cf. Heffner's definition for vertical and horizontal rounding (1964:98). Ladefoged's terminology (1967:38) is 'lip compression' for vertical rounding and 'lip rounding' for horizontal rounding.

[2] Delattre 1948 shows that the second formants of y and unrounded ɛ are nearly identical.

(9) **kiwi** [kiwi] 'kiwi'

qu'il lui (a dit) [kiqi (jadi)] 'that he said to him'

5.2.3 Anticipatory Rounding

5.2.3.1 In word-initial position, all leading stops and fricatives have the same rounding as the following approximant. In example (10) t, r, and s are rounded.

(10) **tu** [t̪y] 'you'

tuile [t̪ɥil] 'slate'

trou [t̪ru] 'hole'

structure [st̪rykt̪yr] 'structure'

(11) rounding of labial sounds

$$[\alpha \text{ labial stricture}] \rightarrow [\beta \text{ round}] \; / \; \#C_0\_\_C_0 \left|\begin{matrix}3 \text{ lingual stricture} \\ \beta \text{ round}\end{matrix}\right|$$

where α = 1 or 2

(12) labialization of lingual sounds

$$[\alpha \text{ lingual stricture}] \rightarrow \left|\begin{matrix}\beta \text{ round} \\ 4 \text{ labial stricture}\end{matrix}\right| \; / \; \#C_0\_\_C_0 \left|\begin{matrix}3 \text{ lingual stricture} \\ \beta \text{ round}\end{matrix}\right|$$

where α = 1 or 2

5.2.3.2 In final position, stops and fricatives preceded by a rounded vowel are rounded except during their release, when they become unrounded:

(13) **lune** [lyn] 'moon'

ruse [ryz] 'trick'

5.2.3.3 Within words, rounding appears to be characteristic of the syllable: syllable-initial consonants behave like word-initial consonants, syllable-final consonants, like word-final consonants.

(14) **excuse** [ɛk.s̪kyz] 'excuse'

exclus [ɛk.s̪kly] 'excluded'

(15) **escroc** [ɛs.kro] 'crook'

Esculape [ɛs.k̪ylap] 'Aesculapius'

In (14) s is rounded because it belongs to the second, rounded syllable, whereas in (15) s is not rounded because it belongs to the first, non-rounded syllable.

5.2.4.4 In anticipatory rounding of stops and fricatives, the rounding is vertical if the following vowel is velar, and horizontal if

the following vowel is palatal, as expressed by rules (11) and (12). There is, however, one exception to this rule, namely, when the initial consonant is the prepalatal ʃ or ʒ, in which case the rounding is always horizontal. A closer examination shows that rounding in the prepalatals ʃ and ʒ is not due to assimilation, but appears in all positions. It is always vertical and accompanied by protrusion of the lips.[1] In all the following examples ʃ and ʒ are rounded with protrusion of the lips. (In (16) the corresponding s's and z's are all unrounded.)

(16)	**Pchitt**	[pʃit]	(trademark of a pop drink)	**psi**	[psi]	'psi'
	chat	[ʃa]	'cat'	**ça**	[sa]	'this'
	chemin	[ʃmɛ̃]	'way'	**semaine**	[smɛn]	'week'
	schlass	[ʃlas]	'knife'	**cela**	[sla]	'this'
	cage	[kaʒ]	'cage'	**case**	[kaz]	'box'

The vowels following ʃ and ʒ become rounded but without neutralizing the opposition between labial and nonlabial palatal vowels, cf. the contrast between **assis** [asi] 'seated' and **hachis** [aʃi] 'hash' or between **jus** [jy] 'juice' and **gît** [ʒi] 'lays'.

(17) vowel rounding after ʃ and ʒ

$$\begin{vmatrix} 3 \text{ lingual stricture} \\ -\text{ labial} \end{vmatrix} \rightarrow \begin{vmatrix} 1 \text{ round} \\ 4 \text{ labial stricture} \end{vmatrix} \; / \; \{ʃ, ʒ\} \_\_$$

The rounding induced by ʃ and ʒ does not characterize the whole syllable but affects only the adjacent segments, e.g. in the word **échine** [eʃin] 'spine' the consonant n is not rounded. Consonants following word-initial ʃ and ʒ are rounded:

(18)	**chemin**	[ʃm̬ɛ̃]	'path'
	schlass	[ʃl̬as]	'knife'
	je vais bien	[ʒv̬ɛbjɛ̃]	'I'm fine'

5.3 SYLLABICITY

5.3.1 Vowels are normally syllabic. In some environments, high and mid-high vowels may become nonsyllabic, e.g. **souriez** [surie] or [surje] 'smile', **casoar** [kazɔar] or [kazwar] 'cassowary'. We study this problem in more detail in Chapter 7.

5.3.2 Sonorants are normally nonsyllabic. They become syllabic when they are in initial position and followed by a nonsyllabic sound:

(19)	**ne lui dit pas**	[n̩lɥidipa]	'don't tell him'
	reluque moi ça	[r̩lykmwasa]	'look at that'
	le fumier	[l̩fymje]	'the dirty pig'

[1] Grammont 1954:76-7 shows the importance of protrusion of the lips in the articulation of these two segments.

The syllabicity is best noticed in exclamations, where the schwa in the initial article **le** is deleted and the next vowel is stressed. In some cases, the onset of vocalic [l] is acoustically close to schwa.

(20) **le fumier** [l̩fymje] or [œlfymje] 'the dirty pig'

Unlike nonvocalic initial consonants which anticipate the rounding of the next vowel, e.g. s in [s̬fymje] 'that dirty pig', syllabic sonorants tend not to anticipate the rounding of the next vowel, e.g. l in [l̩fymje]. There also is some contrast between vocalic and nonvocalic sonorants before a glide as shown in (21).

(21)	**l'ouate**	[l̬wat]	**le watt**	[l̩wat]
	l'ouie	[l̬wi]	**le oüistiti**	[l̩wistiti]
	l'iode	[ljɔd]	**le yod**	[l̩jɔd]

5.4 FRICATIVIZATION OF PALATAL GLIDES

5.4.1 Palatal glides may optionally become fricative before tense stops and fricatives.

(22)	**piailleur**	[pj̑ajœr]	'squealer'
	tiens	[tj̑ɛ̃]	'so! (expressing surprise)'
	et puis	[epɥi]	'so what'
	tuile	[tɥil]	'tile'
	kiosque	[kj̑ɔsk]	'newsstand'

Fricativization is more easily observed when the vowel following a palatal glide has an emphatic stress.

(23) fricativization

$$\begin{vmatrix} 3 \text{ lingual} \\ 3 \text{ lingual stricture} \end{vmatrix} \rightarrow [2 \text{ lingual stricture}] \; / \; \begin{vmatrix} + \text{ tense} \\ \alpha \text{ stricture} \end{vmatrix} \; —$$

where α = 1 or 2

5.4.2 Two consecutive yods become fricative.

(24) **caillions** [kajj̑ɔ̃] '(we) clot'

5.4.3 Before a consonant, j is also fricative.

(25)	**feuilleter**	[fœj̑te]	'to browse'
	bouilloire	[buj̑war]	'boiler'

5.4.4 We previously observed that labial sounds are palatalized before palatal approximants, i.e. the tongue anticipates the position of the next approximant. The lingual stricture in those cases remains the lingual stricture of the approximant. The dental n is palatalized as ɲ

before yod,[1] and not infrequently before ɥ. Compare for instance the two allophones of n in (26).

(26) a. **(je) manie** [mani] '(I) handle'
(nous) manions [maɲjõ] '(we) handle'
b. **(je) continue** [kõtiny] '(I) continue'
(nous) continuons [kõtiɲɥõ] '(we) continue'

(27) palatalization of n

$$n \rightarrow [3\ \text{lingual}] \ / \ \_\_ \begin{vmatrix} 3\ \text{lingual stricture} \\ 3\ \text{lingual} \end{vmatrix}$$

5.5 NASALIZATION

Stops and vowels are the only segments for which nasality is contrastive. Liquids and glides may become nasalized when they are in contact with nasal segments; sibilants, however, appear to be oral in all contexts.

5.5.1 Assimilation of Stops

In phrase-initial position, unreleased stops which precede a nasal stop may be nasalized.[2]

(28) **demain** [dmɛ̃] or [nmɛ̃] 'tomorrow'
demi [dmi] or [nmi] 'half'
Dniestre [dnjɛstr] or [nnjɛstr] (geographical name)

The reverse phenomenon, i.e. denasalization of phrase-initial nasal stops preceding an oral consonant is very rare and seems limited to the word (29)[3]; in all other cases (30) phrase-initial nasal stops remain nasal.

(29) **monsieur** [msjø] or [psjø] 'sir'
(30) **me salit pas** [m̥salipa] 'don't dirty me'
ne parle pas [n̥parlpa] 'don't speak'

5.5.2 Assimilation of Liquid and Glide

Liquids and glides are nasalized when they are between two nasal segments:

(31) **branlant** [brãl̃ã] 'shaking'
en rang [ãr̃ã] 'in ranks'

---

[1]Bauche 1929:50 observes that "n devient gn avant ier. Ex.: pagnier."
[2]Observed by Nyrop 1902:123.
[3]Observed by Nyrop 1902:28.

(32)	**ne rentre pas**	[nr̃ãtrœpa]	'do not go in'
	ne l'ennuie pas	[nl̃ãnɥipa]	'don't bother him'
	mien	[mj̃ɛ̃]	'mine'
	moins	[mw̃ɛ̃]	'minus'
	nuance	[nɥ̃ãs]	'hue'

5.6 TENSE-LAX OPPOSITION

5.6.1 Tense-lax Contrast

The opposition between tense and lax obstruents may be manifested by voicing, lengthening of the obstruent, and lengthening of the preceding vowel. Before an approximant or in sentence-final position, tense obstruents are voiceless and lax obstruents are voiced.

(33)	**taupe**	[t̥op̥]	'mole'
	daube	[d̬ob̬]	'slew'

Vowels preceding tense obstruents are shorter than before the corresponding lax obstruents.[1]

(34)	**bec**	[bɛk̥]	'beak'	**bègue**	[bɛ:g̬]	'stutter'
	bêche	[bɛʃ̥]	'spade'	**beige**	[bɛ:ʒ̬]	'beige'

Finally, in a given context, tense obstruents are longer than lax obstruents.[2] As a rule, therefore, tense and lax obstruents are respectively voiceless and voiced, except before another obstruent, where they tend to assimilate to the next obstruent with respect to voicing.

5.6.2 Voicing Assimilation

We saw previously that glide and liquid releases assimilate to a preceding obstruent with respect to voicing (except, perhaps, l after p). This appears to be also true of postconsonantal nasals:

---

[1] Cf. Delattre 1939b and Delattre 1941.

[2] Cf. Thorsen 1966:73-5. In his experiments, Thorsen was looking for a context-independent cue for tenseness, but found (a) that lax and tense obstruents are shorter before lax obstruents than before tense obstruents, and (b) that obstruent length was not a context-independent cue for tenseness. His experiments, however, show that in a given context, obstruent length is directly related to tenseness. In an experiment which I conducted, I found that discrimination between lax and tense obstruents in prevocalic and postvocalic positions is maintained in whispered speech, although the discrimination was slightly less accurate for word-initial prevocalic stops, as in **bière** [bjɛr] 'beer', **pierre** [pjɛr] 'stone'.

(35)

gnou	[gnu]	'gnu'
acné	[akne]	'acne'
segment	[sɛgmã]	'segment'
asthme	[asm]	'asthma'
flegme	[flɛgm]	'phlegm'

However, a nasal stop is voiced when it is preceded by an epenthetic release:

(36)

knout	[k°nut]	'knout'
acné	[ak°ne]	'acne'

In all other positions, sonorants are voiced.

Prevocalic obstruents assimilate to a following obstruent with respect to voicing, while maintaining the lax-tense opposition.

(37) Lax obstruents before tense obstruents

/p,b/	ça ne se développe pas	[sansœdevlɔppa]	'it does not grow'
	ça ne l'englobe pas	[sanlãglɔbpa]	'it does not include it'
/t,d/	ça ne s'évite pas	[sansevitpa]	'it's unavoidable'
	ça ne s'évide pas	[sansevidpa]	'it cannot be unrolled'
/k,g/	il ne la brique pas	[inlabrikpa]	'he does not clean it'
	il ne la brigue pas	[inlabrigpa]	'he does not maneuver to get it'
/f,v/	il ne suife pas	[insɥifpa]	'it does not grease'
	ils ne suivent pas	[insɥivpa]	'they don't follow'
/s,z/	il ne le visse pas	[inlœvispa]	'he does not screw it'
	il ne le vise pas	[inlœvizpa]	'he does not aim at it'
/ʃ,ʒ/	il ne le bouche pas	[inlœbuʃpa]	'he does not clog it'
	il ne le bouge pas	[inlœbuʒpa]	'he does not move at it'

(38) Tense obstruents before lax obstruents (replace ne...pas by bien in the previous example)

ça se développe bien	[sasdevlɔpbjɛ̃]	'it grows well'
ça l'englobe bien	[salãglɔbbjɛ̃]	'it includes it well'
...		

This assimilation, however, does not take place when the obstruent is followed by an epenthetic release:

(39) anecdote [anɛkdɔt] or [anɛk°dɔt] 'anecdote'

Initial obstruents followed by another obstruent behave like prevocalic obstruents, with the exception of spirants. Tense spirants may remain voiceless in initial position:

(40)	te joue pas de moi	[tʒupadmwa]	'don't trick me'
	ce garçon	[sgarsɔ̃] or [sgarsɔ̃]	'that boy'

Lax spirants before tense obstruents become tense in initial position:

(41) je faibli [ʒœfɛbli], [ʃfɛbli] 'I am becoming weak'

5.6.3 Lax-tense Assimilation

Within a word, the assimilation between two obstruents is often not limited to voicing alone, but also optionally extends to tenseness or laxness:

(42)	le second	[lœsgɔ̃], [lœzgɔ̃]	'the second'
	Sganarelle	[sganarɛl], [sganarɛl], [zganarɛl]	(proper name)
	absent	[apsã], [apsã]	'absent'
	obtus	[ɔpty], [ɔpty]	'obtuse'
	jeton	[ʒtɔ̃], [ʃtɔ̃]	'mark'

Within a word, the assimilation of two consecutive spirants is not always regressive, as is the case when the two spirants belong to different words, e.g. (45), but is regressive in the group fz, e.g. (46a), progressive in the group ʃv, e.g. (46b), and either in the group sʒ, e.g. (46c).

(45)	je sais bien	[ʒœsɛbjɛ̃], [ʃsɛbjɛ̃], [ʃʃɛbjɛ̃]	'I know'
	je cherche	[ʒœʃɛrʃ], [ʃʃɛrʃ]	'I am looking'
	je faibli	[ʒœfɛbli], [ʃfɛbli]	'I am becoming weak'
	une tache verte	[yntaʃvɛrt]	'a green spot'
(46)	a. faisez le	[fœzelø], [fzelø], [vzelø]	'do it'
	b. achevez le	[aʃœvelø], [aʃfelø]	'finish it'
	c. disjoint	/disʒwɛ̃/ > [dizʒwɛ̃], [disʃwɛ̃]	'disjoint'

Example (46) indicates that weak spirants f and v assimilate to strong spirants s, z, ʃ, and ʒ. When both spirants are strong, the assimilation may take place in either direction.

CHAPTER 6

VOWEL SYSTEM

6.1. ACADEMIC FRENCH

6.1.1 Inventory of Vowels

Academic French distinguishes twelve oral and four nasalized vowels.

	Classification[1]		
	front unrounded	front rounded	back rounded
Oral vowels			
high	i	y	u
high mid	e	ø	o
low mid	ɛ	œ	ɔ
low	a	ə	ɑ
Nasalized vowels			
low mid	ɛ̃	œ̃	ɔ̃
low			ɑ̃

Table 13 shows examples of these vowels.

The acoustic contrast between high mid and low mid vowels with the same place of articulation is stronger in the last syllable of a word, is less marked in the penult, and still less marked in the other syllables (Fouché 1959:63-4, Warnant 1968:xvi), high mid vowels becoming less high and low mid vowels becoming less low. As we shall see later, there is a distinctive contrast between high mid and low mid vowels only in the last syllable and, in the case of o - ɔ, in the penult as well.

6.1.2 Contrast in Final Syllables

In word-final syllables, the contrast between e and ɛ, between o and ɔ, between ø and œ, and between œ and ə depends on the nature of the syllable.

Contrast between e and ɛ

The vowels e and ɛ contrast only in open syllables.[2] Only ɛ appears

---

[1]This classification has been proposed by Hall 1948. In Chapters 6 and 7, we shall use the terms 'front' and 'back' for vowels instead of 'palatal' and 'velar', respectively, in conformance with traditional descriptions; for the same reasons we shall use interchangeably the features 'labial' and 'rounded' for vowels.

[2]Even in open syllables the distribution of e and ɛ appears to be idiolectal. In Southern speech, ɛ does not appear in final open syllables. In Northern speech, the distribution of e and ɛ varies with the speaker:

TABLE 13: CONTRASTIVE DISPLAY OF ACADEMIC FRENCH VOWELS

/i/	vie	[vi]	'life'	brie	[bri]	'Brie cheese'	lie	[li]	'dregs'
/e/	v	[ve]	'v-shaped'				lé	[le]	'width'
/ɛ/	vais	[vɛ]	'go (1st pers. sg. present)'	braies	[brɛ]	'breeches'	lait	[lɛ]	'milk'
/a/	va	[va]	'go (3rd pers. sg. present)'	bras	[bra]	'arm'	là	[la]	'there'
/ɛ̃/	vin	[vɛ̃]	'wine'	brin	[brɛ̃]	'bit'	lin	[lɛ̃]	'flax'
/y/	vue	[vy]	'view'	brue	[bry]	'daughter-in-law'	lu	[ly]	'read (past part.)'
/ø/	voeu	[vø]	'wish'				leu	[lø]	(Rumanian unit)
/œ/									
/ə/							le	[lə]	'it'
/œ̃/				brun	[brœ̃]	'brown'			
/u/	vous	[vu]	'you'	brou	[bru]	'husk'	loue	[lu]	'rent (3rd pers. sg. present)'
/o/	vos	[vo]	'your (pl.)'	broc	[bro]	'pitcher'	lot	[lo]	'prize'
/ɔ/									
/ɑ/							las	[lɑ]	'tired'
/ɔ̃/	vont	[vɔ̃]	'go (3rd pers. pl. present)'				long	[lɔ̃]	'long'
/ɑ̃/	vent	[vɑ̃]	'wind'				lent	[lɑ̃]	'slow'

TABLE 13 (Concluded)

/i/	**ville**	[vil]	'town'	**cil**	[sil]	'eyelid'	**cillait**	[silɛ]	'blinked (3rd pers. sg. imperfect)'
/e/									
/ɛ/				**selle**	[sɛl]	'saddle'	**scellait**	[sɛlɛ]	'closed (3rd pers. sg. imperfect)'
/a/	**valent**	[val]	'are worth'				**salait**	[salɛ]	'salted (3rd pers. sg. imperfect)'
/ɛ̃/									
/y/									
/ø/	**veule**	[vøl]	'weak'						
/œ/	**veulent**	[vœl]	'want (3rd pers. pl. present)'	**seul**	[sœl]	'alone'	**seulet**	[sœlɛ]	'lonely'
/ə/							**celait**	[səlɛ]	'hid (3rd pers. sg. imperfect)'
/œ̃/									
/u/				**saoule**	[sul]	'drunk (fem.)'	**saoulait**	[sulɛ]	'got drunk (3rd pers. sg. imperfect)'
/o/				**saule**	[sol]	'willow'	**saulaie**	[solɛ]	'willow park'
/ɔ/	**vol**	[vɔl]	'flight'	**sole**	[sɔl]	'sole'			
/ɑ/									
/ɔ̃/									
/ɑ̃/									

in closed syllables:

(2) a. dé [de] 'dice'
dais [dɛ] 'canopy'
b. fête [fɛt] 'feast'

Contrast between ø and œ, and between o and ɔ

The contrast between ø and œ and between o and ɔ is limited to closed syllables without postvocalic r. Only the high vowels ø and o appear in final position. Only the low vowels œ and ɔ appear before r:

(3) a. saule [sol] 'willow'
sole [sɔl] 'sole'
b. noyau [nwajo] 'kernel'
c. porte [pɔrt] 'door'

The vowels o and ɔ do not contrast in a word-final syllable ending in ɲ, where only ɔ appears, or in a word-final syllable ending in z, where only o appears:

(4) cogne [kɔɲ] 'cop' rose [roz] 'rose'

This lack of contrast appears to be an accidental gap, as o may appear before the other nasal consonants n and m, and ɔ before the other sibilants s, ʃ, and ʒ:

(5)	/p/	taupe	[top]	'mole'	top	[tɔp]	'tone'
	/b/	aube	[ob]	'dawn'	globe	[glɔb]	'globe'
	/t/	côte	[kot]	'slope'	cote	[kɔt]	'measure'

"... les Français divergent dans la répartition qu'ils font des différents phonèmes de leur langue. Pour gai, les uns disent [ge], les autres [gɛ]. Tel prononce [ke] pour quai qui dit [gɛ] pour gai, ou inversement [kɛ] et [ge]. Est et et sont prononcés par certains de façon identique, [e] chez les uns, [ɛ] chez les autres. Mais beaucoup distinguent les deux mots et disent, les uns [e], [ɛ], les autres [ɛ], [e] ... Dans ces conditions, il paraît bien difficile de dresser pour le français un système phonologique unique. Ceux qui se sont jusqu'à ce jour attachés à ce problème, que leur préoccupations aient été explicitement phonologiques et scientifiques, ou simplement descriptives avec des arrières pensées normatives, ont eu tendance à établir leurs propres habitudes phoniques comme base de leur description." Martinet 1949: 30-31.

This is not a case of free variation, each speaker having a definite and stable distribution in word-final position.

/k/	rauque	[rok]	'coarse'	roc	[rɔk]	'rock'
/g/	baugue	[bog]		vogue	[vɔg]	'fashion'
/m/	paume	[pom]	'palm'	pomme	[pɔm]	'apple'
/n/	cône	[kon]	'cone'	conne	[kɔn]	'silly (fem.)'
/ɲ/	----			cogne	[kɔɲ]	'cop'
/f/	sauf	[sof]	'safe'	étoffe	[etɔf]	'cloth'
/v/	fauve	[fov]	'wild beast'	ove	[ɔv]	'ovolo'
/s/	fausse	[fos]	'false (fem.)'	fosse	[fɔs]	'pit'
/z/	rose	[roz]	'rose'	----		
/ʃ/	gauche	[goʃ]	'left'	coche	[kɔʃ]	'coach'
/ʒ/	jauge	[ʒoʒ]	'gauge'	loge	[lɔʒ]	'lodge'

Before a cluster *consonant + liquid*, the contrast between o and ɔ is limited to the clusters tr and fr; but again, this appears to be an accidental gap:

(6)	/p/	propre	[prɔpr]	'proper'	----		
		sinople	[sinɔpl]	'sinople'	----		
	/b/	sobre	[sɔbr]	'sober'	----		
		noble	[nɔbl]	'noble'	----		
	/t/	notre	[nɔtr]	'our'	nôtre	[notr]	'ours'
	/k/	ocre	[ɔkr]	'ochre'	----		
		socle	[sɔkl]	'pedestal'	----		
	/g/	ogre	[ɔgr]	'ogre'	----		
	/f/	offre	[ɔfr]	'offer'	gauffre	[gofr]	'waffle'
		girofle	[ʒirɔfl]	'clove'	----		
	/v/	----			pauvre	[povr]	'poor'

The vowels œ and ø contrast only before n and l in word-final syllables; the lack of contrast appears to be accidental:

(7)	/b/	club	[klœb]	'club'	----		
	/t/	----			meute	[møt]	'pack'
	/d/	----			leude	[lød]	
	/k/	----			Pentateuque	[pɛ̃tatøk]	'Pentateuch'
	/m/	----			neume	[nøm]	'neume'
	/n/	jeune	[ʒœn]	'young'	jeûne	[ʒøn]	'fasting'
	/f/	oeuf	[œf]	'egg'	----		
	/v/	preuve	[prœv]	'proof'	----		

/s/	----			loess	[løs]	'loess'
/z/	----			plieuse	[plijøz]	'folder'
/ʒ/	----			Maubeuge	[mobøʒ]	(town)
/l/	veulent	[vœl]	'want (3rd pers. pl. present)'	veule	[vøl]	'weak'
/j/	œil	[œj]	'eye'	---		

The vowels œ and ø do not contrast before *consonant + liquid* clusters except before the cluster gl; this appears to be an accidental gap:

(8)	/p/	peuple	[pœpl]	'people'	----		
	/b/	meuble	[mœbl]	'furniture'	----		
	/t/	----			feutre	[føtr]	'felt'
	/g/	aveugle	[avœgl]	'blind'	meugle	[møgl]	'to mow (3rd pers sg. present)'
	/v/	oeuvre	[œvr]	'creation'	----		

Contrast between œ and ə

There is no contrast between œ and ə in word-final syllables. The vowel ə appears in open syllables, the vowel œ in closed syllables:

(9)	a.	donne-moi-le	[dɔnmwalə]	'give it to me'
	b.	donne-moi l'oeuf	[dɔnmwalœf]	'give me the egg'

6.1.3 Contrast in Nonfinal Syllables

In nonfinal syllables, it is always possible to find examples of minimal contrast for any pair of vowels.

6.2 COLLOQUIAL FRENCH

In the previous section we made an inventory of vowels recognized in Academic French; from now on, we shall describe the vowel system of colloquial French, and more particularly of my speech.

6.2.1

Some of the contrasts found in Academic French are not found in my speech; namely the contrast between a and ɑ; between œ̃ and ɛ̃, and between œ and ə.[1] The following examples show complete assimilation of these pairs:

---

[1]Hesitations between œ̃ and ɛ̃ and between a and ɑ have already been observed by Nyrop 1902:76,79; Grammont as early as 1914 analyzes ə as being phonetically œ (1954:115). Pleasants 1956 describes a series of experiments conducted in 1939 showing that ə and œ are acoustically different; she does not show, however, that ə and œ can be distinguished

(10) a - ɑ

il est là [ilɛla] 'he is here' (Acad. [a])

il est las [ilɛla] 'he is tired' (Acad. [ɑ])

ɛ̃ - œ̃

(un) brin [brɛ̃] 'a little bit' (Acad. [ɛ̃])

(un) brun [brɛ̃] 'a dark haired person' (Acad. [œ̃])

œ - ə

(je compte) le relire [lœrlir] 'I intend to read it again' (Acad. [ə])

(je compte) leur lire [lœrlir] 'I intend to read it to them' (Acad. [œ])

---

when in the same context, as for instance in the citation forms abreuvait [abrœvɛ] and brevet [brəvɛ] or seulet [sœlɛ] and celait [səlɛ]. In her experiments, Pleasants first taught her subjects to distinguish between ø, œ and ə in isolation:

'*Question A1.*

On a prononcé d'abord les sons isolés [ə], [ø], [œ] [pronounced by whom?, since it never occurs in French in this position]. Puis nous avons posé au sujet les questions suivantes:

a) Entendez-vous toujours la même voyelle?

