

THE PHONOLOGICAL AND  
MORPHOLOGICAL STRUCTURE OF FRENCH

by

Sanford A. Schane

B.A., Wayne State University

(1958)

M.A., University of Michigan

(1961)

Submitted in