....

Réponse A1.

... deux sujets, B et F [out of a total of eight], ont hésité beaucoup plus longtemps; ils nous ont demandé de répéter les trois sons plusieurs fois. Ils ont alors reconnu trois voyelles différentes.' Pleasants 1956:28 (Expressions between square brackets are mine.)

After which, her subjects distinguished between the ə of ne and the œ of neuf, which are not in the same context:

'*Question B1.*

La question était posée par écrit de la façon suivante: a) Prononcez-vous l'e de ne comme la voyelle de noeud ou comme celle de neuf? ou autrement?' Pleasants 1956:32

They cannot always distinguish, however, between such expressions as je ne vaux rien [ʒənvorjɛ̃] and jeune vaurien [ʒœnvorjɛ̃], or le rôt [ləro] and leur eau [lœro], in spite of the cues given by the word boundaries:

'*Question A3.*

....

Réponse A3.

... à part deux sujets, A et B qui n'ont pas distingué entre je ne vaux rien et jeune vaurien, et deux sujets également, B et E qui n'ont pas entendu de différence entre le rôt et leur eau.' Pleasants 1956:32

	Classification		
	front unrounded	front rounded	back rounded
Oral vowels			
high	i	y	u
high mid	e	ø	o
low mid	ɛ	œ	ɔ
low	a		
Nasalized vowels			
low mid	ɛ̃		ɔ̃
low			ã

6.2.2 Contrast in Syllable Final Position

The contrasts observed for Academic French between e and ɛ, between ø and œ, and between o and ɔ are also found in colloquial French. On the other hand, ə and œ, which were in complementary distribution, are now indistinguishable.

The constraints which govern the presence of ɛ in closed syllables and of o in open syllables can be interpreted as morpheme structure constraints of the kind:

(11) $\begin{vmatrix} +\text{front} \\ +\text{mid} \\ -\text{round} \end{vmatrix} \rightarrow [+\text{low}] \; / \; \_\_ \; C_1\#$

(12) $\begin{vmatrix} +\text{back} \\ +\text{mid} \end{vmatrix} \rightarrow [-\text{low}] \; / \; \_\_ \; \#$

6.2.3 Contrast in Nonfinal Syllables

In nonfinal syllables, it is always possible to find examples of minimal contrast for any pair of vowels.

6.3 ALLOPHONIC DISTRIBUTION OF LENGTH

Vowel duration is not contrastive in my speech; it is always determined by the phonological context and depends on (1) whether or not the vowel is stressed, (2) the nature of the following consonant, and (3) the nature of the vowel itself.

6.3.1 Only stressed vowels may be long. Emphatically stressed vowels are always long. We shall analyze here only the length of nonemphatically stressed vowels, i.e. vowels in the last syllable.

6.3.2 Word-final vowels are always short:

(13) **vie** [vi], **v** [ve], **vais** [vɛ], **va** [va], **vin** [vɛ̃], **vue** [vy], **veut** [vø], **le** [lœ], **vous** [vu], **vos** [vo], **vont** [vɔ̃], **vent** [vã]

The length of a preconsonantal vowel is a function of the consonant or cluster of consonants following it and varies on a continuum. Delettre's studies (1966:111-9) show that, as a rule,

1. vowels are shorter before a voiced consonant than the corresponding voiceless consonant:

bec	[bɛk]	'beak'	**bègue**	[bɛg]	'stutterer'
bèche	[bɛʃ]	'spade'	**beige**	[bɛʒ]	'beige'

2. vowels are shorter before a stop than the corresponding continuant:

grèbe	[grɛb]	'grebe'	**grève**	[grɛv]	'strike'

3. for a given stop C and a liquid L, vowels are shorter before LC than before L, and shorter before C than before CL:

serpe	[sɛrp]	'sickle'	**cèpe**	[sɛp]	'esculent botelus'
cède	[sɛd]	'gives (3rd pers. sg. present)'	**cèdre**	[sɛdr]	'cedar'

The [ɛ] in **serpe** is shorter than the [ɛ] in **cèpe**.

The [ɛ] in **cède** is shorter than the [ɛ] in **cèdre**.

However, linguists traditionally, and rather consistently, divide this continuum into two classes. They distinguish a class of lengthening consonants or clusters of consonants, r, z, ʒ, v, and vr, before which vowels are considerably longer than before other consonants or clusters of consonants[1]:

(14)

serre	[sɛ:r]	'greenhouse'
seize	[sɛ:z]	'sixteen'
siège	[sjɛ:ʒ]	'seat'
sève	[sɛ:v]	'sap'
Sèvres	[sɛ:vr]	(town)

---

[1]Nyrop 1902:86-92 describes the lengthening consonants as the 'spirantes sonores' z, ʒ, v, j and r; Damourette & Pichon 1927:185 list r, ʒ, z, v and vr; Grammont 1954:12 lists r, z, ʒ and v; Fouché 1959:xxxvii-xlii lists r, ʒ, z, v and vr; Warnant 1968 indicates vowel lengthening before r, ʒ, z, v and vr. Nyrop & Passy 1929:62-3 also include j among lengthening consonants. In my speech, ɛ before j is perceptually short.

(15) **cèpe** [sɛp] 'esculent boletus'
selle [sɛl] 'saddle'
sème [sɛm] 'sows (3rd pers. sg. present)'
saine [sɛn] 'healthy (fem.)'
sept [sɛt] 'seven'
sèche [sɛʃ] 'dry (fem.)'
cesse [sɛs] 'stops (3rd pers. sg. present)'
seille [sɛj] 'bucket'

This class of lengthening consonants consists of (1) the liquid r and (2) the class of lax continuants optionally followed by r (the clusters zr and ʒr do not appear in word-final position).

(16)
$$[+\text{syllabic}] \rightarrow [+\text{long}] \; / \; \_\_ \left\{ \begin{array}{l} r \\ \left| \begin{array}{l} \text{2 stricture} \\ +\text{lax} \\ -\text{sonorant} \end{array} \right| (r) \end{array} \right\} \#$$

6.3.3 In a given environment the length of the vowel may depend upon the vowel itself:

(17) **cote** [kɔt] 'measure' **conte** [kɔ̃:t] 'tale'
côte [ko:t] 'hill'
ode [ɔd] 'ode' **onde** [ɔ̃:d] 'wave'
Aude [o:d] (river)

6.3.3.1 Nasalized vowels are always long in closed final syllables:

(19) **mont** [mɔ̃] 'mount'
monte [mɔ̃:t] 'climbs (3rd pers. sg. present)'
montre [mɔ̃:tr] 'watch'
monture [mɔ̃ty:r] 'horse'

(20) $\left| \begin{array}{l} +\text{syllabic} \\ +\text{nasal} \end{array} \right| \rightarrow [+\text{long}] \; / \; \_\_ \; C_1\#$

6.3.3.2 The high mid vowels o and ø are always long in closed final syllables:

(21) **haut** [o] 'high (masc.)'
haute [o:t] 'high (fem.)'
autre [o:tr] 'other'
hauteur [otœ:r] 'height'
meute [mø:t] 'pack'

(22) $\begin{vmatrix} +\text{syllabic} \\ +\text{mid} \\ +\text{high} \end{vmatrix} \rightarrow [+\text{long}] \; / \; \_\_ \; C_1\#$

Therefore, the pairs o, ø and ɔ, œ contrast not only with respect to height, but in final syllables also with respect to length.

(23)	**sotte**	[sɔt]	'idiot (fem.)'	**saute**	[so:t]	'jump'
	jeune	[ʒœn]	'young'	**jeûne**	[ʒø:n]	'fasting'

It is exactly before lengthening consonants that the opposition between o and ɔ and between ø and œ is least marked; o, ø never appear before final r, nor do ɔ, œ appear before final z.

(24)	**Meuse**	[mø:z]	(river)	**meurt**	[mœ:r]	'dies (3rd pers. sg. present)'
	pose	[po:z]	'poise'	**port**	[pɔ:r]	'harbor'

6.4 ALLOPHONIC VARIATIONS OF ɔ

6.4.1 Description of Centralization of ɔ

The pronunciation of ɔ in words such as **soviétique** [sɔvjetik] may vary from the back rounded vowel ɔ to the central rounded œ.[1] Note that ɔ and schwa are still distinguishable: (a) ɔ unlike schwa is not deletable, even when centralized, (b) ɔ can take the two pronunciations ɔ or œ, schwa can only be œ.

(25)	**semaille**	/səmaj/ >	[sœmaj] or [smaj]	'sowing'
	sommeil	/sɔmɛj/ >	[sɔmɛj] or [sœmɛj], *[smɛj]	'tiredness'
(26)	**grogner**	/grɔɲe/ >	[grɔɲje] or [grœɲje]	'to growl'
	grenier	/grənie/ >	[grœɲje], not *[grɔɲje]	'attic'

We account for this phenomenon by postulating an optional rule which optionally centralizes /ɔ/.

(27) ɔ-centralization

ɔ → œ

6.4.2 Phonological Environment of ɔ-Centralization

---

[1] This was observed as early as 1507, when Vaugelas 1507:425 complained about the "vicious" pronunciation **quemancer** for **commencer** 'to begin'. Also Martinet 1958 and Lindgren 1968:19-21. It seems limited to Northern speech; I have also observed it in some forms of Franco-Canadian speech. Note also the alternative spellings for proper nouns, 'Maurice' and 'Meurisse'.

6.4.2.1 ɔ-centralization does not take place when ɔ is preceded by velar k, g:

(28)	**coffre**	[kɔfr]	*[kœfr]	'trunk'
	commissaire	[kɔmisɛr]	*[kœmisɛr]	'police chief'
	gomme	[gɔm]	*[gœm]	'eraser'
	(se)gominer	[gɔmine]	*[gœmine]	'to grease one's hair'

Native speaker reaction to the pronunciation [kœfr] or [gœm] for **coffre** or **gomme** is that the k and the g are "bad", but not the œ itself. The back stops are velar k, g before back vowels but become medio-palatal c, ɟ before œ and front vowels. It appears then that it is the side effect of centralization of ɔ which makes it impossible after k and g.[1]

6.4.2.2 ɔ-centralization does not take place when ɔ is stressed and precedes the liquid /r/:

(29)	**sort**	[sɔr]	*[sœr]	'go out'	**soeur**	[sœr]	'sister'
	port	[pɔr]	*[pœr]	'harbor'	**peur**	[pœr]	'fright'
	mort	[mɔr]	*[mœr]	'death'	**meurt**	[mœr]	'die (imp.)'
	or	[ɔr]	*[œr]	'gold'	**heure**	[œr]	'hour'

6.4.2.3 When /ɔ/ is unstressed and precedes the liquid /r/, it may or may not be centralized, depending on the speaker. This appears to be completely idiolectal.[2] However, verbs ending in ɔre or ɔrize, which have historical variants ending in œr, generally undergo ɔ-centralization. This appears to be an analogical regularization of historically related roots:

(30)	**meilleur**	[mɛjœr]	'better'	**améliorer**	[ameljɔre] or [ameljœre] 'to improve'
	détériorer	[deterjɔre] or [deterjœre]			'to ruin'

In the conjugation of verbs (30) ɔ does not centralize in final syllables:

(31)	**j'améliore**	[ʒameljɔr]	*[ʒameljœr]	'I improve'
	j'détériore	[ʒœdeterjɔr]	*[ʒœdeterjœr]	'I ruin'

(32)	**vapeur**	[vapœr]	'steam'	**vaporiser**	[vapœrize] 'to vaporize'
	extérieur	[ɛksterjœr]	'exterior'	**extérioriser**	[ɛksterjœrize] 'to exteriorize'
	terreur	[tɛrœr]	'terror'	**terroriser**	[tɛrœrize] 'to terrorize'

[1]It is possible, though, that ɔ-centralization does occur after velar consonants, but that these velar consonants do not palatalize; more research is required to settle the question.

[2]I have observed changes in speakers' reaction to centralization; forms which were recognized first as not undergoing ɔ-centralization eventually became acceptable with an œ.

In the other cases ɔ may or may not centralize:

(33) (a) **temporiser** [tãpɔrize] 'to temporize'
(b) **autoriser** [otɔrize] 'to authorize'
(c) **horrifier** [ɔrifje] 'to horrify'
(d) **perforer** [pɛrfɔre] 'to perforate'
(e) **déplorer** [deplɔre] 'to deplore'
(f) **explorer** [ɛksplɔre] 'to explore'
(g) **commémorer** [kɔmemɔre] 'to commemorate'
(h) **ignorer** [iɲjɔre] 'to ignore'
(i) **honorer** [ɔnɔre] 'to honor'
(j) **incorporer** [ɛ̃kɔrpɔre] 'to incorporate'
(k) **dévorer** [devɔre] 'to devour'

In my idiolect the vowels ɔ appearing in the words (a) to (h) can all be centralized, but not the vowels ɔ in words (i) to (k). However, I have observed idiolects where only (c, f, i) and (j) could be centralized.

6.4.3 Vowel Harmony Interactions

Because of vowel harmony, a schwa is optionally realized as ɔ when it closely precedes an ɔ, as in (34):

(34) **menotte** [mœnɔt], [mɔnɔt] or [mœnœt] 'handcuffs'
grelotter [grœlɔte], [grɔlɔte] or [grœlœte] 'to shiver'
belote [bœlɔt], [bɔlɔt] or [bœlœt] (card game)

In these words the academic pronunciation with [œ] - [ɔ] is the least natural, and the pronunciation with both [œ] - [œ] the most common.

6.5 ALLOPHONIC VARIATIONS OF a

In the previous classifications of vowels for colloquial French, a has been classified as a front vowel. It appears that a is actually unmarked for frontness, and depending on its phonological environment, can be either front or back. We have not found any acoustic description of this phenomenon; some phonological phenomena, although marginal, corroborate this analysis.

6.5.1 Deconsonantalization of v after ʃ

Deconsonantalization of v after ʃ is observed in many dialects of French.[1] In my speech, v immediately following a ʃ after deletion of

[1]Observed in Paris by Bauche 1929:51, who cites the pronunciations [ʃəval, ʃfal, ʃɥal] and [ʃwal] for **cheval** 'horse' and [ʃəvo, ʃfo, ʃɥo]

schwa is devoiced; when it is in a word-initial syllable, it may become a glide (ɥ, w) instead. This phenomenon is described in Section 5.1.1.

(35) **cheville** [ʃœvij, ʃfij, ʃɥij] 'peg'
cheveux [ʃœvø, ʃfø, ʃɥø] 'hair'
chevet [ʃœvɛ, ʃfɛ, ʃɥɛ] 'bedside'
cheval [ʃœval, ʃfal, ʃɥal] 'horse (sg.)'
chevaux [ʃœvo, ʃfo, ʃwo] 'horses (pl.)'

In **cheval**, a behaves like a front vowel. The list (35) of words in which we observe deconsonantalization of v is nearly exhaustive; deconsonantalization does not allow us to find other environments where a is frontal.

6.5.2 Allophones of Labial Velars

The phenomenon we describe now is also very marginal and restricted to recent Latin borrowings. The velar consonants k, g may be followed by either front or back rounded glides ɥ, w independently of the phonological context:

(36) **gouine** [gwin] 'lesbian'
aiguille [egɥij] 'needle'
couine [kwin] 'squeaks (3rd pers. sg. present)'
cuit [kɥi] 'cooked'

However, there are some alternations between gɥ and gw and between kɥ and kw: gɥ and kɥ appear before front vowels, gw and kw before back vowels. This suggests that the pairs gɥ, gw and kɥ, kw are each allophones of some rounded velars g^w and k^w which assimilate to a following vowel with respect to frontness.[1]

(37) **linguiste** [lɛ̃gɥist] 'linguist'
lingual [lɛ̃gɥal] 'lingual'
linguaux [lɛ̃gwo] 'lingual (pl.)'
linguatule [lɛ̃gwatyl] (worm)
quinquagénaire [kɥɛ̃kwaʒɛnɛr] 'quinquagenarian'
quinquennal [kɥɛ̃kɥɛnal] 'quinquennial'

---

and [ʃwo] for **chevaux** 'horses'. Note also the pronunciation [ʒwal] in some Franco-Canadian dialects for **cheval**. (The name Joual [ʒwal] has been adopted to designate these dialects.)

[1]The alternation found in **lingual** [lɛ̃gɥal], **linguaux** [lɛ̃gwo] is not usually recorded in dictionaries: Robert 1968:996 and Warnant 1968: 236 give [lɛ̃gwal, lɛ̃gwo], whereas Juilland 1965:203, 204, 263 gives **lingual** [lɛ̃gwal], **linguaux** [lɛ̃gwo], **sublingual** [syblɛ̃gɥal], **sublinguaux** [syblɛ̃gɥo].

This distribution is found in all other late Latin borrowings:

(38)	**équilatère**	[ekɥilatɛr]	'equilateral'
	équation	[ekwasjɔ̃]	'equation'
	quatuor	[kwatɥɔr]	'quatuor'
	quidam	[kɥidam]	'a certain individual'
	quota	[kwota]	'quota'
	adéquat	[adekwa]	'adequate'

In these examples, a before a final l behaves like a front vowel, and in all other positions (i.e. here in open syllables), like a back vowel.

6.6 MID-VOWELS: GENERALITIES

6.6.1 In the three groups of mid-vowels, front unrounded e and ɛ, front rounded ø and œ, and back rounded o and ɔ, the low mid-vowels and the high mid-vowels contrast in word-final syllables: **v** [ve], **vais** [vɛ]; **veule** [vøl], **veulent** [vœl]; **saule** [sol], **sole** [sɔl]. The contrast in other positions is less marked (1) because the phonetic contrast between high and low mid-vowels is less important: both series of vowels are short, high mid-vowels are less high, and low mid-vowels less low; and (2) because there are many free variations between low mid-vowels and their corresponding high mid-vowels, as shown in (39).

(39)	**élevé**	[elve, ɛlve]	'raised'
	potiron	[potirɔ̃, pɔtirɔ̃]	'squash'
	peut-être	[pøtɛtr, pœtɛtr]	'perhaps'

There appear to be many factors governing the height of mid-vowels, among which are *vowel harmony* and *openness* of syllables. Vowel harmony makes vowels agree in height with a following vowel. Mid-vowels tend to be low in closed syllables and high in open syllables. The analysis is further complicated by the fact that the distribution between high and low mid-vowels is not the same for the three groups of mid-vowels. One generalization seems to apply to all mid-vowels: only low mid-vowels may appear before a final or preconsonantal r:

(40)	/ɛ/	**altère**	[altɛr]	'modifies (3rd pers. sg. present)'
		altérera	[altɛrra]	'will modify (3rd pers. sg. future)'
		altérer	[altere, altɛre]	'to modify'
	/œ/	**heurt**	[œr]	'clash'
		heurter	[œrte]	'to hurt'
		heureux	[ørø, œrø]	'happy'
	/ɔ/	**dort**	[dɔr]	'sleeps (3rd pers. sg. present)'
		dormez	[dɔrme]	'sleep (2nd pers. pl. present)'
		auréole	[oreɔl, ɔreɔl]	'aureole'

This constraint can be represented as the following morpheme structure rule:

(41) $\begin{vmatrix}+\text{syllabic}\\+\text{mid}\end{vmatrix} \rightarrow [+\text{low}] \;/\; \_\_\; r \begin{Bmatrix}[-\text{syllabic}]\\ \#\end{Bmatrix}$

6.6.2 However, many alternations between low mid-vowels and their corresponding high mid-vowels found in morphologically related words or in abbreviations cannot be accounted for by morpheme structure conditions valid for all three pairs of mid-vowels; cf. the morphological variations in (42) or the abbreviations of (43):

(42)

sot	[so]	'silly (masc.)'	**sotte**	[sɔt]	'silly (fem.)'
veut	[vø]	'wants (3rd pers. sg. present)'	**veulent**	[vœl]	'want (3rd pers. pl. present)'
aime	[ɛm]	'loves (3rd pers. sg. present)'	**aimait**	[ɛmɛ]	'loved (3rd pers. sg. imperfect)'
aimer	[eme]	'to love'			

(43) **pro** [pro] abbreviation for **professionel** [profɛsjɔnɛl] 'professional'
prof [prɔf] abbreviation for **professeur** [profɛsœr] 'professor'

6.7 MID UNROUNDED FRONT VOWELS

6.7.1 Mid Unrounded Front Vowels in Word-Final Syllables

Alternations between e and ɛ are found in the morphologically related masculine and feminine forms of nouns and adjectives such as (44):

(44)

fermier	[fɛrmje]	'farmer (masc.)'	**fermière**	[fɛrmjɛr]	'farmer (fem.)'
premier	[prœmje]	'first (masc.)'	**première**	[prœmjɛr]	'first (fem.)'

This alternation concerns only nouns and adjectives which end in e in the masculine and ɛr in the feminine; this alternation, therefore, can be accounted for by the morpheme structure constraints (41) or (11). All other feminine-masculine pairs which involve a change in the openness of the final syllable, however, occur without alternation of the vowel; the low mid-vowel ɛ appears in both forms:

(45)

laid	[lɛ]	'ugly (masc.)'	**laide**	[lɛd]	'ugly (fem.)'
niais	[njɛ]	'naive (masc.)'	**niaise**	[njɛz]	'naive (fem.)'
prêt	[prɛ]	'ready (masc.)'	**prête**	[prɛt]	'ready (fem.)'

In a syntactical expression, the assignment of height is independent of the following words:

(46) **le premier rappelé** /lə+prəmie+rapəle/ 'the first recalled (masc.)'
> [lœprœmjeraple]

la première appelée /la+prəmier+apəle/ 'the first called (fem.)'
> [laprœmjɛraple]

Note that in the case of liaison, the r following the masculine adjective behaves as if it belongs to the following word[1]:

(47)	le premier rappelé	[lœprœmjeraple]	'the first recalled (masc.)'
	le premier appelé	[lœprœmjeraple]	'the first called (masc.)'
(48)	le premier rang	[lœprœmjerã]	'the first row'
	le premier âne	[lœprœmjeran]	'the first donkey'
	la première âme	[laprœmjɛram]	'the first soul'

6.7.2 Mid Unrounded Front Vowel in Non-Word-Final Position

Except before preconsonantal r, where only [ɛ] may appear, the mid-vowels e and ɛ can always alternate in deliberate speech.

(49)	essence	[esãs, ɛsãs]	'gasoline'
	naissance	[nesãs, nɛsãs]	'birth'
	pessimiste	[pesimist, pɛsimist]	'pessimist'
	maigrir	[megrir, mɛgrir]	'to lose weight'
	élever	[elve, ɛlve]	'to raise'

In normal speech, however, e and ɛ tend to distribute according to some laws which are not fully understood. They interact continuously and often neutralize each other. We may distinguish the following influences:

6.7.2.1 *Hiatus.* Before another vowel, the mid unrounded front vowel is realized as e:

(50)	préau	[preo]	'courtyard'
	océan	[oseã]	'ocean'
	auréole	[oreɔl]	'aureole'
	mea-culpa	[meakylpa]	'confession'
	réunion	[reynjɔ̃]	'reunion'
	méandre	[meãdr]	'meander'
	paysan	[peizã]	'countryman'
	créer	[kree]	'to create'
	créait	[kreɛ]	'created (3rd pers. sg. imperfect)'

6.7.2.2 *Formative boundary.* If a word can be analyzed as a derived word, the mid unrounded front vowel tends to be realized as the mid-vowel appearing in the nonderived form:

[1] In other idiolects, however, r may behave as if it were part of the masculine adjective: premier appelé [prœmjɛraple], premier âne [prœmjɛran].

(51) **bonnet** [bɔnɛ] 'cap' **bonneterie** [bɔnɛtri] 'hosiery'
papier [papje] 'paper' **papeterie** [papetri] 'stationery'

The prefixes ré-, pré- and dé- tend to remain [re], [pre] and [de] in all positions:

(52) **répartir** [repartir] 'to distribute'
prédestiner [predɛstine] 'to predestine'
déterminer [detɛrmine] 'to determine'

6.7.2.3 *Openness of the syllable.* In open syllables, unrounded front mid-vowels tend to appear as high, and in closed syllables as low. However, the openness of nonfinal syllables is not necessarily fixed (Delattre 1966:139-72):

(53) **exiger** [e-gziʒe, ɛg-ziʒe] 'to require'
espérer [e-spere, ɛs-pere] 'to hope'
médecin [me-dsɛ̃, mɛd-sɛ̃] 'doctor'

The syllabic cut in some cases is definite; for instance, in an intervocalic cluster of consonants ending with a nasal, the cut takes place just before the nasal, thus creating a closed syllable; in these cases, the preceding vowel is ɛ:

(54) **Edmond** [ɛdmɔ̃] (name)
Etna [ɛtna] (mountain)
ethnologie [ɛtnɔlɔʒi] 'ethnology'
vêtement [vɛtmã] 'clothes'
segment [sɛgmã] 'segment'
technique [tɛknik] 'technical'

This case can be represented as:

(55) $\begin{vmatrix} +\text{mid} \\ +\text{front} \\ -\text{round} \end{vmatrix} \rightarrow [+\text{low}] \; / \; \_\_ \; C_1 \begin{vmatrix} -\text{syllabic} \\ +\text{nasal} \end{vmatrix}$

6.7.2.4 *Influence of a following prevocalic* r. Before a prevocalic r, the unrounded mid-vowel tends to be low.

(56) **maniéré** [manjere, manjɛre] 'mannered'
altéré [altere, altɛre] 'altered'

6.7.2.5 *Vowel harmony.* Vowels tend to agree in height with a following vowel. This is particularly true for vowels in open syllables:

(57) /e/ before high vowels
aigri [egri] 'embittered'

aimer	[eme]	'to love'
têtu	[tety]	'stubborn'
haineux	[enø]	'full of hatred'
fait-tout	[fetu]	'cooker'
traineau	[treno]	'sleigh'
/ɛ/ before low vowels		
récolte	[rɛkɔlt]	'crop'
aimait	[ɛmɛ]	'loved (3rd pers. sg. imperfect)'
bénévole	[bɛnɛvɔl]	'benevolent'
pénal	[pɛnal]	'penal'
essence	[ɛsãs]	'gasoline'
béton	[bɛtɔ̃]	'concrete'

This can be represented as:

(58) $\begin{vmatrix}+\text{mid}\\+\text{front}\\-\text{round}\end{vmatrix} \rightarrow [\alpha\text{low}] \;/\; \_\_ \;[-\text{syllabic}]\begin{vmatrix}+\text{syllabic}\\\alpha\text{low}\end{vmatrix}$

The exact mechanism of vowel harmony is complex; the effect of vowel harmony minimizes the variation between low and high vowels in a word:

(59) **espérer**	[$\underline{\text{ɛs}}\overline{\text{pere}}$]		'to hope'
désespérer	[$\overline{\text{dezespere}}$, $\underline{\text{dɛzɛs}}\overline{\text{pere}}$, *$\overline{\text{de}}\,\overline{\underline{\text{zɛs}}\,\text{pere}}$]		'to despair'

6.8 *MID ROUNDED BACK VOWELS*

6.8.1 Mid Rounded Back Vowels in Word-Final Syllables

Alternations between o and ɔ are found in morphologically related masculine and feminine forms and also in morphologically related nominal and verbal forms:

(60)	/p/	**salaud**	[salo]	'bastard (masc.)'	**saloppe**	[salɔp] 'bastard (fem.)'
	/t/	**sot**	[so]	'idiot (masc.)'	**sotte**	[sɔt] 'idiot (fem.)'
	/k/	**escroc**	[ɛskro]	'swindler'	**escroque**	[ɛskrɔk] 'swindles (3rd pers.)'

There are other cases where o appears in both forms:

(61)	/t/	**haut**	[o]	'high (masc.)'	**haute**	[ot] 'high (fem.)'
	/d/	**courtaud**	[kurto]	'shortie (masc.)'	**courtaude**	[kurtod] 'shortie (fem.)'
	/s/	**faux**	[fo]	'false (masc.)'	**fausse**	[fos] 'falsifies (3rd pers.)'

The paradigms of **sot, sotte** and of **haut, haute** show that the distribution of o and ɔ cannot be predicted from the phonological environment. The high mid-vowel o in **haut** must be specified as [-low] since it remains nonlow in all of its forms (here the feminine form); the mid back vowel in **sot**, on the other hand, may be left unspecified for height, the form **sot** [so] with the high mid-vowel o being a consequence of the morpheme structure condition (12), provided that we posit a rule lowering all mid back vowels unmarked for height in final closed syllables:

(62) $\begin{vmatrix} +\text{back} \\ +\text{syllabic} \\ +\text{mid} \end{vmatrix} \rightarrow [+\text{low}] \; / \; \_\_ \; C_1\#$

Note that some words contain a mid back vowel which can optionally be low or high in closed final syllables. This suggests a change of the back vowel from a marked to an unmarked status.

(63)	**nigaud**	[nigo]	'dummy (masc.)'	**nigaude**	[nigod]	'id. (fem.)'
				nigotte	[nigɔt]	
	costaud	[kɔsto]	'strong (masc.)'	**côstaude**	[kɔstod]	'id. (fem.)'
				costote[1]	[kɔstɔt]	
	tuyau	[tɥijo]	'advice'	**tuyaute**[2]	[tɥijɔt]	'advises (3rd
					[tɥijɔt]	pers. sg.)'
	noyau	[nwajo]	'stone (of	**noyaute**	[nwajɔt]	'controls (3rd
			fruit)'		[nwajɔt]	pers. sg.)'

In syntactical expressions with a liaison, o remains o.[3]

(64)	**trop grand**	[trogrã]	'too big'
	trop important	[tropɛ̃pɔrtã]	'too important'

6.8.2 o - ɔ Alternation in Non-Word-Final Syllables

The vowels o and ɔ contrast in penultimate position:

(65)	**papauté**	[papote]	'papacy'	**papoter**	[papɔte]	'to chat'
	ôter	[ote]	'to remove'	**hotter**	[ɔte]	'to transport'
	rosit	[rozi]	'becomes pink'	**sosie**	[sɔzi]	'double'
	caution	[kosjõ]	'bail'	**lotion**	[lɔsjõ]	'lotion'
	frauder	[frode]	'to defraud'	**broder**	[brɔde]	'to embroid'
	frôler	[frole]	'to graze'	**pétroler**	[petrɔle]	'to cover with petrol'

---

[1] Alternation already noted in Bauche 1929:210.

[2] Robert 1968 gives **noyauter** [nwajote], **tuyauter** [tɥijote], **poireauter** [pwarote, pwarɔte]; Warnant 1968 gives **noyauter** [nwajote], **tuyauter** [tyjote]; Juilland 1965 gives **tuyauter** [tɥijɔte], **poireauter** [pwarɔte].

[3] In some idiolects, the p of **trop** before a vowel behaves as if it were part of **trop** rather than part of the following noun: **trop petit** [tropti], **trop important** [trɔpɛ̃pɔrtã].

In other positions, however, the distribution of o, ɔ is similar to the distribution of e, ɛ. In particular, o and ɔ can always alternate in deliberate speech. In normal speech, however, they tend to distribute according to the following influences:

Formative boundaries

Prefixes ending in o remain high:

(66)

co-occupant	[koɔkypã]	'co-occupant'
co-équipier	[koekipje]	'workmate'
pro-soviétique	[prosovjetik]	'pro-soviet'

When a prefix ending in o ceases to be recognized as a prefix, its last vowel may be lowered. If this lowering creates a cluster ɔɔ, it reduces to ɔ:

(67)

coopération	[koɔpɛrasjɔ̃] or	[kɔpɛrasjɔ̃]	'cooperation'
coop	[koɔp] or	[kɔp]	'cooperative store'
coordonnée	[koɔrdone] or	[kɔrdone]	'co-ordinate'

Openness of the syllable

(68)

ausculter	[ɔs-kylte] or	[o-skylte]	'to examine'
austrogot	[ɔs-trogo] or	[o-strogo]	(mild swear word)
augmenter	[ɔg-mãte]		'to increase'
octogénaire	[ɔk-tɔʒɛnɛr]		'octogenarian'

Influence of a following prevocalic r

(69)

auriculaire	[orikylɛr,	ɔrikylɛr]	'little finger'
horizon	[orizɔ̃,	ɔrizɔ̃]	'horizon'

Vowel harmony

(70)

opérer	[opere]	'to operate'	**opérait**	[ɔpɛrɛ]	'operated'
tolérer	[tolere]	'to tolerate'	**tolérait**	[tɔlɛrɛ]	'tolerated'

Vowel harmony does not take place between an o in the penultimate syllable and the vowel in the last syllable as in the words (71), unless the vowel in the last syllable is o, as in (72).

(71)

donner	[dɔne]	'to give'
stopper	[stɔpe]	'to stop'
clocher	[klɔʃe]	'steeple'
noter	[nɔte]	'to note'

(72)	[ɔ]	**cocotte**	[kɔkɔt,	*kokɔt]	'hen'
		cochonne	[kɔʃɔn,	*koʃɔn]	'dirty (fem.)'
	[o]	**coco**	[kɔko,	koko]	'egg'
		mémoriaux	[mɛmɔrjo,	memorjo]	'memorial (pl.)'
		poteau	[pɔto,	poto]	'pole'
		costaud	[kɔsto,	kosto]	'strong'
		rococo	[rɔkɔko, rokoko,	rɔkoko, *rokɔko]	'rococo'

The fact that [rokɔko] is not a possible pronunciation shows that vowel harmony tends to minimize the variations *low high* in a word: [rɔkɔ⌈ko, rɔ⌈koko, rokoko, *ro⌈kɔ⌈ko].

6.9 MID ROUNDED FRONT VOWELS

We can define four classes of rounded front vowels according to their patterns of alternations, either in morphologically related words or in free variations.

6.9.1 The Marked Mid-Vowel ø

The marked mid-vowel ø has no variant and is realized as ø in all environments.

(73)	**ameute**	[amøt]	'stirs up'	**ameuter**	[amøte]	'to stir up'
	creuse	[krøz]	'digs'	**creuser**	[krøze]	'to dig'
	neutre	[nøtr]	'neuter'	**neutralité**	[nøtralite]	'neutrality'
	bleu	[blø]	'blue'	**bleuté**	[bløte]	'covered with blue'
				bleuet	[bløɛ]	'corn-flower'

(Note, however, that in nonfinal, nonpenultimate position ø may become œ: **neutralité** [nœtralite].)

6.9.2 The Unmarked Mid-Vowel œ

The unmarked mid-vowel œ is optionally realized as ø or œ in all positions,[1] except in final syllables where it is realized as œ if the syllable is closed and as ø if the syllable is open:

(74)	**veuve**	[vœv]	'widow'	**veuvage**	[vøvaʒ, vœvaʒ]	'widowhood'
	beurre	[bœr]	'butter'	**beurrer**	[børe, bœre]	'to butter'
	cueille	[kœj]	'picks up'	**cueillir**	[køjir, kœjir]	'to pick up'

[1] Grammont 1954:50 accounts for the alternation through vowel harmony.

			cueillette	[køjɛt, kœjɛt]	'picking up'
boeuf	[bœf]	'ox'	boeufs	[bø]	'oxen'
veulent	[vœl]	'want (3rd pers. pl.)'	veut	[vø]	'wants (3rd pers. sg.)'
pleut	[plø]	'rains'	pleuvoir	[pløvwar, plœvwar]	'to rain'
peuplier	[pøplije, pœplije]	'poplar'			
heureux	[ørø, œrø]	'happy'			
eustache	[østaʃ, œstaʃ]	'knife'			

The marked mid-vowel ø is marked [+high] and does not participate in any variation. The unmarked mid-vowel œ is assigned its height by the following rules:

(75) Assignment of height for œ

a. final syllable before consonants

$$\begin{vmatrix} +\text{front} \\ +\text{mid} \\ +\text{round} \end{vmatrix} \rightarrow [+\text{low}] \; / \; \_\_ \; C_1\#$$

b. final position

$$\begin{vmatrix} +\text{front} \\ +\text{mid} \\ +\text{round} \end{vmatrix} \rightarrow [-\text{low}] \; / \; \_\_ \; \#$$

6.9.3 The Mid-Vowel œ Alternating with ɔ

We saw that in this case œ must be analyzed as an allophone of ɔ. The vowel œ, the allophonic variant of ɔ, does not normally alternate with ø, except in the words (76).

(76)	améliorer	[ameljɔre, ameljore, ameljœre, ameljøre]	'to improve'
	détériorer	[detɛrjɔre, deterjore, detɛrjœre, deterjøre]	'to deteriorate'

6.9.4 Schwa

Schwa is realized as œ in all positions, except in final open syllables where it is optionally realized as œ or ø:

(77)	brebis	[brœbi]	'ewe'
	retour	[rœtur]	'return'
	prem[1]	[prœm]	'first'
(78)	donne-moi-le	[dɔnmwalœ, dɔnmwalø]	'give it to me'
	pre[1]	[prœ, prø]	'first'

[1]Pre [prœ] and prem [prœm] may be abbreviations of premier [prœmje] and are used by schoolchildren in their games to decide who will play first; prem may be a dialectal reflex of Latin prima.

This vowel is also characterized by its possible deletion in given environments, as in the word retour [rœtur, rtur].

Vocalic harmony with ɔ. We saw previously that a schwa may harmonize with ɔ.

(79) menotte [mœnɔt, mɔnɔt, mœnœt] (also [mnɔt, mnœt]) 'handcuffs'

Vocalic harmony with ø. A schwa may also harmonize with a following ø:

(81)

demeurer	[dœmœre,	dømøre]	'to stay'
repeupler	[rœpœple,	røpøple]	'to repopulate'
refleurir	[rœflœrir,	røfløri r]	'to re-blossom'
monsieur	[mœsjø, (also [msjø])	møsjø]	'sir'

CHAPTER 7

GLIDE FORMATION

7.1 PHONETIC DISTRIBUTION OF GLIDES

7.1.1 Prevocalic Glides

There are three glides in French: j, w, and ɥ. They appear prevocalically in all positions: (a) initially, (b) intervocalically, and (c) after consonants.

(1)	j	a.	iode	[jɔd]	'iodine'
		b.	cahier	[kaje]	'notebook'
		c.	rien	[rjɛ̃]	'nothing'
			ptyaline	[ptjalin]	'ptyaline'
	w	a.	ouate	[wat]	'cotton'
		b.	cahoua	[kawa]	'coffee'[1]
		c.	fouet	[fwɛ]	'whip'
			square	[skwar]	'public garden'
	ɥ	a.	huile	[ɥil]	'oil'
		b.	cacahuète	[kakaɥɛt]	'peanut'
		c.	nuit	[nɥi]	'night'
			Stuart	[stɥar]	(proper name)

7.1.2 Constraints on Prevocalic Glides

Prevocalic glides do not appear after some segments or clusters of segments, viz., (a) after initial or postconsonantal glides and (b) after a cluster *consonant + liquid,* except if they belong to one of the combinations wa, wɛ̃, or ɥi.

(2)	cloître	[klwatr] 'cloister'
	trois	[trwa] 'three'
	groin	[grwɛ̃] 'snout'
	truie	[trɥi] 'sow'
	pluie	[plɥi] 'rain'

Constraint 1: There are no two consecutive glides either initially or postconsonantally.

Constraint 2: A glide cannot follow a cluster *consonant + liquid* unless it belongs to one of the combinations wa, wɛ̃, or ɥi.

---

[1]Borrowed from Arabic.

7.1.3 Preconsonantal and Final Glides

With the exception of j, glides do not occur in preconsonantal or final position.[1]

(3)	**ail**	[aj]	'garlic'
	feuilleter	[fœjte]	'to browse'
	boy-scout	[bɔjskut]	'naive person'
	bouilloire	[bujwar]	'kettle'

The corresponding constraints are:

Constraint 3: No glide, except j, can be final, precede a consonant, or precede another glide.

Constraint 4: Glides never appear between two consonants or initially before a consonant.

7.2 CONTRASTIVE ANALYSIS

The three glides j w ɥ and the three vowels i u y have corresponding points of articulation, which suggests that they may be respective allophonic variants. Traditional phonemic analysis contrasts the minimal and near minimal pairs (4), showing that j w ɥ and i u y are contrastive, and therefore cannot be analyzed as systematic variants of one another.

(4)	a.	**ail**	[aj]	'garlic'	**haï**	[ai]	'hatred'
		paye	[pɛj]	'wages'	**pays**	[pɛi]	'country'
		boy-scout	[bɔjskut]	'naive person'	**égoiste**	[egɔist]	'egotist'
	b.	**trois**	[trwa]	'three'	**troua**	[trua]	'pierced'
		cloître	[klwatr]	'cloister'	**cloua**	[klua]	'nailed'
	c.	**truite**	[trɥit]	'trout'	**truisme**	[tryism]	'truism'
		Marianne	[marjan]	(girl's name)	**Marie-Anne**	[marian]	(girl's name)
		vanille-la	[vanijla]	'cover it with vanilla'	**annihila**	[aniila]	'annihilated'

In the next paragraphs, we shall show that the contrast between i u y and j w ɥ shown in (4) does not necessarily preclude the analysis of some glides as variants of their corresponding high vowel. In fact we show that the contrast is limited to (a) i and j in final and preconsonantal position, and (b) to i u y and j w ɥ in intervocalic position. Examples (4a) show that i and j contrast in final and preconsonantal position; examples (5) show that i u and j w contrast intervocalically.

---

[1]The borrowed form **outsider** is pronounced [autsaidɛr]; pronunciations such as [awtsajdɛr] described in Warnant 1968 or Robert 1967 appear to be artificial.

(5)	a.	**interviewer**	[ɛ̃tɛrvjue]	'to interview'
		Siouah	[sjua]	(proper name)
	b.	**chouyat**	[ʃuja]	'small amount'[1]
		kiwi	[kiwi]	'kiwi'

The glides j w cannot be variants of i u in both series of words (5a) and (5b). To account for the words of (5a) we must postulate that if a series of two consecutive high vowels precedes a vowel, the first high vowel becomes a glide; to account for the words of (5b) the opposite convention is necessary, viz., the second high vowel becomes a glide. We shall show that we must postulate underlying glides in the words (5b), that the opposition exhibited in (4b) corresponds to an underlying o for the glides w appearing in **trois** and **cloître**, and that the opposition in (4c) corresponds to a difference in morpheme distribution.

7.3 MORPHOLOGICAL VARIANTS: i u y BEFORE FORMATIVE BOUNDARIES

7.3.1 The alternation between the glides j w ɥ and the corresponding high vowels is exhibited in many derived forms in which a high front vowel precedes the formative boundary:

(6)	i j	**je scie**	[ʒœsi]	'I saw'	**je sciais**	[ʒœsjɛ]	'I sawed'
		je ski	[ʒœski]	'I ski'	**je skiais**	[ʒœskjɛ]	'I skied'
	u w	**je loue**	[ʒœlu]	'I rent'	**je louais**	[ʒœlwɛ]	'I rented'
		je secoue	[ʒœsku]	'I shake'	**je secouais**	[ʒœskwɛ]	'I shook'
	y ɥ	**je sue**	[ʒœsy]	'I sweat'	**je suais**	[ʒœsɥɛ]	'I sweated'

Examples (6) show that a formative-final high vowel is realized as a glide when followed by another vowel. This phenomenon can be represented as (7), where

(7) [+high] → [-syllabic] / __ +[+syllabic]

7.3.2 Formulation (7) is consistent with constraint (1) according to which glide formation cannot occur when the high vowel is followed by another glide:

(8)	i	**nous sciions**	[nusijɔ̃]	'we sawed'
		nous skiions	[nuskijɔ̃]	'we skied'
	u	**nous louions**	[nulujɔ̃]	'we rented'
		nous secouions	[nuskujɔ̃]	'we shook'
	y	**nous suions**	[nusyjɔ̃]	'we sweated'

Formulation (7) is also consistent with constraint (3), since it assures that glide formation does not take place when the high vowel precedes a

---

[1] Borrowed from Arabic.

consonant. It is actually more general than constraint (3) since it does not allow derived j to appear before any consonant.

(9)	i	je scierai	[ʒœsirɛ]	'I shall saw'
		je skierai	[ʒœskirɛ]	'I shall ski'
	u	je louerai	[ʒœlurɛ]	'I shall rent'
		je secouerai	[ʒœskurɛ]	'I shall shake'
	y	je suerai	[ʒœsyrɛ]	'I shall sweat'

7.3.3 The rule (7) of glide formation must be further constrained so it does not apply to high vowels preceded by either another glide in initial position or preceded by a consonant (constraint 1), as in (11), or the sequence *consonant + liquid* (constraint 2), as in (12).

(10) Formative-final glide formation

$$[+\text{high}] \rightarrow [-\text{syllabic}] \;/\; X\_\_ + [+\text{syllabic}]$$

Where X is not a glide (except postvocalic j) and X is not a cluster *consonant + liquid.*

(11)	i	j'essuie 'I wipe'	[ʒɛsɥi]	j'essuyais 'I wiped'	[ʒɛsɥijɛ]
	u	j'interviewe 'I interview'	[ʒɛ̃tɛrvju]	j'interviewais 'I interviewed'	[ʒɛ̃tɛrvjuɛ][1]

This formulation accounts for i u y remaining vocalic in the following examples:

(12)	i	je trie	[ʒœtri]	'I sort'	je triais	[ʒœtrijɛ]	'I sorted'
		je plie	[ʒœpli]	'I fold'	je pliais	[ʒœplijɛ]	'I folded'
	u	je trou	[ʒœtru]	'I drive a hole'	je trouais	[ʒœtruɛ]	'I drove a hole'
		je clou	[ʒœklu]	'I nail down'	je clouais	[ʒœkluɛ]	'I nailed down'
	y	j'obstrue	[ʒɔbstry]	'I obstruct'	j'obstruais	[ʒɔbstryɛ]	'I obstructed'
		j'englue	[ʒɑ̃gly]	'I cover with glue'	j'engluais	[ʒɑ̃glyɛ]	'I covered with glue'

Note first the appearance of an off-glide j between i and the following vowel when i does not convert to j. This phenomenon is restricted to i. We shall study it in more detail later.[2] We shall posit a rule (13) for intervocalic yod which takes place after glide formation:

---

[1]There is also another spelling pronunciation of this verb [ʒɛ̃tɛrvjuv, ʒɛ̃tɛrvjuvɛ]; both pronunciations are described in Warnant 1968.

[2]In particular we shall see that it does not apply to groups of two consecutive i's, e.g. annihila [aniila].

(13) ∅ → j / i __ V

The conditions of application of rule (10) are stronger than constraint (2), which allows the combinations wa, wɛ̃, and ɥi to appear after a *consonant-liquid* cluster; in particular (10) prevents the formation of a glide w after a *consonant-liquid* cluster, even when the following vowel is a. Actually there is never an alternation between u and w when u is preceded by a *consonant-liquid* cluster:

(14) **il troua** [trua, *trwa] 'he pierced a hole' (passé simple)
il cloua [klua, *klwa] 'he nailed' (passé simple)

This indicates that u does not go to w even when this conversion would result in a permissible phonetic cluster, i.e. that the formation of clusters CRwa and CRɥi, where C is any consonant and R any liquid, is independent of the rule (10) of glide formation. In particular the formation of ɥ in the following words (16) must be accounted for by another rule such as (15), which transforms yi into ɥi in all positions (this rule does not affect other clusters *y-vowel* as shown in example 12).

(15) Labial attraction
y → [-syllabic] / __ i

(16)

incongru	[ɛ̃kɔ̃gry]	'incongruous'	**incongruité**	[ɛ̃kɔ̃gɥite]	'incongruity'
superflu	[sypɛrfly]	'superfluous'	**superfluité**	[sypɛrfɥite]	'superfluity'

7.4 THE SUFFIXES #ism, #ist, and #ɛsk.

Rule (15), postulated in the previous section, predicts that there is no phonetic cluster yi, since this cluster always becomes ɥi. Words such as **truisme** [tryism] show that this is not the case. All suffixes do not behave identically with respect to glide formation. Most suffixes like ite, yr, verbal suffixes, etc., behave as we have shown previously. A small class of suffixes, however, such as #ism, #ist, and #ɛsk do not allow the formation of glides. Compare (17) and (18):

(17)

assidu	[asidy]	'assiduous'	**assiduité**	[asidɥite]	'assiduity'
je scie	[ʒœsi]	'I saw'	**sciure**	[sjyr]	'sawing'

(18)

revue	[rœvy]	'review'	**revuiste**	[rœvyist]	'reviewer'
hindou	[ɛ̃du]	'Hindu'	**hindouisme**	[ɛ̃duism]	'Hinduism'
Ubu	[yby]	(proper noun)	**ubuesque**	[ybyɛsk]	'characteristic of Ubu'

Some words ending in ist or ism must be analyzed as derived words because of their phonetic form even though the corresponding stem does not exist in isolation. This is the case for such words as **altruisme** [altryism] 'altruism' or **truisme** [tryism] 'truism'. We must analyze the ending ism as the suffix #ism to account for the syllabicity of y in these words:

(19) **truisme** /try+#ism/ > [tryism]
altruisme /altry+#ism/ > [altryism]

The analysis of the two words **truisme** and **altruisme** as derived words with the suffix #ism is further justified by the fact that they share the general semantic properties of words having the suffix #ism. The words **casuiste** [kazuist] 'casuist' and **ubiquiste** [ybikuist] 'ubiquitarian', on the other hand, cannot have a derivation such as (20a), which gives wrong phonetic forms. They can be analyzed as nonderived words. However, an analysis such as (20b) appears to be more adequate, as it accounts for the fact that **casuiste** and **ubiquiste** share the general properties of words having the suffix #ist.

(20) a. ***casuiste** /kazy+#ist/ > [kazyist]
***ubiquiste** /ybiky+#ist/ > [ybikyist]
b. **casuiste** /kazyi+#ist/ > /kazyi+#st/ > [kazuist]
ubiquiste /ybikyi+#ist/ > /ybikyi+#st/ > [ybikuist]

The deletion of the i in the suffix #ist after another vowel i which we must posit in the derivation (20b) is independently required to account for the derivation of words such as (21).

(21) **ironie** [irɔni] 'irony' **ironiste** [irɔnist] 'ironist'
Marie [mari] 'Mary' **mariste** [marist] 'Marist'

Note that the word **altruisme** must have an alternate decomposition /altryi+#ism/ to account for another possible pronunciation [altruism].

7.5 INTERVOCALIC YOD[1]

In this section we show that the introduction of intervocalic yod is independent of the phenomenon of glide formation.

7.5.1 If intervocalic yod were part of the phenomenon of glide formation, we would also expect an intervocalic w and u between u and y in the words described in (11) and (12), which is never the case.

7.5.2 The rule of glide formation is relatively optional (so-called optional diaeresis); the examples (6) have alternate pronunciations in which i u y remain syllabic, in which case an intervocalic yod appears between i and the following vowel; no intervocalic w or u appears in the same position:

---

[1]It may be the case that there are dialects without intervocalic glides. I have never observed such dialects personally. Warnant 1968 and Littré 1961 describe dialects where intervocalic yod appears only between the cluster ui and a following vowel, as in **essuyer** [esuije] 'to wipe' but not before the cluster *consonant-liquid* + i: **trier** [trie] 'to sort', **plier** [plie] 'to fold'. Their description must be taken with caution since their dictionaries are prescriptive rather than descriptive.

(22)

i	je sciais	[ʒœsijɛ]	'I sawed'
	je skiais	[ʒœskijɛ]	'I skied'
u	je louais	[ʒœluɛ]	'I rented'
	je secouais	[ʒœskuɛ]	'I shook'
y	je suais	[ʒœsyɛ]	'I sweated'
	je transmuais	[ʒœtrɑ̃smyɛ]	'I transmuted'

7.5.3 An intervocalic yod appears in songs where a schwa is pronounced and follows a final i. For instance:

(23) a. **Allons enfants de la Patrie**
alɔ̃ zɑ̃fɑ̃ dœ la patrijœ

b. **Contre nous de la tyrannie**
kɔ̃trœ nu dœ la tiranijœ

Pronunciation (23b) is not a case of diaeresis, since [tiranjœ] is not a legitimate phonetic form for tyrannie: it is a case where an orthographic schwa is pronounced, which creates the environment for the automatic insertion of an intervocalic yod.

7.5.4 In the dialects with intervocalic yod there are no clusters iV in any position within a noncompound word except when the second vowel is another i, e.g. **annihiler** [aniile] 'to annihilate'. We shall show in section 7.6.3 that words such as **Marie-Anne** [marian] must be analyzed as compound words.

7.6 DOMAIN OF APPLICATION OF GLIDE FORMATION

7.6.1 Suffixes

It appears that the final vowels of all items ending in i u y become glides when they are followed by a vowel-initial suffix, with the exception of the suffixes -isme, -iste, -esque. We give here a few examples of such suffixes:

(24) Verbal endings

je scie	[ʒœsi]	'I saw'
nous scions	[nusjɔ̃]	'we saw'
vous sciez	[vusje]	'you saw'
je sciais	[ʒœsjɛ]	'I sawed'

(25) Verbal suffixes

abl	**sciable**	[sjabl]	'that can be sawed'
	remuable	[rœmɥabl]	'movable'
aʒ	**sciage**	[sjaʒ]	'sawing'
	tatouage	[tatwaʒ]	'tattooing'
	remuage	[rœmɥaʒ]	'moving'

œr	scieur	[sjœr]	'sawer'
	tueur	[tɥœr]	'killer'
	joueur	[ʒwœr]	'player'
as	liasse	[ljas]	'bundle'
ãs	méfiance	[mefjãs]	'mistrust'

(26) Noun suffixes

al	génial	[ʒenjal]	'ingenious'
	colonial	[kɔlɔnjal]	'colonial'
ø	hernieux	[ɛrnjø]	'hernial'
	furieux	[fyrjø]	'furious'
ɛl	ruelle	[rɥɛl]	'small street'
ɛt[1]	statuette	[statɥɛt]	'statuette'
	Henriette	[ãrjɛt]	(girl's name) < Henri [ãri]
	Juliette	[ʒyljɛt]	(girl's name) < Julie [ʒyli]

7.6.2 Phrases

Glide formation, on the other hand, does not take place between the different phrases of a sentence:

(27)	a.	Henri est arrivé	[ãriɛtarive]	'Henry arrived'
	b.	j'ai lu un roman	[ʒɛlyɛ̃rɔmã]	'I read a novel'
	c.	je le dédie à sa mémoire	[ʒœlœdediasa memwar]	'I dedicate it to his memory'
	d.	Dis merci au Monsieur	[dimɛrsiomœsjø]	'say thank you to the gentleman'
	e.	je me demande bien si on l'a prévenu	[ʒmœdmãdbjɛ̃ siɔ̃llaprɛvny]	'I wonder whether he has been warned'
	f.	je me demande bien où est Pierre	[ʒmœdmãbjɛ̃ u ɛ pjɛr]	'I wonder where Peter is'
	g.	où est ce que c'est?	[uɛskœsɛ]	'Where is it?'
	h.	un garçon ou une fille?	[ɛ̃garsɔ̃ u ynfij]	'a boy or a girl'
	i.	un mari aimable	[ɛ̃mariɛmabl]	'a nice husband'
	j.	il est si en retard	[ilɛsiãrtar]	'he is so late'
	k.	il est si aimable	[ilɛsiɛmabl]	'he is so nice'

[1]Exception - joliet [ʒɔlijɛ] and joliette [ʒɔlijɛt], from joli [ʒɔli] 'nice'; however La Joliette [laʒɔljɛt] (name of a town).

These examples show that glide formation does not take place between the subject and the following verb (a), the verb and its object (b, c), between objects (d), between a subordinating conjunction and the following word in the clause (e, f, g), between conjoined noun phrases (h), between a noun and its adjective (i), or between an adverb and the expression following it (j, k). Glide formation and intervocalic yod, however, appear within a verbal group, i.e. a verb directly preceded or followed by its complements and subject, if they are pronouns:

(28)	a.	**Pierre y est arrivé**	[pjɛrjɛtarive]	'Peter managed to do it'
	b.	**Henri y est arrivé**	[ãrijɛtarive]	'Henry managed to do it'
	c.	**j'y arriverai jamais**	[ʒjarivrɛʒamɛ]	'I'll never do it'
	d.	**'y a rien**	[jarjɛ̃]	'there is nothing'
	e.	**montes-y-en deux**	[mõtzjãdø]	'take up two'
	f.	**je lui offre**[1]	[ʒœlɥijɔfr]	'I give it to him'
	g.	**offre-lui-en deux**[1]	[ɔfrœlɥijãdø]	'give him two'

These examples show that a sentence must be subdivided into smaller units, phonological islands, so to speak, within which glide formation can take place and between which glide formation is impossible. So far we have observed that islands may be (a) verbal groups and (b) derived words, but they do not contain full noun-phrases or verb-phrases.

7.6.3 Compound Words

Each word in a compound word is an island for glide formation, as shown by the following examples:

(29) Compounded by juxtaposition

scie-égoïne	[siegɔin]	'handsaw'
gris-ardoise	[griardwaz]	'slate grey'
gourou assistant	[guruasistã]	'assistant guru'
statue anniversaire	[statyaniversɛr]	'anniversary statue'
morue amandière	[moryamãdjɛr]	'cod with almonds'

(30) Compounded with preposition

mardi en huit	[mardiãɥit]	'a week from Tuesday'
riz au lait	[riolɛ]	'rice cooked with milk'
chou au beurre	[ʃuobœr]	'puffs with butter'

It is a cultural feature of contemporary French that any feminine first name can be compounded with the name Marie to create a new first name:

---

[1] In some speech I have observed, intervocalic yod does not appear after **lui**.

(31) Marie-Anne [marian]
Marie-Odile [mariodil]
Marie-Angèle [mariãʒɛl]
Marie-Hélène [mariɛlɛn]

In the same way, foreign names with hyphens are interpreted as compound words, and therefore glide formation between the components is prevented:

(32) Chou-en-lai [ʃuãlɛ]
Tchou-hi [tʃui]

7.6.4 Prefixes

There is no glide formation between a prefix and the stem that follows it, as shown in the examples (33):

(33)	/mi/	mi-avril	[miavril]	'middle of April'
		mi-hauteur	[miotœr]	'mid-high'
	/səmi/	semi-automatique	[sœmiotomatik]	'semi automatic'
		semi-auxiliaire	[sœmiɔksiljɛr]	'semi auxiliary'
	/kazi/	quasi-entité	[kaziãtite]	'quasi entity'
	/dəmi/	demi-éteinte	[dœmietɛ̃t]	'half blown out'
	/si/	ci-annexé	[sianɛkse]	'added as an appendix'
	/ãti/	antiatomique	[ãtiatɔmik]	'anti atomic'
		antialcoolique	[ãtialkɔlik]	'anti alcoholic'
	/di/	diatomique	[diatɔmik]	'diatomic'
	/bi/	biacide	[biasid]	'diacid'

When the prefix loses its character, that is, when the word with a prefix comes to be analyzed as a single word, we observe, first, introduction of an intervocalic glide, and eventually, complete glide formation. For instance, in the words (34) the pronunciation (34b) is now the most common one, with an older pronunciation (34a) and a tendency to pronounce as in (34c).

(34)	demi-heure 'half-hour'	bioxide 'dioxide'
a.	[dœmiœr]	[biɔksid]
b.	[dœmijœr]	[bijɔksid]
c.	[dœmjœr]	[bjɔksid]

7.7 MORPHOLOGICAL VARIANTS: i u y AFTER FORMATIVE BOUNDARIES

In Section 7.3 we observed how the high vowel at the end of a formative becomes nonsyllabic if it is followed by a vowel. In this section

we analyze the change of high vowels at the beginning of formatives and see their morphological variants.

7.7.1 If a suffix begins with a high vowel followed by a consonant, we observe that this vowel remains syllabic in all positions. This indicates that glide formation in French creates *on-glides* but not *off-glides*.

(35) /#ism/ **héro** [ero] 'hero' **héroisme** [eroism] 'heroism'
/#ist/ **épée** [epe] 'sword' **épéiste** [epeist] 'sword player'

Actually very few suffixes beginning with a *vowel + consonant* are attached to stems ending with a vowel, unless this vowel is also a high vowel, in which case the vowel of the stem becomes nonsyllabic, e.g. words (17). The only exceptions are the suffixes #ism and #ist, which we have already shown to behave differently from the other suffixes.

7.7.2 If a suffix begins with a high vowel followed by a second vowel, we expect this high vowel to be nonsyllabic in most positions, except when this would lead to clusters violating the glide constraints. If the initial vowel of the suffix is i, we also expect an intervocalic yod when this vowel remains syllabic.

(36)

/+ie/	a.	**cacao**	[kakao]	'cocoa'	**cacaoyer**	[kakaoje]	'cocoa tree'
	b.	**poire**	[pwar]	'pear'	**poirier**	[pwarje]	'pear tree'
	c.	**poivre**	[pwavr]	'pepper'	**poivrier**	[pwavrije]	'pepper tree'
/+iɛ̃/	a.	**Kafka**	[kafka]	'Kafka'	**Kafkaien**	[kafkajɛ̃]	'Kafkaian'
	b.	**Bismarck**	[bismark]	'Bismarck'	**Bismarckien**	[bismarkjɛ̃]	'Bismarckian'
	c.	**Zoroastre**	[zoroastr]	'Zoroaster'	**Zoroastrien**	[zoroastrijɛ̃]	'Zoroastrian'
/+iɔ̃/	a.	**je crée**	[ʒœkre]	'I create'	**nous créions**	[nukrejɔ̃]	'we created'
	b.	**je monte**	[ʒœmɔ̃t]	'I climb'	**nous montions**	[numɔ̃tjɔ̃]	'we climbed'
	c.	**je montre**	[ʒœmɔ̃tr]	'I show'	**nous montrions**	[numɔ̃trijɔ̃]	'we showed'

Examples (36) show that the rule of formative-initial glide formation is formally identical to the rule of formative-final glide formation that we described in Section 7.3.

7.7.3 Let us observe the phonetic forms of the following words which contain both formative-final and formative-initial high vowels:

(37)

/i/	(nous) **sciions**	/si+iɔ̃/	>	[sijɔ̃]	'(we) sawed'
/u/	(nous) **louions**	/lu+iɔ̃/	>	[lujɔ̃]	'(we) rented'
/y/	(nous) **suions**	/sy+iɔ̃/	>	[syjɔ̃]	'(we) sweated'

We can account for the fact that we obtain the phonetic forms sijɔ̃, lujɔ̃, syjɔ̃ and not, for instance, sjijɔ̃, lwijɔ̃, sɥijɔ̃ in two different ways:

(a) By observing that the rightmost high vowel becomes a glide, and by characterizing glide formation as a right-to-left process, i.e. as a phenomenon which applies first to the rightmost segment to which it is applicable.

(b) By observing that the formative-initial high vowel becomes non-syllabic, that is to say that glide formation within a formative takes place before glide formation between formatives.

Another way to express the second alternative is to say that there are two glide formation rules (38) and (39). Rule (38) describes glide formation within a formative and (39) glide formation between formatives.

(38) Formative-level glide formation

[+high] → [-syllabic] / X __ [+syllabic]

(39) Word-level glide formation

[+high] → [-syllabic] / X __ + [+syllabic]

In both (38) and (39) X has the same restrictions as previously (rule 10). We shall see later that the second solution rather than the first fully describes the phenomenon of glide formation.

7.7.4 We have shown that the rule which converts yi to ɥi is applicable to clusters in which y and i belong to different formatives, e.g. **continuité** /kɔ̃tiny+ite/ > [kɔ̃tinɥite], **incongruité** /ɛ̃kɔ̃gry+ite/ > [ɛ̃kɔ̃grɥite]. The phonetic forms of the words in (40) show that this phenomenon takes place after glide formation within formatives:

(40) **(nous) continuions** [kɔ̃tinyjɔ̃] '(we) continued'

(nous) engluions [ãglyjɔ̃] '(we) covered with glue'

These phonetic forms are compatible with both (a) a right-to-left characterization of glide formation and (b) a distinction between formative- and word-level phonological processes.

7.8 GEMINATE GLIDES

7.8.1 The rules of glide formation allow the formulation of geminate glides (a) after stems ending with any of the sequences *vowel*+w+u, *vowel*+j+i, *vowel*+ɥ+y and followed by a vowel, and (b) after stems ending with the sequence *vowel*+j and followed by a suffix in i+*vowel*.

Intervocalic glides in stems are all of recent introduction in French and their relative frequency is still very low: there does not exist any stem which would allow the case (a). Case (b), on the other hand, is very frequent; the resulting geminate is usually reduced to a single j as in (41), except in conjugated verbs (imparfait and subjunctif) as in (42):

(41) /+ie/ **groseille** [grozɛj] 'currant (berry)'
groseillier /grozɛj+ie/ > /grozɛj+je/ > [grozɛje] 'currant (bush)'
vanille [vanij] 'vanilla bean'
vanillier /vanij+ie/ > /vanij+je/ > [vanije] 'vanilla tree'
papaye [papaj] 'papaya (fruit)'
papayier /papaj+ie/ > /papaj+je/ > [papaje] 'papaya (tree)'

(42) /+iɔ̃/ **(je) cueille** [kœj] '(I) pick up'
(nous) cueillions [kœjjɔ̃] '(we) picked up'
(je m')habille [abij] '(I) dress'
(nous nous) habillions [abijjɔ̃] '(we) dressed'

As it appears in these examples, the formative-level glide formation rule applies to prevocalic i even when it is preceded by a glide; geminate jj appears in the verbal forms. A degemination rule such as (43) must be posited for the nonverbal forms:

(43) Yod-degemination

j → Ø / j __

7.8.2 It appears that yod degemination does not take place in verbal forms. As a result, different verbal forms are differentiated which otherwise would be homophonous:

(44) **(nous) cueillons** [kœjɔ̃] '(we) pick up'
(nous) cueillions [kœjjɔ̃] '(we) picked up'
(nous nous) habillons [abijɔ̃] '(we) get dressed'
(nous nous) habillions [abijjɔ̃] '(we) got dressed'

However, a principle of differentiation alone does not explain why degemination does not take place in verbal forms, since the ambiguity between the first and second person plural of the indicative present on the one hand, and the indicative imperfect or subjunctive present on the other hand, appears in many other verbal forms. Example (45) shows how diaeresis in verbs with a stem ending in i introduces ambiguity.

(45) **(nous) scions** /si+ɔ̃/ > [sjɔ̃] (glide formation) '(we) saw'
or > [sijɔ̃] (diaeresis + intervocalic yod)
(nous) sciions /si+iɔ̃/ > [sijɔ̃] (glide formation on the second i) '(we) sawed'

Examples (46) and (47) show how verbs ending with a cluster *consonant* + *liquid* + i or *glide* + i are always homophonous in these tenses.[1]

(46)	(nous) trions /tri+ɔ̃/	> [trijɔ̃]	(intervocalic yod)	'(we) sort'
	(nous) triions /tri+iɔ̃/	> [trijɔ̃]	(glide formation on the second i)	'(we) sorted'
(47)	(nous) essuyons /ɛsɥi+ɔ̃/	> [ɛsɥijɔ̃]	(intervocalic yod)	'(we) wipe'
	(nous) essuyions /ɛsɥi+iɔ̃/	> [ɛsɥijɔ̃]	(glide formation on the second i)	'(we) wiped'

7.9 INTERNAL GLIDES

In Sections 7.3 and 7.9 we have shown that high vowels can be either nonsyllabic, when they precede another vowel and are not preceded by a liquid-cluster, or syllabic in other positions. Glide formation is transparent in these cases because the same vowel appears either as syllabic or as nonsyllabic according to the morphological context. If a high vowel inside a formative is in a context in which its syllabicity is always conditioned, glide formation stops being transparent; for instance, the word **sien** [sjɛ̃] 'his' can be analyzed as /siɛ̃/ or /sjɛ̃/, the rules of glide formation giving in both cases the proper phonetic form. We shall show that most internal glides can also be analyzed as nonsyllabic variants of high vowels; this time, however, our arguments will be distributional arguments rather than morphological arguments.

7.9.1 If we restrict underlying internal glides to the context (48), then occurrences of all other surface glides can be interpreted as nonsyllabic variants of high vowels according to the pattern observed with formative-initial and formative-final high vowels.

(48) a. underlying w, ɥ may appear only intervocalically

b. underlying j may appear only postvocalically

We must allow underlying glides in these positions because rules of glide formation cannot account for all the glides in words (49) and (50):

(49)	**oui**	[wi]	'yes'	**houille**	[uj]	'coal'
	roui	[rwi]	'maceration'	**rouille**	[ruj]	'rust'
	haï	[ai]	'hated'	**ail**	[aj]	'garlic'

If all glides were underlying high vowels, **oui** and **houille** in (49) would have the same underlying form /ui/, and in the same way, **haï** and **ail** in (49), the same underlying form /ai/. Different underlying forms are necessary to account for the phonetic differences. We may, for instance,

---

[1](a) Warnant 1968, who describes a dialect with intervocalic yod after ɥi, also makes a distinction between **essuyons** [ɛsɥi-jɔ̃] and **essuyions** [ɛsɥij-jɔ̃]; (b) Damourette & Pichon 1911-1927, who describe a dialect with intervocalic yod, also add another yod in **triions** [trijjɔ̃] '(we) sorted', **pliions** [plijjɔ̃] '(we) folded'. Speakers of such dialects that I have observed seem to distinguish between the imperfect and the subjunctive.

allow underlying postvocalic yods in the underlying representation of words with phonetic postvocalic yods: **houille** /uj/, **rouille** /ruj/, and **ail** /aj/. The same type of reasoning shows that some intervocalic phonetic glides must be analyzed as underlying glides:

(50) **kiwi** [kiwi] 'kiwi' **Siouah** [sjua] (placename)

If all phonetic glides could be analyzed as underlying high vowels, the underlying forms for the words (50) would be /kiui/ and /siua/. We cannot define a natural rule of glide formation for intervocalic high vowels which would derive [sjua] from /siua/ without deriving *[kjui] from /kiui/. This leads us to analyze w in **kiwi** as an underlying glide.

We can derive [sjua] from underlying /siua/ by application of rule (39) of glide formation, if we further assume that this rule applies from left-to-right.

7.9.2 On the other hand, in an analysis of all internal glides as underlying glides, the distribution (51) of glides in stems becomes complicated and duplicates most of the conditions which are already included in the rule of glide formation. Such an analysis must therefore be rejected.

(51) a. underlying j, w, ɥ may not appear initially before a consonant.

b. underlying w, ɥ may not appear finally or before a consonant.

c. underlying j, w, ɥ may not appear after the cluster *consonant + liquid* or after a glide (except postvocalic yod).

d. underlying u, y may not appear before a vowel, except in environment (c) excluding j, w, ɥ.

e. underlying i may never appear before a vowel.

f. underlying y may never precede i even in the context (d) which allows y to precede a vowel.

g. underlying w may follow a cluster *consonant + liquid* if it is followed by a or ɛ̃.

7.9.3 Let us analyze the conditions (51) on the distributions of glides and see how this is accounted for by the analysis where the conditions are restricted to (48) and the rules of glide formation apply to the stems. Condition (51a) is a consequence of the syllabicity of high vowels before consonants (high vowels can become nonvocalic only when they precede a vowel). Condition (51b) is a consequence of the syllabicity of high vowels before consonants. Conditions (51c) and (51d) describe the environment in which high vowels are syllabic or nonsyllabic:

(52) j **tiare** [tjar] 'tiara'

w **fouet** [fwɛ] 'whip'

ɥ **duel** [dɥɛl] 'duel'

(53) a. i **brioche** [brijɔʃ] 'cake'

u **brouette** [bruɛt] 'wheelbarrow'

	y	**bruant**	[bryã]	'bunting'
b.	i	**Wyandotte**	[wijãdɔt]	'Wyandotte hen'
	u	**Siouah**	[sjua]	(name)
	y	**Yuan Kiang**	[jyãkjãg]	'Red River (Chinese name)'

Condition (51e) is a consequence of intervocalic yod.

(54) **brioche** /briɔʃ/ > [brijɔʃ] 'cake'

Condition (51f) is a consequence of *labial attraction* (rule 15).

(55) **truie** /tryi/ > [trɥi] 'sow'

We shall show that condition (51g) can also be accounted for independently.

7.9.4 Another argument in favor of an analysis of internal glides as high vowels instead of underlying glides is the fact that there are some cases where these glides are syllabic: namely, in case of diaeresis (which we study later), of emphatic calls, and of reduplication. In emphatic calls, monosyllabic words become disyllabic: the first syllable receives a high pitch and the second a low pitch; if a word does not contain any glide, the vowel is repeated twice; if the word contains a glide, the glide becomes syllabic:

(56)	**Yves**	[iv]	emp. call	[$\overset{41}{\text{iiv}}$]
	Jules	[ʒyl]	emp. call	[$\overset{41}{\text{ʒyyl}}$]
	Louis	[lwi]	emp. call	[$\overset{41}{\text{lui}}$]
	Pierre	[pjɛr]	emp. call	[$\overset{4\ 1}{\text{pijɛr}}$]

In reduplicative formations, one syllable of a word can be reduplicated; in these reduplications, a glide may behave as an ordinary syllabic vowel[1]:

(57)	**Edouard**	[edwar]	redupl.	**Doudou**	[dudu]
	Louis	[lwi]	redupl.	**Loulou**	[lulu]
	Thierry	[tjɛri]	redupl.	**Titi**	[titi]

7.9.5 The constraints (48) imposed on underlying j w ɥ do not completely determine the underlying forms of some formatives with glides which do not have syllabic variants. This is the case with examples (50), in which the glides can be analyzed indifferently as underlying vowels or glides:

---

[1]Cf. Morin 1972.

(58) cahier [kaje] 'notebook'
ailleurs [ajœr] 'somewhere else'
cahoua [kawa] 'coffee'

7.9.6 Glide formation appears to be neither a left-to-right nor a right-to-left process. We saw in Section 7.7 that the forms (37) show that either (a) glide formation is a right-to-left process or (b) there are two glide formations, one at the formative level and one at the word level. The phonetic forms exhibited in (59) show that glide formation cannot be considered as a single rule, applying from right-to-left, since the sequences y+iɔ̃ and yi+ɔ̃ become respectively yjɔ̃ and ɥijɔ̃:

(59)				
(je) sue	[sy]		'(I) sweat'
(nous) suions	/sy+iɔ̃/	> [syjɔ̃]	'(we) sweated'
(j')essuie	/ɛsyi/	> [ɛsɥi]	'(I) wipe'
(nous) essuyons	/ɛsyi+ɔ̃/	> [ɛsɥijɔ̃]	'(we) wipe'

Examples (59) show that the factor conditioning the proper phonetic form is the position of the formative boundary: in /sy+iɔ̃/, glide formation applies first within the formative iɔ̃ > jɔ̃, thus preventing y from becoming a glide; in /ɛsyi+ɔ̃/, glide formation applies first within the formative /ɛsyi/ > /ɛsɥi/, and intervocalic yod appears between i and ɔ̃.

7.9.7 Examples (59) show that glide formation takes place in two steps: first within a formative and second between formatives, within words. This does not preclude, however, that each step of glide formation be either a right-to-left or left-to-right process. The example of **Siouah** [sjua] seems to indicate that glide formation within stems is left-to-right. The examples (60) seem to contradict this hypothesis.

(60)					
tuyau	/tyio/	> [tɥijo]	or [tyjo]	'hose'
tuyère	/tyiɛr/	> [tɥijɛr]	or [tyjɛr]	'exhaust pipe'
gruyère	/gryiɛr/	> [grɥijɛr]	or [gryjɛr]	'Swiss cheese'
bruyère	/bryiɛr/	> [brɥijɛr]	or [bryjɛr]	'heather'
Tuyen-Quan[1]	/tyiɛnkan/	> [tɥijɛnkan]	or [tyjɛnkan]	(town)
Juillac[2]	/ʒyiak/	> [ʒɥijak]	or [ʒyjak]	(town)

---

[1]Cited in Fouché 1959:215.

[2]Cited in Warnant 1968:529. In this last case, this appears to be a case of imprecision in the French writing system. Postvocalic yod in French is usually spelled **ill**, unless the preceding vowel is an **i**, in which case it is reduced to **ll**, e.g. **ailleurs** [ajœr], **trille** [trij]. In the word **Juillac**, i may be interpreted either as belonging to the preceding vocalic group, hence [ʒyijak], or part of the spelling for yod, hence [ʒyjak]. This interpretation is suggested by the two possible phonetic forms of **Juilly** [ʒɥiji] or [ʒyji], also cited in Warnant 1968:529. In this case the underlying form cannot be /ʒyii/ as we shall see that two consecutive i's do not give ji, e.g. **annihiler** [aniile].

These examples are not conclusive, however, because they are very limited (list 60 is nearly exhaustive) and because other underlying forms are possible: for instance, **tuyère** /tyjɛr/ or /tyijɛr/. Usually only one of the two pronunciations is found in one idiolect and not consistently the same type of pronunciation; for instance, one can find **bruyère** [bryjɛr] and **tuyère** [tɥijɛr] in the same idiolect. Furthermore many other words such as (61) have a unique pronunciation ɥij. (However, all words containing the sequence yj have two alternate pronunciations yj and ɥij, e.g. (60).)

(61) **cuillère** [kɥijɛr] 'spoon'
écuyère [ekɥijɛr] 'page'

7.10 LABIAL DISSIMILATION

When two consecutive high vowels are both rounded or unrounded, glide formation does not take place:

(62) **nouure** /nu+yr/ > [nuyr] 'beginning of the formation of a fruit'
lituus [lityys] 'augur's wand'
annihiler [aniile] 'to annihilate'
Piis[1] [piïs] (town)

This leads us to analyze the glides found in the following words as being underlying glides:

(63) **Woolite** [wulit] (registered trademark)
yiddish [jidiʃ] 'Yiddish'

7.11 LABIAL ATTRACTION

In contrast with labial dissimilation, we observe that there is a strong tendency toward glide formation when the rounded high vowels y u precede the unrounded high vowel i.

7.11.1 We observed previously that y becomes nonvocalic when it precedes i, even when it is preceded by a cluster *consonant + liquid.*

(64) **truite** [trɥit] 'trout' **truelle** [trylɛl] 'trowel'
bruit [brɥi] 'noise' **bruant** [bryã] 'bunting'

We also note that diaeresis is always possible when ɥ is followed by any vowel but i:

(65) **nuée** [nɥe] or [nye] 'clouds' **nuit** [nɥi] but not *[nyi] 'night'
puer [pɥe] or [pye] 'to stink' **puit** [pɥi] but not *[pyi] 'well'

[1]Cited in Warnant 1968:588.

huer	[ɥe]	or [ye]	'to boo'	**huis**	[ɥi]	but not *[yi]	'door'
buée	[bɥe]	or [bye]	'fog'	**buis**	[bɥi]	but not *[byi]	'box'
lueur	[lɥœr]	or [lyœr]	'lights'	**lui**	[lɥi]	but not *[lyi]	'him'

Diaeresis of ɥi is impossible, even when it is preceded by the cluster *consonant + liquid*[1]:

(66) **pluie** [plɥi] *[plyi] 'rain'
bruit [brɥi] *[bryi] 'noise'

This indicates that the formation of ɥ before i is not conditioned by the same factors which form ɥ before other vowels and justifies our adopting a different rule to represent this formation:

(67) y → ɥ / __ i

7.11.2 Actually, labial attraction is not restricted to y, but can also be observed for u as well. However, in this case the number of words containing the sequence wi is, because of the historical development of French, much less important than the number of words containing the sequence ɥi. We observe that u may become w before i even when it is preceded by the cluster *consonant* + r, as in (68), but not when it is preceded by the cluster *consonant* + l, as in (69):

(68) **écroui** [ekrui] or [ekrwi] 'hard-hammered'
Crouy [krui] or [krwi] (town)
(69) **ébloui** [eblui] but not *[eblwi] 'blinded'

Diaeresis is not possible when w is followed by i as is the case for ɥ before i:

(70) **houer**	[we]	or [ue]	'to plough'	**oui**	[wi]	but not *[ui]	'yes'
louer	[lwe]	or [lue]	'to praise'	**louis**[2]	[lwi]	but not *[lui]	'gold coin'
bouée	[bwe]	or [bue]	'buoy'	**bouiboui**	[bwibwi]		'joint'
				cambouis	[kãbwi]		'old geese'
				mouise	[mwiz, *muiz]		'trouble'
jouer	[ʒwe]	or [ʒue]	'to play'	**Jouy(-en-Josas)**	[ʒwi, *ʒui]		(town)

This indicates that, here again, the formation of the glide w before i is not conditioned by the same rule which forms w before other vowels.

(71) u → w / __ i

---

[1] One exception, however, for fluide, which has both pronunciations [flyid] and [flɥid] in my speech.

[2] The name Louis can be disyllabic, [lui], but with the characteristic intonation of emphatic calls.

Rules (67) and (71) are very similar; however, they have different levels of generality: rule (67) applies everywhere but rule (71) does not apply after a *consonant* + l cluster and is optional after a *consonant* + r cluster.

7.11.3 Another phenomenon seems to belong to the class of attraction; namely, the transformation of ɔ into w before ɛ and a. This phenomenon is always optional in my speech.

(72)	ɔa	**coasser**	[kɔase]	or	[kwase]	'to croak (frog)'
		oasis	[ɔazis]	or	[wazis][1]	'oasis'
		casoar	[kazɔar]	or	[kazwar]	'cassowary'
		Loanda	[lɔãda]	or	[lwãda]	(town, Africa)
		Loango	[lɔãgo]	or	[lwãgo]	(town, Africa)
	ɔɛ	**goéland**	[gɔɛlã]	or	[gwɛlã]	'seagull'
		goémon	[gɔɛmõ]	or	[gwɛmõ]	'seaweed'
		Coëtquidan	[kɔɛtkidã]	or	[kwɛtkidã]	(town)
		coïncidence	[kɔɛ̃sidãs]	or	[kwɛ̃sidãs]	'coincidence'
		poète	[pɔɛt]	or	[pwɛt][2]	'poet'
		poème	[pɔɛm]	or	[pwɛm][2]	'poem'
		Noël	[nɔɛl]	or	[nwɛl]	'Christmas'
(73)	ɔa	**croasser**	[krɔase]	or	[krwase]	'to croak (crow)'
		Troade	[trɔad]	or	[trwad]	(town)
		Troarn	[trɔarn]	or	[trwarn]	(town)
	ɔɛ	**Groënland**	[grɔɛnlãd]	or	[grwɛnlãd]	'Greenland'
		Citroën	[sitrɔɛn]	or	[sitrwɛn]	(car make)
		troène	[trɔɛn]	or	[trwɛn][2]	'privet'

In the two previous cases of labial attraction, the vowel becoming a glide and the following vowel have the same height; in this case ɔ can be followed either by a vowel of the same height, ɛ, or of lower height, a.

7.11.4 Labial attraction takes place only when the first vowel is rounded: none of the characteristics of labial attraction are observed for the clusters iu or iy, where the two vowels in each cluster agree in height and have opposite roundness.

(74)	**striure**	[strijyr]	*[strjyr] 'striation'
	pliure	[plijyr]	*[pljyr] 'folding'

---

[1]After the article, e.g. **une oasis** /ynwazis/.

[2]Appears only during fast speech in my own speech. However, I have observed these phonetic forms in deliberate speech. Also cited in Frei 1922:105.

(75) liure [ljyr] or [lijyr] 'rope'

In (74) glide formation does not take place before a cluster *consonant + liquid* and in (75) diaeresis is possible. The characteristics of labial attraction can be represented by the following rule:

(76) $\begin{vmatrix}+\text{syllabic}\\+\text{labial}\\\alpha\text{high}\end{vmatrix} \rightarrow [-\text{syllabic}] \;/\; \_\_ \begin{vmatrix}+\text{syllabic}\\-\text{labial}\\\alpha\text{high}\end{vmatrix}$

(a) $\begin{vmatrix}+\text{syllabic}\\+\text{labial}\\+\text{high}\end{vmatrix}$ represents either u or y and $\begin{vmatrix}+\text{syllabic}\\-\text{labial}\\+\text{high}\end{vmatrix}$ represents i.

(b) $\begin{vmatrix}+\text{syllabic}\\+\text{labial}\\-\text{high}\end{vmatrix}$ represents ɔ and $\begin{vmatrix}+\text{syllabic}\\-\text{labial}\\-\text{high}\end{vmatrix}$ represents either ɛ or a.

7.12 DIAERESIS

In the previous chapter we mentioned the possibility for glides preceding a vowel to have an alternate syllabic pronunciation, that is, the possibility for diaeresis. We observed that diaeresis was not possible in the clusters ɥi and wi. It appears that in all other positions, diaeresis is stylistically possible, although sometimes very contrived. This property is used in poetry, where the count of syllables is essential.[1] In this section, we shall investigate the environments which allow diaeresis and those which do not. The distinction appears to be partly idiolectal, and here again I will follow my own speech habits.

7.12.1 Diaeresis of j

7.12.1.1 Diaeresis of j is impossible if it does not precede a formative boundary:

(77) liez /li+e/ > [lje] or [lije] 'bind'
riez /ri+e/ > [rje] or [rije] 'laugh'
niez /ni+e/ > [nje] or [nije] 'deny'

(78) lieu /liø/ > [ljø], not *[lijø] 'place'
rien /riɛ̃/ > [rjɛ̃], not *[rijɛ̃] 'nothing'
niais /niɛ/ > [njɛ], not *[nijɛ] 'idiot'

7.12.1.2 Diaeresis of j takes place only after a liquid or after the nasal n.[2] Compare for instance (77) and (79):

---

[1] Grammont 1908:14 shows uses of fouet, miasme, opium as [fuɛ] and [fwɛ], [mijasm] and [mjasm], [opijɔm] and [opjɔm] where both the disyllabic and monosyllabic pronunciations are used by the same authors to fit the meter of their verse.

[2] There are no instances of stem final i following m in a position where diaeresis could take place; miette [mjɛt] 'crumbs' is no longer analyzed as the diminutive [mi+ɛt] of mie [mi] 'noncrusty part of bread'.

(79) **sciez** /si+e/ > [sje], not *[sije] 'saw'
fiez /fi+e/ > [fje], not *[fije] 'trust'
skiez /ski+e/ > [skje], not *[skije] 'ski'

7.12.1.3 Diaeresis is optional when r, l, and n are sentence initial, as for instance, in the imperatives of (77) or the citation forms of (80):

(80) **liaison** /li+ɛzɔ̃/ > [ljɛzɔ̃] or [lijɛzɔ̃] 'binding'
rieur /ri+œr/ > [rjœr] or [rijœr] 'laughter'

7.12.1.4 Diaeresis does not take place when r, l, and n are preceded by a vowel:

(81) **déliez-le** /deli+e+lə/ > [deljelø] 'untie him'
mariez-vous /mari+e+vu/ > [marjevu] 'get married'
reniez-tout /rəni+e+tu/ > [rœnjetu] 'renege everything'
la liaison /la+li+ɛzɔ̃/ > [laljɛzɔ̃] 'the binding'
ne riez pas /nə+ri+e+pa/ > [nœrjepa] 'don't laugh'

However, if the glide is in a syllable which receives contrastive intonation (particularly in sentence-final position), then diaeresis is still possible:

(82) **(faites attention) à la liaison** [alaljɛzɔ̃] (4 1) '(watch) the binding'
(faites attention) aux lieurs [olijœr] (4 1) '(watch) the tiers'
(faites attention) aux rieurs [orijœr] '(watch) the laughers'
souriez [surije] (4 1) 'smile (cheese)'
souriez-moi [surjemwa] (2 4 1), but not *[surijemwa] (2 2 4 1) 'smile at me'

7.12.1.5 Diaeresis is obligatory when r or l[1] are preceded by a consonant:

(83) **une liaison** [ynlijɛzɔ̃] 'a binding'
vous ne riez pas? [vunrijepa] 'you don't laugh?'

This last case of diaeresis corresponds to the general constraint that yod does not appear after the cluster *consonant + liquid.*

7.12.2 Diaeresis of w and ɥ

---

[1]There are no occurrences of n in such positions.

7.12.2.1 As we observed previously, diaeresis of w and ɥ does not take place before i; this is the phenomenon of labial attraction.

7.12.2.2 Diaeresis is very rare after fricatives (f v s z ʃ ʒ).

(84)	fouet	[fwɛ]	*[fuɛ]	'whip'
	fuégien	[fɥeʒjɛ̃]	*[fyeʒjɛ̃]	'Fuegian'
	vouer	[vwe]	*[vue]	'to devote'
	souhait	[swɛ]	*[suɛ]	'wish'
	suer	[sɥe]	*[sye]	'to sweat'
	zouave	[zwav]	*[zuav]	'Zouave', also 'funny person'
	chouette	[ʃwɛt]	*[ʃuɛt]	'howl'
	échouer	[eʃwe]	*[eʃue]	'to fail'
	jouer	[ʒwe]	*[ʒue]	'to play'
	juin	[ʒɥɛ̃]	*[ʒyɛ̃]	'June'

7.12.2.3 Diaeresis after the liquids r and l and the nasal n is optional when they are sentence-initial as in (85), does not take place when they are preceded by a vowel or an r as in (86), and is obligatory when they are preceded by a consonant as in (87). This situation is similar to the diaeresis of j after liquids and n; here, however, it does not appear to depend upon the presence of formative boundaries:

(85)	rouer	[rwe, rue]	'to beat up'
	Rouen	[rwã, ruã]	(town)
	ruer	[rɥe, ɾye]	'to kick'
	Rueil	[rɥɛj, ɾyɛj]	(town)
	louer	[lwe, lue]	'to rent'
	luette	[lɥɛt, lyɛt]	'uvula'
	nouer	[nwe, nue]	'to make a knot'
	nuage	[nɥaʒ, nyaʒ]	'cloud'

(86)	s'enrouer	[sãrwe]	*[sãrue]	'to get a hoarse voice'
	allouer	[alwe]	*[alue]	'to allocate'
	évaluer	[evalɥe]	*[evalye]	'to evaluate'
	renouer	[rœnwe]	*[rœnue]	'to resume'
	continuer	[kɔ̃tinɥe]	*[kɔ̃tinye]	'to continue'

(87)	une nuée	[ynnye]	'a cloud'
	une luette	[ynlyɛt]	'a uvula'
	vous ne louez pas ...	[vunluepa...]	'you don't rent ...'

7.12.2.4 Diaeresis after the bilabials m p b is obligatory when they are initial, as in (88), or preceded by a consonant, as in (89). It does not normally take place when the bilabials are preceded by a vowel, as in (90).

(88) **muet** [myɛ] 'dumb'
muer [mye] 'to mutate'
puer [pye] 'to stink'
bouée [bue] 'buoy'
boueux [buø] 'garbage collector'
buée [bye] 'fog'

However one exception: **mouette** [mwɛt, muɛt] 'seagull', the only occurrence of initial mu, mw.

(89) **transmuer** [trãsmye] 'to transmute'
conspuer [kõspye] 'to spit upon'
(90) **remuer** [rœmɥe] 'to move'
distribuer [distribɥe] 'to distribute'

7.12.2.5 After the dentals t and d, diaeresis appears less subject to generalization. Diaeresis does not normally take place when t and d are preceded by a vowel or an r, as in (91):

(91) **situer** [sitɥe] 'to situate'
évertuer [evɛrtɥe] 'to try'
tatouer [tatwe] 'to tattoo'
graduel [gradɥɛl] 'gradual'
amadouer [amadwe] 'to conciliate'

There is no diaeresis of ɥ after t, nor of w after t and d:

(92) **tuer** [tɥe] 'to kill'
ponctuer [põktɥe] 'to punctuate'
touer [twe] 'to tow'

Diaeresis of ɥ is obligatory after initial d:

(93) **duel** [dyɛl] 'duel'
duo [dyo] 'duo'
duodénum [dyodenɔm] 'duodenum'

7.12.2.6 If y and u are initial, there is usually diaeresis:

(94) **huez-le** [yelø] 'boo him'
houez-le [uelø] 'plough it'
Hué [ye] (town, Vietnam)

This may also explain why **ou** [u] does not become w in sentences (27g).

7.13 INITIAL GLIDES

Initial glides are always followed by a vowel. We saw that in the words **Woolite** [wulit] and **yiddish** [jidiʃ], the initial glides must be underlying glides. We observe two classes of words with initial phonetic glides: a class (95) which behave like vowel-initial words and a class (96) which behave like consonant-initial words with respect to liaison and elision:

(95) **iodure** [jɔdyr] 'iodate'
oued [wɛd] 'wadi'
huissier [ɥisje] 'doorman'
(96) **yacht** [jak] 'yacht'
week-end [wikɛnd] 'weekend'
yiddish [jidiʃ] 'Yiddish'
Woolite [wulit] (trademark)

Liaison and elision take place before vowel-initial words and words such as (95) but do not take place before consonant-initial words and words such as (96):

(97) **l'enfant** [lãfã] 'the child' **un enfant** [ɛ̃nãfã] 'a child'
l'iodure [ljɔdyr] 'the iodate' **un iodure** [ɛ̃njɔdyr] 'an iodate'
le garçon [lœgarsɔ̃] 'the boy' **un garçon** [ɛ̃garsɔ̃] 'a boy'
le yacht [lœjak] 'the yacht' **yn yacht** [ɛ̃jak] 'a yacht'

This indicates[1] that we must distinguish two types of initial phonetic glides: (a) glides which have an underlying high vowel and thus command liaison or elision, and (b) underlying glides, which behave like consonants.

7.14 THE COMBINATION wa

7.14.1 Sources for wa

We have observed two sources for phonetic wa: (a) regular glide formation of u before a (for instance **loua** /lua/ > [lwa]) and (b) labial attraction of ɔ before a (for instance **coasser** /kɔase/ > [kwase]). There exists a third type of combination wa which cannot be reduced to either

[1]Position taken by Milner 1967.

of these two sources. This wa in the standard spelling of French is written oi. It cannot be reduced to regular glide formation because this wa may appear after a cluster *consonant + liquid:*

(98) **trois** [trwa] 'three' **troua** [trua] 'pierced'
cloitre [klwatr] 'cloister' **cloua** [klua] 'nailed'

It cannot be reduced to either glide formation or labial attraction because it is not susceptible to diaeresis:

(99) **loi** [lwa] *[lua] 'law' **loua** [lua] or [lwa] 'praised'
roi [rwa] *[rua] 'king' **roua** [rua] or [rwa] 'beat'
noix [nwa] *[nua] 'nut' **noua** [nua] or [nwa] 'knotted'
bois [bwa] *[bua] 'wood' **bouée** [bue] or [bwe] 'buoy'

(100) **(ils) croissent** [krwas] *[krɔas] '(they) grow'
(ils) croassent [krɔas] or [krwas] '(they) croak'
oiseux [wazø] *[ɔazø] 'useless'
oasis [ɔazis] or [wazis] 'oasis'

We refer to this wa as the 'inherent' wa.

7.14.2 Acoustic Properties

Phonetic w may have different realizations. In a word such as **méchoui** [meʃwi] 'roasted mutton', w corresponds to syllabic u, in **choix** [ʃwa] 'choice', w corresponds to syllabic o, and in **chouette** [ʃwɛt] 'owl', it has a sound intermediate between u̯ and o̯.[1] This appears to be a simple height assimilation to the following vowel, u̯ occurring before high vowels and o̯ before low vowels. We observe, however, that this assimilation is not uniform, depending upon the source of w.

If w is obtained through glide formation, the assimilation appears to be optional -- thus **loua** is realized as [lu̯a] or [lo̯a] -- especially when the consonants preceding w allow diaeresis. In **échoua** [eʃwa] 'failed', where diaeresis is not possible, w always appears as o̯.

If w is obtained through labial attraction, assimilation always takes place; for instance, w in **bouiboui** [bwibwi] 'joint' is always realized as u̯, not as o̯, and w in **casoar** [kazwar] 'cassowary' is always realized as o̯, not as u̯.

The w in inherent wa always assimilates, i.e. it is always realized as o̯. In other words, inherent wa and wa obtained through labial attraction are acoustically identical.

7.14.3 Analysis of Inherent wa

---

[1]Cf. Damourette & Pichon 1911-1927:190.

Inherent wa is distinct from wa obtained through glide formation and labial attraction. We could analyze it as being an underlying wa with the underlying glide w. This analysis, however, is not consistent with the properties of inherent wa with respect to liaison and elision, and with respect to glide formation:

(101)	**l'oie**	[lwa]	'the goose'				
	l'oasis	[lwazis]	'the oasis'				
	la Wallone	[lawalɔn]	'the Walloon (fem.)'				
(102)	**(je) plie**	[pli]	'(I) fold'	**plioir**	[plijwar]	(instrument for folding)
	(j')appuie	[apɥi]	'(I) press'	**appuyoir**	[apɥijwar]	(instrument for holding and pressing two plates together)

Examples (101) show that inherent wa cannot be underlying wa; otherwise it would behave like **Wallone** /walɔn/ with respect to elision. Inherent wa behaves more like underlying ɔa. Examples (102) confirm the fact that inherent wa cannot be underlying wa; if it were the case that the underlying form of **plioir** were /pli+war/, we could not justify the existence of an intervocalic yod in [plijwar] since intervocalic yods do not appear between i and w, e.g. **kiwi** [kiwi].

Inherent wa behaves similarly to a vowel-initial cluster, and more particularly to ɔa: the two combinations have the same acoustic properties and behave similarly in the same context, the only difference being that labial attraction is optional for ɔa. We shall analyze inherent wa as some underlying ɔ̯a, where ɔ̯ is a vowel which must necessarily undergo labial attraction.[1] In other words, ɔ̯a is a notation to represent that inherent wa behaves similarly to other clusters ɔa, namely, that it begins with a vowel, is acoustically similar to ɔa, and furthermore, that it is always realized as the glide w, i.e. that it is constrained to undergo labial attraction.

7.14.4 Consequence of this Constraint

We can account for intervocalic yod in words (102) if we analyze labial attraction as a process which takes place after yod-insertion. The derivation of **plioir** in that case can be represented as (103):

(103)	underlying form	/pli + ɔ̯ar/
	intervocalic yod	/plij + ɔ̯ar/
	labial attraction	[plijwar]

[1] I have observed only one case when inherent wa undergoes diaeresis: this is when **moi** [mwa] 'I' is used emphatically and also somewhat ironically, in which it becomes [moa].

We observed previously that glide formation takes place before intervocalic yod insertion. If we assume that the ordering of rules is transitive, the derivation of hypothetical /li+ɔ̣ar/ 'binder' (from (je) lie [li] '(I) bind') is as follows:

(104) underlying form /li + ɔ̣ar/
glide formation /lj + ɔ̣ar/
labial attraction *[ljwar]

The phonetic form *[ljwar] violates constraint (1), that two consecutive glides cannot follow a consonant, and is therefore not permissible. The suffix ɔ̣ar is not permissible after any root ending with a high vowel, unless this high vowel is in a context which does not allow its becoming a glide.[1] Stems like /li/ 'bind' will take other suffixes, e.g. **lieuse** [ljøz] 'binder'. This is a clear case where the phonological constraints impose a constraint on word formation.

Inherent wɛ̃, as in **groin** [grwɛ̃] 'snout', will be similarly analyzed, namely as ɔ̣ɛ̃.

7.15 i BEFORE SCHWA

7.15.1 In popular Parisian speech,[2] we observe an optional yod after final i of the third person plural present form and of the subjunctive forms and after preconsonantal i of the future and conditional forms. Academic French allows only the forms of (105) and (106) without the yod.

(105)	**(il) crie**	[kri]		'(he) cries (present)'
	(ils) crient	[kri]	or [krij]	'(they) cry (present)'
	(il) crie	[kri]	or [krij]	'(he) cries (subjunctive)'
	(ils) crient	[kri]	or [krij]	'(they) cry (subjunctive)'
	(il) criera	[krira]	or [krijra]	'(he) will cry'
(106)	**(il s')ennuie**	[ãnɥi]		'(he) is bored (present)'
	(ils s')ennuient	[ãnɥi]	or [ãnɥij]	'(they) are bored (present)'
(107)	**(il) scie**	[si]		'(he) saws (present or subjunctive)'
	(ils) scient	[si]		'(they) saw (present or subjunctive)'
	(il) sciera	[si]		'(he) will saw'

We observe that yod appears after i only when it is in a context which blocks glide formation.[3] One explanation for this phenomenon is the

---

[1] The suffix ɔ̣ar is very productive in French. Juilland 1965 cites more than 180 stems taking this suffix.

[2] I describe here my personal speech. This has also been observed by Bauche 1929:37,115.

[3] In some forms of Parisian speech, the constraint limiting yod to appear only after i in a context which blocks glide formation seems to be relaxed: I have observed pronunciations such as **ils rient jaune** [irijʒon] 'they give a forced laugh', where j may also appear.

'analogical tendency'. A verb such as crier /kri+e/ > [krije] is reanalyzed as /krij+e/ on the model of briller /brij+e/ and ennuyer /ãnyi+e/ > [ãnɥije] is reanalyzed as /ãnyij+e/ on the model of aiguiller /egyij+e/. This analysis, however, does not explain why the singular persons of the indicative never appear with the stem ending in j:

(108) (je) crie, (tu) cries, (il) crie [kri], not *[krij]

It seems better to regard this ending j as an optional marker (a) of the plural for the third person of the indicative, (b) of the subjunctive, (c) of the future, and (d) of the conditional.[1]

7.15.2 The yod appearing in these positions has all the characteristics of an intervocalic yod, except that it is not intervocalic. It appears only in those positions where intervocalic yods appear, namely when i is preceded by a *consonant + liquid* cluster, as in (105), or a glide, as in (106). It does not appear after i preceded by a single consonant, as in (107), or after u or y, where there are never any intervocalic glides:

(109) (je) joue [ʒu] '(I) play' (je) jouerai [ʒurɛ] '(I) shall play'
(je) troue [tru] '(I) nail' (je) trouerai [trurɛ] '(I) shall nail'

This leads us to analyze this yod as a real intervocalic yod, where the vowel following i is subsequently deleted. In fact, this vowel appears in the first and second plural persons of the conditional conjugation of verbs with the stem-ending *consonant + liquid* + i:

(110) conditional conjugation of créer 'to create' and crier 'to cry'

(je) créerais	[krerɛ]	(je) crierais	[krirɛ]	or [krijrɛ]
(tu) créerais	[krerɛ]	(tu) crierais	[krirɛ]	or [krijrɛ]
(il) créerait	[krerɛ]	(il) crierait	[krirɛ]	or [krijrɛ]
(nous) crérions	[krerjõ]	(nous) crierions	[krirjõ]	or [krijœrjõ]
(vous) crériez	[krerje]	(vous) crieriez	[krirje]	or [krijœrje]
(ils) créraient	[krerɛ]	(ils) crieraient	[krirɛ]	or [krijrɛ]

In the first and second persons of the plural a schwa is present. Schwa normally deletes when preceded by a vowel or a single consonant, except when this would create a forbidden cluster *consonant + liquid* + j (constraint 1). That is, if we analyze yod in (105) and (106) as intervocalic yod resulting from the juxtaposition of /i + ə/, we also account for the presence of schwa in [krijœrjõ] and [krijœrje], since the schwa regularly deletes in all other positions.

7.15.3 The schwa appears to be a plural marker, a subjunctive marker, as in (ils) crient /kri+ə/, and to be part of the future and

---

[1]Cf. Frei 1929:188.

conditional markers /ər/, as in (ils) **crieront** /kri+ər+õ/. This schwa must delete in two different places: (a) optionally before glide formation /kriərõ/ > (opt.) [krirõ] or /kriərõ/ (we refer to this deletion as *schwa deletion after vowel*), and (b) obligatorily after glide formation /kriərõ/ > /krijərõ/ > [krijrõ] (we refer to this deletion as *schwa deletion after consonant*). In the derivation of verbs such as **scierons** /si+ər+õ/, the schwa deletion after vowels must be obligatory. It would also appear that schwa deletion must take place before glide formation, since otherwise /si+ər+õ/ would become *[sjœrõ]. This conclusion, however, is not necessary. Since there does not exist any instance of glide formation before a schwa, we could naturally assume that glide formation does not occur when a high vowel is followed by schwa.

7.16 TRANSITIONAL YOD

7.16.1 When a stem ends with a vowel and is followed by a suffix beginning with a vowel, a transitional consonant may be inserted. This transition may not always be predicted, even for a given word. For instance, the name of a fruit-bearing tree is obtained by adding the suffix +ie to the name of the fruit, e.g. **pòmme** [pɔm] 'apple', **pommier** [pɔmje] 'apple tree'. When the name of the fruit ends with a vowel, the suffix may be added directly to the vowel, as in (111), or the transitional consonant t may be inserted, as in (112). Note that some words, such as **cacao**, may belong to both groups of words.

(111)	**cacao**	[kakao]	'cocoa'	**cacaoyer**	[kakaoje]	'cocoa tree'
	rocou	[roku]	'annatto'	**racouier**	[rokuje]	'annatto tree'
	sagou	[sagu]	'sago'	**sagouier**	[saguje]	'sago tree'
(112)	**cacao**	[kakao]	'cocoa'	**cacaotier**	[kakaotje]	'cocoa tree'
	sagou	[sagu]	'sago'	**sagoutier**	[sagutje]	'sago tree'
	abricot	[abriko]	'apricot'	**abricotier**	[abrikɔtje]	'apricot tree'
	coco	[koko]	'coconut'	**cocotier**	[kɔkɔtje]	'coconut tree'

7.16.2 One of the characteristics of the French regular conjugation is the permanence of the stem throughout the conjugation (with possibly some phonological changes such as glide formation). The only exceptions are the so-called verbs in -yer, where the stems have two variants. Compare the present conjugation of **créer** 'to create' and **nettoyer** 'to clean':

(113)	(je) crée	[kre]	(je) nettoie	[nɛtwa]
	(tu) crées	[kre]	(tu) nettoies	[nɛtwa]
	(il) crée	[kre]	(il) nettoie	[nɛtwa]
	(nous) créons	[kreõ]	(nous) nettoyons	[nɛtwajõ]
	(vous) créez	[kree]	(vous) nettoyez	[nɛtwaje]
	(ils) créent	[kre]	(ils) nettoient	[nɛtwa]

The variant [nɛtwaj] appears before vowels and the variant [nɛtwa] in all other places. The glide j appears as a transitional consonant when the following suffix begins with a vowel, as in [nɛtwajɔ̃] and [nɛtwaje].[1] There are exactly two classes of verbs of the first conjugation ending with a vowel: (a) verbs whose stems end with a high vowel i u y or the vowel e, for which there are no transitional consonants, and (b) verbs whose stems end with ɔ̣a or ɛ, for which the transitional consonant is j.[2] This transitional glide j is never subject to diaeresis.

7.16.3 Verbs with a stem ending in ɛ all have an alternate stem in which the transitional glide has become part of the stem, giving rise, therefore, to two competing forms. Observe for instance the two forms of **balayer** 'to sweep':

(114)	**(je) balaie**	[balɛ]	**(je) balaye**	[balɛj]
	(tu) balaies	[balɛ]	**(tu) balayes**	[balɛj]
	(il) balaie	[balɛ]	**(il) balaye**	[balɛj]
	(nous) balayons	[balɛjɔ̃]	**(nous) balayons**	[balɛjɔ̃]
	(vous) balayez	[baleje]	**(vous) balayez**	[baleje]
	(ils) balaient	[balɛ]	**(ils) balayent**	[balɛj]

7.16.4 In academic French, verbs ending with ɔ̣a have only one stem and conjugate according to paradigm (113). In popular Parisian French, we observe (a) that monosyllabic stems ending in ɔ̣a tend also to have an alternate stem which incorporates the transitional yod, e.g. **broyer** stem /brɔ̣a/ or /brɔ̣aj/ 'to crush', **noyer** stem /nɔ̣a/ or /nɔ̣aj/ 'to drown', and (b) that disyllabic stems ending in ɔ̣a have the same forms as previously observed for the verb **crier**. Thus distinctions of the type (115):

(115)	**(il) nettoie**	[nɛtwa]	'(he) cleans'
	(ils) nettoient	[nɛtwaj]	'(they) clean'

The contrast exhibited in (115) also indicates that the introduction of transitional yod takes place before schwa deletion after vowel.

---

[1] This appears to be the approach suggested by Schane 1968:150, note 29.

[2] This classification does not appear to be phonemically justified; in Southern French final ɛ is normally e and, therefore, verbs ending with final e may belong to either class in this form of speech.

CHAPTER 8

HISTORICAL PHONOLOGICAL GAPS

There are many sequences of sounds which appear to be permissible in French but which are not in the vocabulary because of historical developments and because they do not exist in the languages from which French has borrowed. In this chapter, we study some of the recent words which appear to fill some of the historical gaps. As it will appear, these words can be neologisms, borrowed words, or acronyms. Proper names are more numerous than common names.

8.1 RECENT WORDS

8.1.1 Borrowed Words

In this class of words we shall include neologisms, which for the most part are made from roots borrowed from Latin and Greek, e.g. **adsorption** [atsɔrpsjɔ̃] 'adsorption'. This class of Latin and Greek borrowings is by far the most numerous and accounts for most of the consonant clusters in French:

(1)

adsorption	[atsɔrpsjɔ̃]	'adsorption'
sphère	[sfɛr]	'sphere'
apte	[apt]	'apt'

Without these borrowings, French would have evolved toward a structure of the type (C)V(CV)(C) with C being a consonant optionally followed by a liquid or by a glide and V a vowel optionally followed by a liquid.

(2) Latin

aestas	>	**été**	[ete]	'summer'
diurnum	>	**jour**	[ʒur]	'day'
stabula	>	**étable**	[etabl]	'stable'
advocatum	>	**avoué**	[avwe]	'attorney'

Recently French has been borrowing from English and has created some French neologisms from English roots:

(3)

footing	[futiŋ]	'jogging'
rugbyman	[rygbiman]	'rugby player'
speakerine	[spikrin]	'female T.V. or radio announcer'
footballeur	[futbalœr]	'football player'
shooter	[ʃute]	'to shoot (a goal)'

The pronunciation of borrowed words tends to follow three patterns: (a) a French version of the pronunciation in the original language, in-

dependent of the spelling, (b) a spelling pronunciation of the borrowed words, and (c) a combination of both. Latin and Greek borrowings tend to have a spelling pronunciation, e.g. words (4). Words borrowed from spoken languages show the three tendencies, e.g. words (5).

(4) **suggérer** [sygʒere] 'to suggest'
hymne [imn] 'hymn'
mnémonique [mnemonik] 'mnemonic'

(5) a. **business** [biznɛs] 'business'
weekend [wikɛnd] 'weekend'
bluff [blœf] 'bluff'
club [klœb] 'club'
b. **outsider** [utsidɛr] 'outsider'
compound [kõpund] 'compound (engine)'
round [rund] 'round (boxing)'
sandwich [sãdwiʃ] 'sandwich'
c. **Wisconsin** [wiskõsin] 'Wisconsin'
Los Angeles [lɔsãʒɛl, lɔsãʒlɛs] 'Los Angeles'
suspense [syspɛns] 'suspense'

8.1.2 Acronyms

The pronunciation of acronyms can be done (a) as a sequence of letters, (b) as a word itself. In the first case, the letters follow the traditional pronunciations [a, be, se, de, œ, ɛf, ʒe, ...] although in some cases they may follow the modern pronunciation suggested by Littré 1961 [a, bœ, sœ, dœ, œ, fœ, gœ,...] and used in primary school for reading purposes.

(6) a. **T.S.F.** [teɛsɛf] 'radio'
H.L.M. [aʃɛlɛm] 'high rise building'
b. **SNCF** [ɛsɛnseɛf, sœnœsœfœ] 'National Railroad'

In the second case the spelling rules are used with some incertitude as to whether an intervocalic **s** should be voiceless or voiced, and whether a postvocalic or final **n** should be pronounced or should nasalize the preceding vowel.

(7) **NASA** [naza, nasa] 'NASA'
OTAN [otã, otan] 'NATO'
ENSET [ãsɛt, ɛnsɛt] (schoöl)

The rules which determine whether an acronym is pronounced as a sequence of letters or as a word are not well established, e.g. (8).

(8) **ONU** [ony, oɛny] 'UNO'
URSS [yrs, yɛrɛsɛs] 'USSR'

As a general rule an acronym is pronounced as a word when it contains at least one vowel, is easy to pronounce, and would be very long if pronounced as a sequence of letters. Compare:

(9) **SEITA** [sɛta] **R.A.U.** [ɛraɣ]
FNEF [fnɛf] **RATP** [ɛratepe]
OSSU [osy] **USA** [yɛsa]

8.2 FILLING OF HISTORICAL PHONOLOGICAL GAPS

8.2.1 Distribution of œ

The historical development of French prevented œ from appearing in open stressed syllables. It is now found in this environment in syntactic constructions such as (10) or in abbreviations and acronyms such as (11).

(10) **Donne-moi-le** [dɔnmwalœ̀] 'give it to me'

(11) **pre** [prœ] abbreviation for **premier** 'first'
SNCF [sœnœsœfœ] 'National Railroad'
e [œ] '(the letter) e' (modern pronunciation)
b [bœ] 2nd letter of the alphabet (modern pronunciation)

8.2.2 Distribution of z

In the historical development of French, z could not occur initially or after a consonant. Recent words have filled this gap.

(12) **zoo** [zoo] 'zoo'
zan [zã] 'licorice'

8.2.3 Nasalized Vowels

The historical development of French caused all preconsonantal or word-final nasals to be deleted while nasalizing the preceding vowel, if any. The subsequent deletion of schwas inside words caused clusters of *oral vowel + nasal consonant* to reappear in final and preconsonantal positions.

(13) **bon** [bɔn] > [bɔ̃] 'good (masc.)'
bonté [bɔnte] > [bɔ̃te] 'goodness'
bonne [bɔnə] > [bɔn] 'good (fem.)'
bonnement [bɔnəman] > [bɔnmã] 'in a good way'
hanneton [anətɔn] > [antɔ̃] 'June beetle'

To this type of preconsonantal and final cluster *oral vowel + nasal consonant* have been added numerous new words:

(14) SROM [srɔm]
ENSI [ɛnsi]
INSEE [inse]
CNAM [knam]
chatterton [ʃatɛrtɔn] 'adhesive tape'
amnésie [amnezi] 'amnesia'

The combined effect of nasalization and schwa deletion caused some gaps in the distribution of segments:

(a) clusters *oral vowel + nasal consonant + consonant* in final position because of the absence of deletable schwas in tonic position; nowadays we find the following words which fill this gap:

(15) week-end [wikɛnd] 'weekend'
binse [bins] 'disorder'
clamse [klams] 'dies (slang)'
Minsk [minsk] (geographical name)
round [rund] 'round (boxing)'
AGEMP [aʒɛmp]

(b) clusters *nasalized vowel + nasal consonant + vowel*, now found in derived words and formerly derived words:

(16) ennui [ãnɥi] 'boredom'
enivrer [ãnivre] 'to intoxicate'

(c) clusters *nasal vowel + oral vowel*, now found in derived words and nouns:

(17) enhardir [ãardir] 'to embolden'
Panhard [pãar] (car make)

(d) cluster *nasalized vowel* + z (because the n causing nasalization prevented voicing of s) now found in:

(18) onze [õz] 'eleven'
bonze [bõz] 'bonze'

Not all gaps due to this development, however, have been filled; for example, there is no instance of *nasalized vowel* + r + *nasalized vowel* in a single word, although this combination is found in syntactic expressions such as:

(19) **en rang** [ărã] 'fall into place'

8.2.4 Consonantal Extension and Clusters

Most consecutive extensions and clusters are due to borrowing or recent creation: onset extensions, as in (20), liquid extensions after s and ʃ, as in (21), and clusters, as in (22):

(20)	**statue**	[staty]	'statue'
	svelte	[svɛlt]	'slender'
	souscription	[suskripsjɔ̃]	'subscription'
	schproute	[ʃprut]	'uproar'
	FSIF	[fsif]	
(21)	**SROM**	[srɔm]	
	schlass	[ʃlas]	'knife'
	slip	[slip]	'underwear'
(22)	**CNIT**	[knit]	
	FNEF	[fnɛf]	
	pschent	[pskɛnt]	'pschent'

TABLE 14 - LIST OF ACRONYMS

AFNOR	[afnɔr]	Association Française de Normalisation
AFC	[aɛfse]	Association France-Canada
AGEMP	[aʒɛmp]	Association Générale des Etudiants en Médecine de Paris
CNAM	[knam]	Conservatoire National des Arts et Métiers
CNIT	[knit, seɛnite]	Centre National d'Information Technique
ENSET	[ãsɛt, ɛnsɛt]	Ecole Normale Supérieure de l'Enseignement Technique
ENSI	[ɛnsi]	Ecole Nationale Supérieure d'Ingénieurs
ENSIAM	[ɛnsjam]	Ecole Nationale Supérieure d'Ingénieurs Arts et Métiers
FNEF	[fnɛf]	Fédération Nationale des Etudiants de France
FSIF	[fsif]	Fédération des Syndicats d'Initiative de France
HLM	[aʃɛlɛm]	Habitation à Loyer Modéré
INSEE	[inse]	Institut National de la Statistique et des Etudes Economiques
NASA	[naza, nasa]	National Aeronautics and Space Administration
ONERA	[onera]	Office National d'Etudes et de Recherches Aéronautique
O.N.U.	[oɛny, ony]	Organisation des Nations Unies
OSSU	[ɔsy]	Office du Sport Scolaire et Universitaire
OTAN	[otã, otan]	Organisation du Traité de l'Atlantique Nord
PMU	[peɛmy]	Pari Mutuel Urbain
RATP	[ɛratepe]	Régie Autonome des Transports Parisiens
RAU	[ɛray]	République Arabe Unie
SDECE	[sdɛk]	Service de Documentation Extérieure et de Contre-Espionnage
SEITA	[sɛta]	Société d'Exploitation Industrielle du Tabac et des Allumettes
SIMCA	[simka]	Société Industrielle de Moteurs et de Construction Automobile
SMIG	[smig]	Salaire Minimum Interprofessionnel Garanti
SNCF	[ɛsɛnseɛf, sœnœsœfœ]	Société Nationale des Chemins de fer Français
SNECMA	[snɛkma]	Société Nationale d'Etudes de de Construction de Moteurs d'Avion
SNES	[snɛs]	Syndicat National de l'Enseignement Supérieur

APPENDIX

COMPUTER IMPLEMENTATION

9.1 INTRODUCTION

This appendix is an annotated computer implementation of low-level French phonology restricted to rules which apply within words and includes both a redundancy grammar and a phonological grammar. The redundancy grammar contains a set of redundancy rules which allows the complete description of the segments of French from a minimal representation. The phonological grammar contains the rules described in the previous chapters.

Expressions between double quotes are ignored by the computer program; this allows us to introduce notes and references within the grammar. All references to previous sections are preceded by the prefix CF. and enclosed within parentheses, e.g. '(CF. RULE 8, SEC. 2.4)' refers to Rule 8 in Section 2.4.

9.2 REPRESENTATION

The type limitations have led us to adopt the following representations:

Segments

I	for IPA i	ON	for IPA õ	P	for IPA p
Y	for IPA y	EN	for IPA ɛ̃	B	for IPA b
U	for IPA u	AN	for IPA ɑ̃	M	for IPA m
EE	for IPA e	J	for IPA j	F	for IPA f
OEE	for IPA ø	YH	for IPA ɥ	V	for IPA v
OO	for IPA o	W	for IPA w	T	for IPA t
EH	for IPA ɛ	R	for IPA r	D	for IPA d
OEH	for IPA œ	L	for IPA l	N	for IPA n
OH	for IPA ɔ			S	for IPA s
A	for IPA a			Z	for IPA z
EW	for IPA ə			SH	for IPA ʃ
				ZH	for IPA ʒ
OW	for ọ			GN	for IPA ɲ
				K	for IPA k
|	(or)			G	for IPA g
RL	for epenthetic or final release			NG	for IPA ŋ

Diacritics

:	for length	>	for voice
;	for vertical rounding	*	for stress
,	for horizontal rounding	+	for fricativization
<	for voicelessness	J	for palatalization

Archi-segments

E represents a front unrounded mid vowel unmarked for height
OE represents a front rounded mid vowel unmarked for height
O represents a back mid vowel unmarked for height

Boundaries

(or) WB for word boundary
- (or) CB for compound word boundary
+ (or) FB for formative boundary
. (or) SB for syllable boundary

Abbreviations

VV for vowel
CC for consonant
LL for liquid
SN for sonorant
RC for released consonant

9.3 RULE FORMAT

A rule consists of three parts: an identification, a change, and a context, e.g.

```
'RULE SCHDEL'      is an identification
'EW => *'          is a change
'/< 'WB 'CC _ >'   is a context
```

Identification

All rules are identified by name. Rules are specified for local application, except when the identification contains the symbol AC, which indicates single application, or the symbol ACAC, which indicates left-to-right iterative application. Rules are obligatory, except when the identification contains the symbol OP, which indicates optionality.

Change

When no symbol * appears in a change, the rule introduces the features on the right-hand side of the arrow into the segments containing the features specified on the left-hand side of the arrow which are in the context of application of the rule.

When the right-hand side is the symbol *, the rule deletes the segments containing the features specified on the left-hand side of the arrow which are in the context of application of the rule.

When the left-hand side of the arrow is the symbol *, the rule introduces the segment specified on the right-hand side of the arrow in the context specified in the rule.

Context

The context of a rule, including the conditions of application, must be within angular brackets.

A single quote symbol ' precedes each segment in the context.

The symbol % matches any number of segments or boundaries. The symbol * matches one segment or boundary.

The context must match the entire string under derivation. If it need not match the initial segment, the variable symbol % must begin the context; if it need not match the final segment, the variable symbol % must end the context.

Choices are represented by parentheses, commas separating alternate elements, e.g. (A,B,C) represents a choice between A, B, and C.

Options are represented by parentheses, e.g. the notation (A) indicates that A is optional.

The notation '0'CC means 'any number of consecutive segments CC', the notation '1'CC, 'one or more consecutive segments CC', etc.

In conditions, the operators which permit the comparison of feature values are represented by VLT (less than), VLE (less than or equal to), VGT (greater than), and VGE (greater than or equal to). The operators which permit the comparison of segments are INCl (includes the segment) and NINCl (does not include the segment).

9.4 REDUNDANCY GRAMMAR

See next page.

```
                    "************************"
                    "*  REDUNDANCY GRAMMAR  *"
                    "************************"

PHONLEXICON
VARIABLE
  I   = |+SYLL -LABIAL 3LINGUAL -MID +HIGH|,
  Y   = |+SYLL +LABIAL 3LINGUAL -MID +HIGH|,
  U   = |+SYLL         4LINGUAL -MID +HIGH|,
  E   = |+SYLL -LABIAL 3LINGUAL +MID       -NASAL|,
  OE  = |+SYLL +LABIAL 3LINGUAL +MID       -NASAL|,
  O   = |+SYLL         4LINGUAL +MID       -NASAL|,
  EE  = |+SYLL -LABIAL 3LINGUAL +MID +HIGH|,
  OEE = |+SYLL +LABIAL 3LINGUAL +MID +HIGH|,
  OO  = |+SYLL         4LINGUAL +MID +HIGH|,
  EH  = |+SYLL -LABIAL 3LINGUAL +MID -HIGH -NASAL|,
  OEH = |+SYLL +LABIAL 3LINGUAL +MID -HIGH -NASAL|,
  OH  = |+SYLL         4LINGUAL +MID -HIGH -NASAL|,
  A   = |+SYLL                  -MID -HIGH -NASAL|,
  ON  = |+SYLL         4LINGUAL +MID      +NASAL|,
  EN  = |+SYLL -LABIAL 3LINGUAL +MID       +NASAL|,
  AN  = |+SYLL                  -MID       +NASAL|,
  J   = |-SYLL +SONOR -LABIAL          3LINGUAL 3LINSTR|,
  YH  = |-SYLL +SONOR +LABIAL 3LABSTR  3LINGUAL 3LINSTR|,
  W   = |-SYLL +SONOR +LABIAL 3LABSTR  4LINGUAL 3LINSTR|,
  R   = |      +SONOR                           2LINSTR -LAT|,
  L   = |      +SONOR                           2LINSTR +LAT|,
  P   = |                    1LABSTR +TENSE -NASAL|,
  B   = |                    1LABSTR -TENSE -NASAL|,
  M   = |                    1LABSTR        +NASAL|,
  F   = |                    2LABSTR +TENSE|,
  V   = |                    2LABSTR -TENSE|,
  T   = |    1LINGUAL 1LINSTR         +TENSE -NASAL|,
  D   = |    1LINGUAL 1LINSTR         -TENSE -NASAL|,
  N   = |    1LINGUAL 1LINSTR                +NASAL|,
  S   = |    1LINGUAL 2LINSTR -SONOR  +TENSE|;
  Z   = |    1LINGUAL 2LINSTR -SONOR  -TENSE|,
  SH  = |    2LINGUAL 2LINSTR -SONOR  +TENSE|,
  ZH  = |    2LINGUAL 2LINSTR -SONOR  -TENSE|,
  GN  = |    3LINGUAL 1LINSTR                +NASAL|,
  K   = |    4LINGUAL 1LINSTR         +TENSE -NASAL|,
  G   = |    4LINGUAL 1LINSTR         -TENSE -NASAL|,
  NG  = |    4LINGUAL 1LINSTR                +NASAL|.
```

```
PHONUNIT
  I=I, Y=Y, U=U, EE=EE, OE=OE, OO=OO, EH=EH, OEH=OEH, OH=OH, E=E, OE=OE,
  O=O, A=A,
  EN=EN, ON=ON, AN=AN,
  YH=YH, J=J, W=W, R=R, L=L,
  P=P, B=B, M=M, F=F, V=V, T=T, D=D, N=N, S=S, Z=Z, SH=SH, ZH=ZH, GN=GN,
  K=K, G=G, NG=NG.

DIACRITIC
  * = |1STRESS|.

  $ENDLEX

TRANSFORMATIONS

IMPLICIT AACC I.

"REDUNDANCY RULES"
RULE REDVOW.     |+SYLL| => |+SONOR 3LINSTR +VOICE|.
RULE REDLABV.    |+SYLL +LABIAL| => |3LABSTR|.
RULE HIGHVOW.    |+HIGH| => |-NASAL|.
RULE NASALVOW.   |+SYLL +NASAL| => |-HIGH|.
RULE BACKVOW.    |+SYLL 4LINGUAL| => |+LABIAL|.
RULE LOWVOW.     |-HIGH -MID| => |-LABIAL|.
RULE STRICT1.    |(ALPHA)LINSTR| => |(ALPHA)STRICT|.
RULE STRICT2.    |(ALPHA)LABSTR| => |(ALPHA)STRICT +LABIAL|.
RULE REDSTOP.    |1STRICT (ALPHA)NASAL| => |-SYLL (ALPHA)SONOR|.
RULE REDLABF.    |2LABSTR| => |-SONOR|.
RULE REDFR.      |2STRICT| => |-SYLL|.
RULE REDAPP.     |3STRICT| => |+SONOR|.
RULE REDBAKAP.   |3STRICT +LABIAL| => |3LABSTR|.
RULE ROUND.      |+SYLL 3LABSTR (ALPHA)LINGUAL| => |(ALPHA-2)ROUND|.
RULE REDOBN.     |-SONOR| => |-SYLL|.
RULE LIQUART1.   L => |1LINGUAL|.
RULE LIQUART2.   R => |4LINGUAL|.
RULE PALRND1.    |-SONOR 2LINGUAL 2LINSTR| => |+LABIAL 3LABSTR|.

CP I.

$END $MAIN FTRIN TRAN
```

9.5 EXAMPLES OF REDUNDANCY DERIVATIONS

```
U
|+LABIAL -NASAL +SONOR 3LINSTR 3LABSTR +VOICE 3STRICT 2ROUND|

OO
|+LABIAL -NASAL +SONOR 3LINSTR 3LABSTR +VOICE 3STRICT 2ROUND|

AN
|-LABIAL -HIGH +SONOR 3LINSTR +VOICE 3STRICT|

YH
|3STRICT +ROUND|

R
|-SYLL 4LINGUAL 2STRICT|

T
|-SYLL -SONOR 1STRICT|

ZH
|-SYLL 2STRICT|

GN
|-SYLL +SONOR 1STRICT|

M
|-SYLL +LABIAL +SONOR 1STRICT|
```

9.6 PHONOLOGICAL GRAMMAR

```
                    "**************************"
                    "*  PHONOLOGICAL GRAMMAR  *"
                    "**************************"

"*************"
"*  LEXICON  *"
"*************"

PHONLEXICON
VARIABLE

"VOWELS                                                                    "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
  I   = |+SYLL +SONOR -LABIAL          3LINGUAL 3LINSTR 3STRICT -NASAL
         -MID +HIGH +VOICE|,
  Y   = |+SYLL +SONOR +LABIAL 3LABSTR 3LINGUAL 3LINSTR 3STRICT -NASAL
         -MID +HIGH +VOICE 1ROUND|,
  U   = |+SYLL +SONOR +LABIAL 3LABSTR 4LINGUAL 3LINSTR 3STRICT -NASAL
         -MID +HIGH +VOICE 2ROUND|,
  E   = |+SYLL +SONOR -LABIAL          3LINGUAL 3LINSTR 3STRICT -NASAL
         +MID       +VOICE|,
```

```
  OE  = |+SYLL +SONOR +LABIAL 3LABSTR 3LINGUAL 3LINSTR 3STRICT -NASAL
         +MID +HIGH +VOICE 1ROUND|,
  O   = |+SYLL +SONOR +LABIAL 3LABSTR 4LINGUAL 3LINSTR 3STRICT -NASAL
         +MID       +VOICE 2ROUND|,
  EE  = |+SYLL +SONOR -LABIAL         3LINGUAL 3LINSTR 3STRICT -NASAL
         +MID +HIGH +VOICE|,
  OEH = |+SYLL +SONOR +LABIAL 3LABSTR 3LINGUAL 3LINSTR 3STRICT -NASAL
         +MID +HIGH +VOICE 1ROUND|,
  OO  = |+SYLL +SONOR +LABIAL 3LABSTR 4LINGUAL 3LINSTR 3STRICT -NASAL
         +MID +HIGH +VOICE 2ROUND|,
  EH  = |+SYLL +SONOR -LABIAL         3LINGUAL 3LINSTR 3STRICT -NASAL
         +MID -HIGH +VOICE|,
  OEE = |+SYLL +SONOR +LABIAL 3LABSTR 3LINGUAL 3LINSTR 3STRICT -NASAL
         +MID -HIGH +VOICE 1ROUND|,
  OH  = |+SYLL +SONOR +LABIAL 3LABSTR 4LINGUAL 3LINSTR 3STRICT -NASAL
         +MID -HIGH +VOICE 2ROUND|,
  A   = |+SYLL +SONOR -LABIAL                  3LINSTR 3STRICT -NASAL
         -MID -HIGH +VOICE|,
  EN  = |+SYLL +SONOR -LABIAL         3LINGUAL 3LINSTR 3STRICT +NASAL
         +MID -HIGH +VOICE|,
  ON  = |+SYLL +SONOR +LABIAL 3LABSTR 4LINGUAL 3LINSTR 3STRICT +NASAL
         +MID -HIGH +VOICE 2ROUND|,
  AN  = |+SYLL +SONOR -LABIAL                  3LINSTR 3STRICT +NASAL
         -MID -HIGH +VOICE|,
  EW  = |+SYLL +SONOR +LABIAL 3LABSTR 3LINGUAL 3LINSTR 3STRICT -NASAL
         +MID +HIGH +VOICE 1ROUND DEL|,
  OW  = |+SYLL +SONOR +LABIAL 3LABSTR 4LINGUAL 3LINSTR 3STRICT -NASAL
         +MID       +VOICE 2ROUND GLIDE|,

"GLIDES AND LIQUIDS                                                    "
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
  J   = |-SYLL +SONOR -LABIAL         3LINGUAL 3LINSTR 3STRICT|,
  YH  = |-SYLL +SONOR +LABIAL 3LABSTR 3LINGUAL 3LINSTR 3STRICT|,
  W   = |-SYLL +SONOR +LABIAL 3LABSTR 4LINGUAL 3LINSTR 3STRICT|,
  R   = |-SYLL +SONOR                 4LINGUAL 2LINSTR 2STRICT -LAT|,
  L   = |-SYLL +SONOR                 1LINGUAL 2LINSTR 2STRICT +LAT|,

"OBSTRUENTS                                                            "
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
  P   = |-SYLL -SONOR +LABIAL 1LABSTR 1STRICT -NASAL +TENSE|,
  B   = |-SYLL -SONOR +LABIAL 1LABSTR 1STRICT -NASAL -TENSE|,
  M   = |-SYLL +SONOR +LABIAL 1LABSTR 1STRICT +NASAL|,
  F   = |-SYLL -SONOR +LABIAL 2LABSTR 2STRICT -NASAL +TENSE|,
  V   = |-SYLL -SONOR +LABIAL 2LABSTR 2STRICT -NASAL -TENSE|,
  T   = |-SYLL -SONOR 1LINGUAL 1LINSTR 1STRICT -NASAL +TENSE|,
  D   = |-SYLL -SONOR 1LINGUAL 1LINSTR 1STRICT -NASAL -TENSE|,
  N   = |-SYLL -SONOR 1LINGUAL 1LINSTR 1STRICT -NASAL|,
  S   = |-SYLL -SONOR 1LINGUAL 2LINSTR 2STRICT -NASAL +TENSE|,
  Z   = |-SYLL -SONOR 1LINGUAL 2LINSTR 2STRICT -NASAL -TENSE|,
  SH  = |-SYLL -SONOR +LABIAL 3LABSTR 2LINGUAL 2LINSTR 2STRICT -NASAL
         +TENSE 1ROUND|,
  ZH  = |-SYLL -SONOR +LABIAL 3LABSTR 2LINGUAL 2LINSTR 2STRICT -NASAL
         -TENSE 1ROUND|,
```

```
  GN  = |-SYLL +SONOR 3LINGUAL 1LINSTR 1STRICT +NASAL|,
  K   = |-SYLL -SONOR 4LINGUAL 1LINSTR 1STRICT -NASAL +TENSE|,
  G   = |-SYLL -SONOR 4LINGUAL 1LINSTR 1STRICT -NASAL -TENSE|,
  NG  = |-SYLL +SONOR 4LINGUAL 1LINSTR 1STRICT +NASAL|,

"ABBREVIATIONS                                                          "
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
  RL  = |3STRICT +TRANS|,
  VV  = |+SYLL|,
  CC  = |-SYLL|,
  LL  = |-SYLL +SONOR 2LINSTR|, -
  SN  = |+SONOR|,
  RC  = |+REL|,

"BOUNDARIES                                                             "
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
  SB  = |+SBOUND|,
  WB  = |1BOUND|,
  CB  = |2BOUND|,
  FB  = |3BOUND|.
PHONUNIT

"SYMBOLS USED FOR OUTPUT                                                "
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
  I=I, Y=Y, U=U, EE=EE, OEE=OEE, OO=OO, EH=EH, OEH=OEH, OH=OH, E=E,
  OE=OE, O=O, A=A,
  EN=EN, ON=ON, AN=AN,
  YH=YH, J=J, W=W, R=R, L=L,
  P=P, B=B, M=M, F=F, V=V, T=T, D=D, N=N, S=S, Z=Z, SH=SH, ZH=ZH, GN=GN,
  K=K, G=G, NG=NG,
  YH+ = |-SYLL +SONOR +LABIAL 3LABSTR 3LINGUAL 2LINSTR 2STRICT 1ROUND|,
  J+  = |-SYLL +SONOR -LABIAL         3LINGUAL 2LINSTR 2STRICT|,
  KJ  = |-SYLL -SONOR +TENSE          3LINGUAL 1LINSTR 1STRICT -NASAL|,
  GJ  = |-SYLL -SONOR -TENSE          3LINGUAL 1LINSTR 1STRICT -NASAL|,
  |   = RL,
  # = WB, - = CB, + = FB, . = SB.
DIACRITIC
  :   = |+LONG|,
  ;   = |1ROUND|,
  ,   = |2ROUND|,
  <   = |-VOICE|,
  >   = |+VOICE|,
  *   = |1STRESS|.
  $ENDLEX


"*************"
"*   RULES   *"
"*************"

"SCHWA DELETION                                                         "
"     SCHWAS DELETE IN DIFFERENT CONTEXTS, E.G. LA CHEMISE              "
"/L A SH M I Z/ 'THE SHIRT', UNE CHEMISE /Y N SH OEE M I Z/ 'A SHIRT'."
```

```
"SCHWA DELETION HAS BEEN INCLUDED IN THIS GRAMMAR AS AN OPTIONAL RULE "
"TO ALLOW DERIVATIONS SUCH AS : CHEVEU /SH OEE V OE/, /SH F OE/, OR   "
"/SH YH OE/ 'HAIR'.                                                   "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE SCHDEL OP .    EW => * /< 'WB 'CC _ %>.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"STRESS PLACEMENT                                                     "
"     THIS RULE ADDS A STRESS ON THE LAST SYLLABLE OF A WORD (CF. SEC."
"2.1).                                                                "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE STRESS AC.     VV => |1STRESS| /<% _ '0'CC 'WB >.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"GLIDE FORMATION                                                      "
"     RULES GLIDEF1 AND GLIDEF2 TRANSFORM A HIGH VOWEL INTO THE COR-  "
"RESPONDING GLIDE, E.G., ENNUI  /AN N Y I/ > /AN N YH I/ 'BOREDOM'.   "
"THE TWO RULES ARE NEARLY IDENTICAL:  RULE GLIDEF2, BUT NOT RULE      "
"GLIDEF1, APPLIES TO HIGH VOWELS FOLLOWED BY A FORMATIVE BOUNDARY (CF."
"RULES 38 AND 39, SEC. 7.7).                                          "
"     THE CONDITIONS A, B, AND C ALLOW ONLY SOME CONSONANTS OR CLUS-  "
"TERS OF CONSONANTS TO PRECEDE A VOWEL UNDERGOING GLIDE FORMATION.    "
"CONDITION A INSURES THAT THE TWO PRECEDING UNITS TO BE CHECKED, IF   "
"ANY, ARE IN FACT SEGMENTS, AND NOT BOUNDARIES.  CONDITION B INSURES  "
"THAT THE PRECEDING SEGMENT IS NOT A GLIDE, E.G., ENNUYER             "
"/AN N YH I + E/ > */AN N YH J E/ 'TO BORE', UNLESS IT IS A POSTVOCAL-"
"IC GLIDE, E.G., CUEILLIEZ /K OEH J + I E/ > /K OEH J J E/ '(YOU) CUT "
"(PAST)'.  CONDITION C INSURES THAT THE PRECEDING TWO SEGMENTS ARE NOT"
"A CONSONANT FOLLOWED BY A LIQUID, E.G., CLOUER /K L U + E/ >         "
"*/K L W E/ 'TO NAIL'.  CONDITION D INSURES THAT THE FIRST VOWEL OF A "
"GROUP OF TWO CONSECUTIVE HIGH VOWELS WITH IDENTICAL LABIALITY DOES   "
"NOT BECOME A GLIDE, E.G., NOUURE  /N U + Y R/ > */N W Y R/ 'KNOTTING'"
"(CF. SEC. 7.10).                                                     "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE GLIDEF1 ACAC. |+HIGH -MID +SYLL| => |-SYLL|
             /<'WB ((% 2*) 1*) ('FB) 3_ 4'VV %, WHERE
   "A"        1 NINC1 |(ALPHA)BOUND| ε 2 NINC1 |(BETA)BOUND|
   "B" ε     (1 NINC1 |-SYLL +SONOR 3LINSTR| | 2 INC1 |-SYLL|)
   "C" ε     (1 NINC1 |-SYLL +SONOR 2LINSTR| | 2 NINC1 |-SYLL|)
   "D" ε     (4 NINC1 |-MID +HIGH (GAMMA)LABIAL|
             | 3 NINC1 |(GAMMA)LABIAL| ) >.
RULE GLIDEF2 ACAC. |+HIGH -MID +SYLL| => |-SYLL|
             /<'WB ((% 2*) 1*) ('FB) 3_ 'FB 4'VV %, WHERE
   "A"        1 NINC1 |(ALPHA)BOUND| ε 2 NINC1 |(BETA)BOUND|
   "B" ε     (1 NINC1 |-SYLL +SONOR 3LINSTR| | 2 INC1 |-SYLL|)
   "C" ε     (1 NINC1 |-SYLL +SONOR 2LINSTR| | 2 NINC1 |-SYLL|)
   "D" ε     (4 NINC1 |-MID +HIGH (GAMMA)LABIAL|
             | 3 NINC1 |(GAMMA)LABIAL| ) >.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
```

```
"ERASING OF FORMATIVE BOUNDARIES                                              "
"     THE RULES FOLLOWING RULE ERASFB DO NOT DEPEND ON THE POSITION OF"
"FORMATIVE BOUNDARIES.                                                        "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE ERASFB.     FB => * .
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"INTERVOCALIC YOD                                                             "
"     A YOD IS INTRODUCED BETWEEN A VOWEL I FOLLOWED BY ANY OTHER             "
"VOWEL BUT I, E.G. CRIER /K R I + E/ > /K R I J E/ 'TO SHOUT',               "
"ANNIHILER /A N I I L E/ > */A N I J I L E/ 'TO ANNIHILATE' (CF. SEC. "
"7.5 AND 7.10).                                                               "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE INTYOD.     * => J /<% 'I _ 1'VV %,
                          WHERE 1 NINC1 |-LABIAL 3LINGUAL -MID +HIGH| >.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"LABIAL ATTRACTION                                                            "
"     THE VOWEL Y IS ALWAYS NONSYLLABIC BEFORE I (CF. SEC. 7.11, AND          "
"RULE 15, SEC. 7.3).                                                          "
"     THE VOWEL OW IS CONSTRAINED TO BE NONSYLLABIC BEFORE A AND E            "
"(CF. SEC. 7.14).                                                             "
"     THE VOWEL O IS SOMETIMES NONSYLLABIC BEFORE A AND E (CF. SEC.           "
"7.11).                                                                       "
"     NOTE THAT LABIAL ATTRACTION MUST TAKE PLACE AFTER INTERVOCALIC          "
"YOD INTRODUCTION, E.G. PLIOIR /P L I + OW A R/ > /P L I J W A R/           "
"'FOLDING KNIFE', AND AFTER GLIDE FORMATION, E.G. TUIONS /T Y + I ON/ "
"> */T YH I J ON/ '(WE) KILLED'.  THIS ORDERING PREVENTS /G R Y I E R/"
"FROM BEING THE UNDERLYING FORM FOR GRUYERE (PRONOUNCED                       "
"/G R YH I J EH R/ OR /G R Y J EH R/), SINCE I NECESSARILY BECOMES          "
"NONSYLLABIC BEFORE LABIAL ATTRACTION TAKES PLACE.                            "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE LABAT1.     Y => |-SYLL| /<% _ 'I %>.
RULE LABAT2.    OW => |-SYLL| /<% _ '|+SYLL -LABIAL -HIGH| %>.
RULE LABAT3 OP.
                 O => |-SYLL| /<% _ '|+SYLL -LABIAL -HIGH| %>.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"YOD DEGEMINATION                                                             "
"     IN NONVERBAL FORMS, A CLUSTER OF TWO CONSECUTIVE YODS REDUCES TO"
"A SINGLE YOD, E.G. GROSEILLIER /G R O Z E J + I E/ >                         "
"/G R O Z E J J E/ > /G R O Z E J E/ 'CURRANT TREE' (CF. RULE 43, SEC."
"7.8).                                                                        "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE YODDEG.     J => * /<1*<% 'J _ %>, WHERE 1 NINC1 |+V| >.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"FRICATIVIZATION OF GLIDES                                                    "
"     RULE FRIYOD1 DESCRIBES THE FRICATIVIZATION OF YOD BEFORE A CON- "
"SONANT AND IN FINAL POSITION, E.G. FEUILLETER /F OOE J+ T EE/ 'TO    "
"BROWSE', BOUILLOIRE /B U J+ W A R/ 'KETTLE', FEUILLE /F OEE J+/      "
"'LEAVE'.                                                                     "
```

```
"     RULE FRIYOD2 DESCRIBES THE FRICATIVIZATION OF YOD AFTER A     "
"TENSE CONSONANT OR A FRICATIVIZED GLIDE, E.G. PIED /P J+ EE/       "
"'FOOT', CUEILLIEZ /K OEE J+ J+ EE/ '(YOU) CUT (PAST)' (CF. RULE    "
"23, SEC. 5.4).                                                     "
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE FRIYOD1.  J => |2LINSTR 2STRICT| /<% _ ('CC, 'WB) %>.
RULE FRIYOD2.  J => |2LINSTR 2STRICT|
               /<% ('|+TENSE|, '|+SONOR 2LINSTR|) _ %>.
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"NASALIZATION OF SONORANTS                                          "
"     SONORANTS ARE NASALIZED WHEN THEY ARE BETWEEN TWO NASAL SEG-  "
"MENTS, E.G. THE L IN BRANLANT /B R AN L AN/ 'SHAKING' IS NASALIZED"
"(CF. SEC. 5.5).                                                    "
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE NASSON.   |-SYLL +SONOR| => |+NASAL|
               /<% '|+NASAL| _ '|+NASAL| %>.
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"EPENTHETIC RELEASE                                                 "
"     RULE EPREL1 DESCRIBES THE INTRODUCTION OF AN EPENTHETIC RE-   "
"LEASE BETWEEN A VELAR STOP AND AN ADJACENT STOP IN WORD-INITIAL    "
"POSITION, E.G. GNOU /G N U/ 'GNU'.                                 "
"     RULE EPREL2 DESCRIBES THE INTRODUCTION OF AN EPENTHETIC RE-   "
"LEASE BETWEEN A TENSE VELAR STOP AND AN ADJACENT STOP IN POST-     "
"TONIC POSITION, E.G. ACTE /A K | T |/ 'ACT' (CF. WORDS 26 AND 29,  "
"SEC 4.2).                                                          "
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE EPREL1.   * => RL /< 'WB '|4LINGUAL 1LINSTR| _ '|1STRICT| %>.
RULE EPREL2.   * => RL /<% '|1STRESS| '0'SN
               '|4LINGUAL 1LINSTR +TENSE| _ '|1STRICT| %>.
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"FINAL RELEASE                                                      "
"     A FINAL CONSONANT RECEIVES A FINAL RELEASE WHEN IT IS PRE-    "
"CEDED BY A SEGMENT WITH A SMALLER LEVEL OF STRICTURE, E.G. POTE    "
"/P OH T |/ 'PAL', PORTE /P OH R T |/ 'DOOR', POSTE /P OH S T |/    "
"'POST' (CF. WORDS 7, SEC. 4.2).                                    "
"     RULE FINREL2 HAS BEEN ADDED BECAUSE A RELEASE ALSO APPEARS    "
"WHEN A SPIRANT IS PRECEDED BY A LIQUID, E.G. LARVE /L A R V |/     "
"'LARVA'.  THIS RULE WOULD BE UNNECESSARY IF WE COULD SPECIFY THE   "
"ACOUSTIC STRICTURE OF LIQUIDS AS SLIGHTLY SMALLER THAN THE STRIC-  "
"TURE OF SPIRANTS, E.G. LEVEL OF STRICTURE 2.3 FOR LIQUIDS AND 2    "
"FOR SPIRANTS (THE STRICTURE LEVEL 2 ADOPTED IN THE LEXICON FOR     "
"SPIRANTS AND LIQUIDS IS A CLASSIFICATORY LEVEL, THE ACOUSTIC LEVEL"
"MAY VARY FROM THE CLASSIFICATORY LEVEL).  RULE FINREL2 MUST BE     "
"ANALYZED AS A VARIANT OF RULE FINREL1.                             "
"     RULE FINREL3 ACCOUNTS FOR THE NONRELEASE OF VELAR NASALS,     "
"E.G. SMOKING /S M O K I NG/ 'DINNER JACKET' (CF. WORDS 22, SEC.    "
"4.2).                                                              "
"     RULE FINREL4 ACCOUNTS FOR THE OPTIONAL NONRELEASE OF LAX      "
"STOPS WHEN THEY ARE PRECEDED BY A NASALIZED VOWEL.  THIS NONRE-    "
"LEASE CONDITIONS THE EVENTUAL WEAKENING OF THESE CONSONANTS, E.G.  "
```

```
"MONDE /M ON D/ > /M ON N/ 'PEOPLE' (CF. WORDS 44, SEC. 4.2).      "
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE FINREL1.    * => RL /<% '|(ALPHA)STRICT| '|-SYLL (BETA)STRICT| _
                 'WB, WHERE ALPHA VGE BETA >.
RULE FINREL2.    RL => * /<% '|-SONOR 2STRICT| '|+SONOR 2STRICT| _ %>.
RULE FINREL3.    RL => * /<% 'NG _ %>.
RULE FINREL4 OP.  RL => * /<% ' +SYLL +NASAL  ' 1STRICT -TENSE  _ %>.
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"A-FRONTING                                                         "
"     THIS RULE DESCRIBES THE FRONTING OF A BEFORE A FINAL OR       "
"PRECONSONANTAL L (CF. SEC. 6.5).                                   "
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE AFRONT.   A => |3LINGUAL| /<% _ 'L ('RL, 'CC) %>.
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"LINGUAL ASSIMILATION                                               "
"     THIS RULE DESCRIBES THE ANTICIPATORY MOVEMENT OF THE TONGUE   "
"DURING THE UTTERANCE OF A LABIAL CONSONANT (CF. RULE 2, SEC. 5.1)."
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE LINASS.   |(ALPHA) LABSTR| => |(BETA)LINGUAL 3LINSTR| /<% _
               '|(BETA)LINGUAL 3LINSTR| %, WHERE ALPHA VLE 2 >.
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"V-RELAXATION                                                       "
"     THIS RULE DESCRIBES THE RELAXATION OF V INTO A GLIDE WHEN IT   "
"FOLLOWS A WORD-INITIAL SH, E.G. CHEVET /SH OEE V EH/ OR /SH YH EH/"
"'BEDSIDE'.  V-RELAXATION DOES NOT TAKE PLACE WHEN SH IS NOT WORD-  "
"INITIAL, E.G. ACHEVER /A SH OEE V EE/, */A SH YH EE/ 'TO FINISH'   "
"(CF. RULE 4, SEC. 5.1).                                            "
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE VRELAX OP.   V =  |+SONOR 3LABSTR 3STRICT -TENSE|
                  /< 'WB 'SH _ %>.
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"LAX-TENSE ASSIMILATION                                             "
"     RULE LAX1 DESCRIBES THE ASSIMILATION OF A LABIAL FRICATIVE TO"
"AN ADJACENT LINGUAL FRICATIVE, E.G. CHEVET /SH OEE V EH/ >         "
"/SH F EH/ 'BEDSIDE', FAISONS /F OEE Z ON/ > /V Z ON/ '(WE) DO'.    "
"     RULE LAX2 DESCRIBES THE OPTIONAL ASSIMILATION OF A LINGUAL    "
"FRICATIVE TO A FOLLOWING CONSONANT, E.G. SVELTE /S V EH L T/ OR    "
"/Z V EH L T/ 'SLENDER'.                                            "
"     RULE LAX3 DESCRIBES THE OPTIONAL LAX-TENSE ASSIMILATION OF A  "
"STOP TO A FOLLOWING STOP, E.G. OBTUS /OH B T Y/ OR /OH P T Y/      "
"'OBTUSE', ANECDOTE /A N EH K D OH T/ OR /A N EH G D OH T/          "
"'ANECDOTE' (CF. SEC. 5.6).                                         "
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE LAX1.    |-SONOR +LABIAL 2LABSTR| => |(ALPHA)TENSE|
              /<% ('|-SONOR 2LABSTR (ALPHA)TENSE| _ % ,
                   '|-SONOR 2LABSTR (ALPHA)TENSE| ) %>.
RULE LAX2 OP.   |-SONOR 2LINSTR +TENSE| =  |-TENSE|
                /<% _ '|-TENSE| %>.
RULE LAX3 OP.   |-SONOR 1STRICT| => |(ALPHA)TENSE|
                /<% _ '|(ALPHA)TENSE| %>.
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
```

```
"VOICING OF OBSTRUENTS                                                  "
"     VCOBN1 INDICATES THAT OBSTRUENTS ARE NORMALLY VOICELESS WHEN "
"TENSE AND VOICED WHEN LAX, E.G. DETTE /D> EH T</ 'DEBT'.               "
"     VCOBN2 INDICATES THAT AN OBSTRUENT ASSIMILATES TO THE NEXT   "
"CONSECUTIVE OBSTRUENT WITH RESPECT TO VOICING, E.G. SVELTE             "
"/S> V> EH L T</ 'SLIM'.                                                "
"     VCOBN3 INDICATES THAT IN INITIAL POSITION, TENSE SIBILANTS   "
"MAY REMAIN VOICELESS, E.G. SVELTE /S< V> EH L T</ (CF. SEC. 5.6). "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE VCOBN1.      |-SONOR (ALPHA)TENSE| => |(-ALPHA)VOICE|.
RULE VCOBN2.      |-SONOR| => |(ALPHA)VOICE|
                  /<% _ '|-SONOR (ALPHA)VOICE| %>.
RULE VCOBN3 OP.   |-SONOR +TENSE| => |-VOICE| /< 'WB _ %>.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"VOICING OF SONORANTS                                                   "
"     VCSN1 INDICATES THAT SONORANTS ARE NORMALLY VOICED.           "
"     VCSN2 INDICATES THAT SONORANTS ASSIMILATE TO A PRECEDING OB- "
"STRUENT WITH RESPECT TO VOICING.                                       "
"     VCSN3 INDICATES THAT L AFTER P OR F IS AN EXCEPTION TO RULE  "
"VCSN2 (CF. SEC. 5.6).                                                  "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE VCSN1.    SN => |+VOICE|.
RULE VCSN2.    |-SYLL +SONOR| => |(ALPHA)VOICE|
               /<% '|-SONOR (ALPHA)VOICE| _ %>.
RULE VCSN3.    L => |+VOICE| /<% '|+LABIAL -SONOR +TENSE| _ %>.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"SYLLABIFICATION                                                        "
"     THE DIVISION OF WORDS INTO SYLLABLES IS NOT NECESSARILY       "
"UNIQUE, E.G. THE WORD ESPERER 'TO HOPE' BEING ANALYZABLE AS          "
"/EE . S P EE . R EE/ OR /EH S . P EE . R EE/.  IN THIS GRAMMAR,    "
"WE ADOPT THE MOST FREQUENT PATTERN OF DIVISION.                        "
"     RULE RELEAS1 SPECIFIES THAT A CONSONANT IS RELEASED WHEN IT   "
"IS FOLLOWED BY A SEGMENT WITH A SMALLER LEVEL OF STRICTURE, E.G.    "
"THE CONSONANT T IN THE WORD TEMPS /T AN/ 'WEATHER' IS RELEASED.     "
"     RULE RELEAS2 SPECIFIES THAT A SIBILANT IS RELEASED BEFORE A   "
"LIQUID, E.G. THE CONSONANT V IN VRAI /V R EH/ 'TRUE'.  RULE          "
"RELEAS3 SPECIFIES THAT A GLIDE IS RELEASED BEFORE A VOWEL, E.G.     "
"THE GLIDE J IN YACHT /J A K/ 'YACHT'.  THESE TWO RULES WOULD BE     "
"UNNECESSARY IF WE COULD SPECIFY THE ACOUSTIC LEVEL OF STRICTURE,    "
"THE LEVEL OF LIQUID STRICTURE BEING SLIGHTLY SMALLER THAN THE       "
"LEVEL OF SIBILANT STRICTURE, AND THE LEVEL OF VOWEL STRICTURE THAN"
"THE LEVEL OF GLIDE STRICTURE, E.G. 2 FOR SIBILANTS, 2.3 FOR         "
"LIQUIDS, 2.7 FOR GLIDES, AND 3 FOR VOWELS.  (WE REPEAT THAT THE     "
"LEVELS USED IN THIS ANALYSIS ARE CLASSIFICATORY, NOT ACOUSTIC.)     "
"     RULE RELS SPECIFIES THAT A STOP MAY BE UNRELEASED BEFORE A    "
"SIBILANT, E.G. THE STOP P IN THE WORD CAPSULE /K A P S Y L/ 'CAP- "
"SULE' MAY BE UNRELEASED.  THIS ACCOUNTS FOR THE FACT THAT STOPS     "
"MAY BE OPTIONALLY WEAKENED BEFORE SIBILANTS (CF. WORDS 40, SECTION"
"4.2).                                                                  "
"     RULE SYLLAB1 SPECIFIES THAT BOTH INITIAL AND FINAL WORD BOUN-"
"DARIES ARE ALSO SYLLABIC BOUNDARIES.                                   "
```

```
"     RULE SYLLAB2 SPECIFIES THAT, INSIDE A WORD, THE SYLLABLE     "
"BOUNDARY FALLS BEFORE THE FIRST OF A SERIES OF RELEASED CONSONANTS"
"PRECEDING A VOWEL, OR BETWEEN TWO VOWELS.  THIS PROCESS COULD BE  "
"DESCRIBED AS AN ITERATIVE APPLICATION OF THE RULE:                 "
"     * => SB /<% 'VV % _ '0'RC 'VV %>.                             "
"(THIS FORMAT, HOWEVER, IS NOT ALLOWED IN THE TESTER.)              "
"EXAMPLES OF SYLLABLE DIVISION ARE:                                 "
"PARLER      /P A R . L E/          'TO SPEAK'                      "
"PARLERA     /P A R L . R A/        '(HE) WILL SPEAK'               "
"CORNEDBEEF  /K OH R N D . B I F/   'CORNED BEEF'                   "
"DETROIT     /D E . T R W A/        'STRAIGHT'                      "
"CAPSULE     /K A . P S Y L/ OR /K A P . S Y L/  'CAPSULE'         "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE RELEAS1.   |-SYLL (ALPHA)STRICT| => RC
                /<% _ '|(BETA)STRICT| %, WHERE BETA VGT ALPHA >.
RULE RELEAS2.   |-SONOR 2STRICT| => RC /<% _ '|+SONOR 2STRICT| % >.
RULE RELEAS3.   |-SYLL 3STRICT| => RC /<% _ 'VV % >.
RULE RELS OP.   |1STRICT +REL| => |¬REL|/<% _ '|-SONOR 2LINSTR| % >.
RULE SYLLAB1.   WB => SB /< (% _, _ %) >.
RULE SYLLAB2.   * => SB
      /<% 'VV, ( _ 'VV, ( '0'CC '|¬REL -SYLL|) _ 'RC '0'RC ) 'VV %>.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"ROUNDING                                                           "
"     RULE ROUND1 ACCOUNTS FOR THE ROUNDING OF THE GLIDES W AND YH."
"     RULE ROUND2 DESCRIBES THE ROUNDING ASSIMILATION OF CONSONANTS"
"TO A FOLLOWING APPROXIMANT IN THE SAME SYLLABLE.                   "
"     RULE ROUND3 DESCRIBES THE ROUNDING ASSIMILATION OF CONSONANTS"
"TO A PRECEDING VOWEL IN THE SAME SYLLABLE, WITH THE EXCEPTION OF  "
"WORD-FINAL CONSONANTS (CF. RULES 11 AND 12, SEC. 5.2).             "
"     RULE PALRND2 DESCRIBES THE ROUNDING OF ALL CONSONANTS ADJA-  "
"CENT TO A PALATAL SIBILANT SH OR ZH INITIALLY IN A SYLLABLE (CF.   "
"RULE 17, SEC. 5.2).                                               "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE ROUND1.    |-SYLL +SONOR 3LABSTR (ALPHA)LINGUAL| =>
                                              |(ALPHA-2)ROUND|.
RULE ROUND2.    |-SYLL ¬ROUND| => |(BETA)ROUND|
                /<% 'SB '0'CC _ '0'CC '|3LINSTR (BETA)ROUND| %>.
RULE ROUND3.    |-SYLL ¬ROUND| => |(BETA)ROUND|
      /<% '|3LINSTR (BETA)ROUND| '0'CC _ '0'CC ('SB, 'CC 'WB ) %>.
RULE PALRND2.   |-SYLL| => |2ROUND|
                /<% ('SB '|-SONOR 2LINGUAL 2LINSTR| _,
                     'SB _ '|-SONOR 2LINGUAL 2LINSTR|) %>.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"LENGTHENING                                                        "
"     RULE LENGTH1 INDICATES THAT VOWELS ARE LONG IN FINAL SYLLA-   "
"BLES WHEN THEY PRECEDE /R, V, Z, ZH/ OR THE CLUSTER /VR/, E.G.     "
"SEVE /S EH: V/ 'SAP' (CF. RULE 16, SEC. 6.3).                      "
"     RULE LENGTH2 INDICATES THAT NASALIZED VOWELS ARE LONG IN FI-  "
"NAL CLOSED SYLLABLES, E.G. CONTE /K ON: T/ 'TALE' (CF. RULE 20,     "
"SEC. 6.3).                                                         "
```

```
"     RULE LENGTH3 SPECIFIES THAT HIGH MID VOWELS ARE LONG IN FINAL"
"CLOSED SYLLABLES, E.G. FAUTE /F OO: T/ 'MISTAKE' (CF. RULE 22,    "
"SEC. 6.3).                                                        "
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE LENGTH1   |+SYLL| => |+LONG|
               /<% _ ('R, '|2STRICT -TENSE -SONOR| ('R)) 'WB>.
RULE LENGTH2.  |+SYLL +NASAL| => |+LONG| /<% _ '1'CC 'WB>.
RULE LENGTH3.  |+SYLL +MID +HIGH| => |+LONG| /<% _ '1'CC 'WB>.
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"MIDVOWELS                                                         "
"     IN THE ASSIGNMENT OF HEIGHT FOR MID VOWELS WE FOLLOW THE FOL-"
"LOWING PRINCIPLES:  (A) IN CLOSED SYLLABLES, MID VOWELS ARE LOW   "
"(RULE CLSSYL), (B) IN OPEN WORD-FINAL SYLLABLES, MID VOWELS ARE   "
"HIGH (RULE OPNSYL), AND (C) IN OPEN NON-WORD-FINAL SYLLABLES, MID "
"VOWELS HARMONIZE WITH THE VOWEL IN THE FOLLOWING SYLLABLE (RULE   "
"VOWHARM).                                                         "
"     THESE CONVENTIONS ARE OVERRIDDEN WHEN A VOWEL IS ALREADY     "
"MARKED FOR HEIGHT ( E CAN ONLY BE MARKED IN WORD-FINAL SYLLABLES, "
"OE IN CLOSED WORD-FINAL SYLLABLES, O IN CLOSED WORD-FINAL AND PEN-"
"ULTIMATE SYLLABLES (CF. SEC. 6.6 TO 6.9)).                        "
"     SCHWA MAY HARMONIZE WITH OH (RULE SCHARM1) OR WITH OEE (RULE "
"SCHARM2).                                                         "
"     RULE OCENTR DESCRIBES THE OPTIONAL CENTRALIZATION OF OH WHEN "
"IT IS NEITHER PRECEDED BY A VELAR STOP (FIRST RESTRICTION) NOR    "
"FOLLOWED BY R IN THE SAME SYLLABLE (SECOND RESTRICTION).          "
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE CLSSYL.   |+MID ¬HIGH| => |-HIGH| /<% _ '1'CC 'SB %>.
RULE OPNSYL.   |+MID ¬HIGH| => |+HIGH| /<% _ '|(ALPHA)BOUND| %>.
RULE VOWHAR.   |+MID ¬HIGH ¬DEL| => |(ALPHA)HIGH|
               /<% _ 'SB '0'CC '|(ALPHA)HIGH| %>.
RULE SCHARM1 OP.  EW => |4LINGUAL| /<% _ 'SB '0'CC 'OH %>.
RULE SCHARM2 OP.  EW => |+HIGH| /<% _ 'SB '0'CC 'OEE %>.
RULE OCENTR OP.   OH => |3LINGUAL| /<% 'SB (% 1*) _ (2* %) 'SB %,
                  WHERE 1 NINC1 |4LINGUAL 1LINSTR|
                      & 2 NINC1 |+SONOR 2LINSTR -LAT| >.
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"VELAR PALATALIZATION                                              "
"     VELAR STOPS ARE PALATALIZED BEFORE FRONT VOWELS (CF. RULE 5, "
"SEC. 5.1).                                                        "
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE VELPAL.   |1LINSTR 4LINGUAL| => |(ALPHA)LINGUAL|
               /<% _ '|(ALPHA)LINGUAL 3LINSTR| %>.
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"R-ADHERENCE                                                       "
"     LABIAL STOPS ARE VELARIZED BETWEEN R'S (CF. RULE 7, SEC. 5.1)."
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE RADH.   |1LABSTR| => |2LINSTR 4LINGUAL| /<% 'R _ 'R 'SB %>.
"++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
```

```
"STOP WEAKENING                                                          "
"     AN UNRELEASED STOP IS WEAKENED TO THE CORRESPONDING NASAL          "
"WHEN IT FOLLOWS A NASALIZED VOWEL, E.G. REDEMPTION                      "
"/R EH D AN P S J ON/ OR /R EH D AN M S J ON/ 'REDEMPTION' (CF.           "
"WORDS 32 TO 40, SEC. 4.2).                                              "
"     A LAX STOP IS WEAKENED BEFORE A NASAL STOP WHEN IT IS PRE-         "
"CEDED BY A NASALIZED VOWEL (NOT INCLUDED IN THIS IMPLEMENTATION).       "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE STPWKN.   |1STRICT ¬REL| => |+NASAL +SONOR ¬TENSE|
               /<% '|+SYLL +NASAL| _ %>.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"NASALIZATION OF STOPS                                                   "
"     THE STOP D IS NASALIZED WHEN IT IS IN WORD-INITIAL POSITION        "
"AND FOLLOWED BY A NASAL STOP, E.G. DEMAIN /D OEE M E N/, /D M EN/,"
"OR /N M EN/ 'TOMORROW' (CF. WORDS 28, SEC. 5.5).                        "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE NASSTOP OP.   D => |+NASAL +SONOR ¬TENSE|
                   /<% 'SB _ '|-SYLL +NASAL| %>.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"VELARIZATION OF GN                                                      "
"     RULE VELN1 DESCRIBES THE VELARIZATION OF NONRELEASED PALATAL       "
"NASALS GN.                                                              "
"     RULE VELN2 DESCRIBES THE VELARIZATION OF GN BEFORE R AND W         "
"(CF. WORDS 20 AND 21, SEC. 4.2).                                        "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE VELN1.    |3LINGUAL 1LINSTR +NASAL ¬REL| => |4LINGUAL|.
RULE VELN2.    |3LINGUAL 1LINSTR +NASAL| => |4LINGUAL|
               /<% _ '|-SYLL 4LINGUAL| %>.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"GLIDE RELEASE OF GN                                                     "
"     RULE GLIDRLN DESCRIBES THE INTRODUCTION OF A YOD AFTER PRE-        "
"VOCALIC AND FINAL GN'S (CF. RULE 18, SEC. 4.2).                         "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE GLIDRLN.   * => J /<% 'GN _ 1'|3STRICT| %,
                        WHERE 1 NINC1 |-SYLL +SONOR| >.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"NASAL PALATALIZATION                                                    "
"     RULE PALAT DESCRIBES THE PALATALIZATION OF THE DENTAL NASAL N"
"BEFORE A YOD (CF. WORDS 15, SEC. 4.2).                                  "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE PALAT.    N => |3LINGUAL| /<% _ 1'J %, WHERE 1 NINC1 |3LABSTR| >.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"

"CLEAN-UP                                                                "
"     THIS RULE ERASES FEATURES WHICH ARE NOT RELEVANT TO THE PHO-       "
"NETIC REPRESENTATION:  HEIGHT FEATURES IN GLIDES, DIACRITIC FEA-        "
"TURES SUCH AS GLIDE.                                                    "
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
RULE CLEAN1.   |-SYLL| => |¬HIGH ¬MID ¬GLIDE|.
"+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++"
```

```
CP @(N, V, A) I.
  $END $MAIN FTRIN TRAN.
```

9.7 EXAMPLES OF PHONOLOGICAL DERIVATIONS

```
ENNUYER   'TO BORE'
UNDERLYING FORM
 1 V          2 #
              3 AN
              4 N
              5 Y
              6 I
              7 +
              8 E
              9 #

    # AN N Y I + E #

RULES WHICH HAVE BEEN APPLIED
        1              2  STRESS'
        2              3  GLIDEF1
        3              5  ERASFB
        4              6  INTYOD
        5             29  VCSON1
        6             32  RELEAS1
        7             34  RELEAS3
        8             36  SYLLAB1
        9             37  SYLLAB2
       10             38  ROUND1
       11             39  ROUND2
       12             46  OPNSYL
       13             59  CLEAN1

PHONETIC FORM
 1 V          2 #
              3 AN
             11 .
              4 N;>
              5 YH;>
              6 I
             12 .
             10 J>
              8 EE*
              9 #

        # AN . N;> YH;> I . J> EE* #

 2 #      |+SBOUND|
 4 N;>    |+REL|
 5 YH;>   |-NASAL +REL|
10 J>     |+REL|
 9 #      |+SBOUND|
```

GRADUIONS '(WE) GRADUATED'

```
UNDERLYING FORM
 1 V          2 #
              3 G
              4 R
              5 A
              6 D
              7 Y
              8 +
              9 I
             10 ON
             11 #

   # G R A D Y + I ON #

RULES WHICH HAVE APPLIED
        1          2  STRESS
        2          3  GLIDEF1
        3          5  ERASFB
        4         26  VCOBN1
        5         29  VCSON1
        6         30  VCSON2
        7         32  RELEAS1
        8         34  RELEAS3
        9         36  SYLLAB1
       10         37  SYLLAB2
       11         39  ROUND2
       12         59  CLEAN1

PHONETIC FORM
 1 V          2 #
              3 G>
              4 R>
              5 A
             12 .
              6 D;>
              7 Y
             13 .
              9 J,>
             10 ON*
             11 #

   # G> R> A . D;> Y . J,> ON* #

 2 #     |+SBOUND|
 3 G>    |+REL|
 4 R>    |+REL|
 6 D;>   |+REL|
 9 J,>   |-NASAL +REL|
11 #     |+SBOUND|
```

PLIOIR 'FOLDING KNIFE'

UNDERLYING FORM

1 N	2 #
	3 P
	4 L
	5 I
	6 +
	7 O
	8 A
	9 R
	10 #

	#	P	L	I	+	O	A	R	#
7 O	|	GLIDE	|						

RULES WHICH HAVE APPLIED

1	2	STRESS
2	5	ERASFB
3	6	INTYOD
4	8	LABAT2
5	11	FRIYOD1
6	16	FINREL1
7	26	VCOBN1
8	28	VCOBN3
9	29	VCSON1
10	30	VCSON2
11	31	VCSON3
12	32	RELEAS1
13	34	RELEAS3
14	36	SYLLAB1
15	37	SYLLAB2
16	38	ROUND1
17	39	ROUND2
18	59	CLEAN1

PHONETIC FORM

1 N	2 #
	3 P<
	4 L>
	5 I
	13 .
	11 J+,>
	7 W,>
	8 A*
	9 R>
	12 |
	10 #

	#	P<	L>	I	.	J+,>	W,>	A*	R>	|	#
2 #	|	+SBOUND	|								
3 P>	|	+REL	|								
4 L>	|	+REL	|								
11 J+,>	|	+REL	|								
7 W,>	|	-NASAL +REL	|								
9 R>	|	+REL	|								
10 #	|	+SBOUND	|								

BAIGNOIRE 'BATHTUB'

UNDERLYING FORM

```
 1 N        2 #
            3 B
            4 E
            5 GN
            6 O
            7 A
            8 R
            9 #

      # B E GN O A R #
 6 O    |GLIDE|
```

RULES WHICH HAVE APPLIED

1	2	STRESS
2	8	LABAT2
3	16	FINREL1
4	21	LINASS
5	26	VCOBN1
6	29	VCSON1
7	32	RELEAS1
8	34	RELEAS3
9	36	SYLLAB1
10	37	SYLLAB2
11	38	ROUND1
12	39	ROUND2
13	47	VOWHAR
14	56	VELN2
15	59	CLEAN1

PHONETIC FORM

```
 1 N        2 #
            3 B>
            4 EH
           11 .
            5 NG,>
            6 W,>
            7 A*
            8 R>
           10 |
            9 #

      # B> EH . NG,> W,> A* R> | #

 2 #     |+SBOUND|
 3 B>    |3LINGUAL 3LINSTR +REL|
 5 NG,>  |+REL|
 6 W,>   |-NASAL +REL|
 8 R>    |+REL|
 9 #     |+SBOUND|
```

SMOKING 'DINNER JACKET'
UNDERLYING FORM
1 N 2 #
3 S
4 M
5 O
6 K
7 I
8 NG
9 #

S M O K I NG

RULES WHICH HAVE APPLIED

1	2	STRESS
2	16	FINREL1
3	18	FINREL3
4	21	LINASS
5	26	VCOBN1
6	28	VCOBN3
7	29	VCSON1
8	30	VCSON2
9	32	RELEAS1
10	36	SYLLAB1
11	37	SYLLAB2
12	39	ROUND2
13	47	VOWHAR
14	51	VELPAL
15	59	CLEAN1

PHONETIC FORM
1 N 2 #
3 S,<
4 M,<
5 OO
11 .
6 KJ<
7 I*
8 NG>
9 #

S,< M,< OO . KJ< I* NG>

2 # |+SBOUND|
4 M, |4LINGUAL 3LINSTR +REL|
6 KJ |+REL|
9 # |+SBOUND|

IMPACT 'IMPACT'
UNDERLYING FORM
1 N 2 #
3 EN
4 P
5 A
6 K
7 T
8 #

EN P A K T

RULES WHICH HAVE APPLIED

1	2	STRESS
2	15	EPREL2
3	16	FINREL1
4	26	VCOBN1
5	29	VCSON1
6	32	RELEAS1
7	36	SYLLAB1
8	37	SYLLAB2
9	59	CLEAN1

PHONETIC FORM
1 N 2 #
3 EN
11 .
4 P<
5 A*
6 K<
9 |
7 T<
10 |
8 #

EN . P< A* K< | T< |

2 # |+SBOUND|
4 P< |+REL|
6 K< |+REL|
7 T< |+REL|
8 # |+SBOUND|

```
PROMPT   'QUICK'
UNDERLYING FORM
 1 A          2 #
              3 P
              4 R
              5 ON
              6 P
              7 T
              8 #

   # P R ON P T #

RULES WHICH HAVE APPLIED
         1          2  STRESS
         2         16  FINREL1
         3         25  LAX3
         4         26  VCOBN1
         5         27  VCOBN2
         6         28  VCOBN3
         7         29  VCSON1
         8         30  VCSON2
         9         32  RELEAS1
        10         36  SYLLAB1
        11         39  ROUND2
        12         40  ROUND3
        13         53  STPWKN
        14         59  CLEAN1

PHONETIC FORM
 1 A          2 #
              3 P,<
              4 R,<
              5 ON*
              6 M,<
              7 T<
              9 |
              8 #

   # P,< R,< ON* M,< T< | #

 2 #      |+SBOUND|
 3 P,<    |+REL|
 4 R,<    |+REL|
 7 T<     |+REL|
 8 #      |+SBOUND|
```

```
REDEMPTION   'REDEMPTION'
UNDERLYING FORM
 1 N          2 #
              3 R
              4 E
              5 D
              6 AN
              7 P
              8 S
              9 I
             10 ON
             11 #

   # R E D AN P S I O N #

RULES WHICH HAVE APPLIED
        1          2  STRESS
        2          3  GLIDEF1
        3         25  LAX3
        4         26  VCOBN1
        5         27  VCOBN2
        6         29  VCSON1
        7         30  VCSON2
        8         32  RELEAS1
        9         34  RELEAS3
       10         35  RELS
       11         36  SYLLAB1
       12         37  SYLLAB2
       13         39  ROUND2
       14         47  VOWHAR
       15         53  STPWKN
       16         59  CLEAN1

PHONETIC FORM
 1 N          2 #
              3 R>
              4 EH
             12 .
              5 D>
              6 AN
              7 M<
             13 .
              8 S,<
              9 J,<
             10 ON*
             11 #

   # R> EH . D> AN M< . S,< J,< ON* #

 2 #      |+SBOUND|
 3 R>     |+REL|
 5 D>     |+REL|
 8 S,<    |+REL|
 9 J,<    |-NASAL +REL|
11 #      |+SBOUND|
```

```
CHEVAL   'HORSE'
UNDERLYING FORM
 1 N          2 #
              3 SH
              4 OEH
              5 V
              6 A
              7 L
              8 #

    # SH OEH V A L #

 4 OEH    |DEL|

RULES WHICH HAVE APPLIED
         1          1  SCHDEL
         2          2  STRESS
         3         16  FINREL1
         4         20  AFRONT
         5         21  LINASS
         6         22  VRELAX
         7         26  VCOBN1
         8         28  VCOBN3
         9         29  VCSON1
        10         30  VCSON2
        11         32  RELEAS1
        12         34  RELEAS3
        13         36  SYLLAB1
        14         38  ROUND1
        15         59  CLEAN1

PHONETIC FORM
 1            2 #
              3 SH<
              5 YH;<
              6 A*
              7 L>
              9 |
              8 #

    # SH< YH;< A* L> | #

 2 #      |+SBOUND|
 3 SH<    |+REL|
 5 YH;<   |-NASAL +REL|
 7 L>     |+REL|
 8 #      |+SBOUND|
```

ESPERER 'TO HOPE'
UNDERLYING FORM
1 V 2 #
3 E
4 S
5 P
6 E
7 R
8 E
9 #

E S P E R E

RULES WHICH HAVE APPLIED

1	2	STRESS
2	21	LINASS
3	26	VCOBN1
4	27	VCOBN2
5	29	VCSON1
6	32	RELEAS1
7	36	SYLLAB1
8	37	SYLLAB2
9	45	CLSSYL
10	46	OPNSYL
11	47	VOWHAR
12	59	CLEAN1

PHONETIC FORM
1 2 #
3 EH
4 S<
10 .
5 P<
6 EE
11 .
7 R>
8 EE*
9 #

EH S< . P< EE . R> EE*

2 # |+SBOUND|
5 P< |3 LINGUAL 3 LINSTR +REL|
7 R> |+REL|
9 # |+SBOUND|

BIBLIOGRAPHY

Bauche, Henri. 1929. Le langage populaire. 2nd ed. (1st ed. 1920). Paris: Payot.

Baudry, Hubert. 1956. Nouveau dictionnaire d'abréviations. 2nd ed. La Chapelle-Montligeon: Editions de Montligeon.

Benguérel, André-Pierre. 1970. Some physiological aspects of stress in French. Natural Language Studies 4. Ann Arbor: The University of Michigan.

Bourciez, Edouard and J. 1967. Phonétique française: étude historique. Paris: Klincksieck.

Chomsky, Noam, and M. Halle. 1968. The sound pattern of English. New York: Harper & Row.

Cohen, Marcel. 1962. L'observation de phonèmes occasionnels (h et ? en français). Proceedings of the IVth International Congress of Phonetic Sciences, 561-2.

Davis, Edwin B. 1943. Voiced détentes. The French Review 17.36-9.

Damourette, Jacques, and E. Pichon. 1911-1927. Essai de grammaire de la langue française. Paris: Collection des linguistes contemporains.

Delattre, Pierre. 1938. L'accent final en français: accent d'intensité, accent de hauteur, accent de durée. The French Review 12.141-5. Reprinted in Delattre 1966:68-9.

_____. 1939a. Accent de mot et accent de groupe. The French Review 13.1-6. Reprinted in Delattre 1966:69-72.

_____. 1939b. Durée vocalique et consonne subséquentes. Le Maître Phonétique 67. Reprinted in Delattre 1966:130-2.

_____. 1941. La force d'articulation consonantique en français. The French Review 14.220-32. Reprinted in Delattre 1966:111-9.

_____. 1948. Un triangle acoustique des voyelles orales du français. The French Review 21.477-84. Reprinted in Delattre 1966:236-42.

_____. 1949. La leçon de phonétique de Farrebique. The French Review 22.323-8. Reprinted in Delattre 1966:218-22.

_____. 1962. Some factors of vowel duration and their cross-linguistic validity. The Journal of the Acoustical Society of America 34:193-210. Reprinted in Delattre 1966:133-7.

_____. 1963. Comparing the prosodic features of English, German, Spanish, and French. International Review of Applied Linguistics in Language Teaching 1.193-210.

_____. 1966. Studies in French and comparative phonetics. The Hague: Mouton.

Deyhime, Guiti. 1967. Enquête sur la phonologie du français. La Linguistique 1.97-108, 2.57-84. Paris: P.U.F.

Durand, Marguerite. 1936. Le genre grammatical en français parlé à Paris et dans la région parisienne. Français Moderne.

Fisher-Jørgensen, Eli. 1969. Voicing, tenseness, and aspiration in stop consonants, with special reference to French and Danish. Annual report of the Institute of Phonetics, 63-114. University of Copenhagen.

Fouché, Pierre. 1959. Traité de prononciation française. 2nd ed. (1st ed. 1956). Paris: Klincksieck.

Frei, Henri. 1929. La grammaire des fautes. Paris: Guenther.

Friedman, Joyce, and Y. Ch. Morin. 1971. Phonological grammar tester: description. Natural Language Studies 9. Ann Arbor: The University of Michigan.

Ginsberg, Raymond. 1968. La détente consonantique en français standard et en français canadien, in P. Léon 1968.
Grammont, Maurice. 1908. Petit traité de versification française. Paris: Colin.
_____. 1954. Traité pratique de prononciation française. 9th ed. (1st ed. 1914). Paris: Delagrave.
Hall, Robert A., Jr. 1948. French. Language Monograph 24, Structural Sketches 1.
Hatzfeld, Adolphe, and A. Darmestier. 1964. Dictionnaire général de la langue française. Paris: Delagrave (first published 1871).
Heffner, R.-M. S. 1964. General phonetics. (1st ed. 1950). Madison: The University of Wisconsin Press.
Juilland, Alphonse. 1965. Dictionnaire inverse de la langue française. The Hague: Mouton.
Ladefoged, Peter. 1967. Linguistic phonetics. Working Papers in Phonetics 6. Los Angeles: University of California.
Léon, Pierre R. 1966. Apparition, maintain et chute du 'e' caduc. La Linguistique 2.111-22. Paris: P.U.F.
_____, ed. 1968. Recherches sur la structure du français canadien. Paris and Montréal: Didier.
Léon, Monique. 1964a. Exercices systématiques de prononciation française 1, articulation. Paris: Hachette et Larousse.
_____. 1964b. Exercices systématiques de prononciation française 2, rythme et intonation. Paris: Hachette et Larousse.
Lindgren, Lauri. 1968. L'interférence des systèmes phonémiques français et finnois. Publications of the Phonetics Department of the University of Turku 4.
Littré, Emile. 1961. Dictionnaire de la langue française. Paris: Gallimard & Hachette (first published 1863-1872).
Martinet, André. 1949. Phonology as functional phonetics. Publications of the Philological Society 15. London: Oxford University Press.
_____. 1958. C'est jeuli le Mareuc. Romance Philology 11.345-55.
Milner, J.-C. G. 1967. French truncation rule. Quarterly Progress Report 86.273-83. MIT Research Laboratory of Electronics.
Morin, Yves Ch. 1972. The phonology of echo-words in French. Language 48.97-108.
_____, and J. Friedman. 1971. Phonological grammar tester: underlying theory. Natural Language Studies 10. Ann Arbor: The University of Michigan.
Nyrop, Kristoffer. 1902. Manuel phonétique du français parlé. 2nd ed., translated by E. Philipot. Copenhagen: Nordiske Forlag.
Passy, Paul. 1929. Les sons du français. Paris: Didier.
Pleasants, Jeanne Varney. 1956. Etudes sur l'e muet. Paris: Klincksieck.
Robert, Paul. 1967. Dictionnaire alphabétique et analogique de la langue française. Paris: Société du Nouveau Littré.
Schane, Sanford A. 1968. French phonology and morphology. Cambridge, Mass.: MIT Press.
Schwartz, William L. 1930. The Parisian accent according to the Institut de Phonétique. The French Review 3.233-42.

Thorsen, Oluf M. 1966. Voice assimilation of stop consonants and fricatives in French and its relation to sound duration and intra-oral air-pressure. Annual report of the Institute of Phonetics, 67-76. University of Copenhagen.

Vaugelas, Claude Favre de. 1647. Remarques sur la langue françoise. Facsimile ed. by J. Streicher, 1937. Paris: Droz.

Warnant, Léon. 1968. Dictionnaire de la prononciation française. 3rd ed. (1st ed. 1962). Gembloux: Duculot.

Zwanenburg, W. 1966. Les phénomènes semi-vocaliques du français moderne. Neo-philologus 50.28-33.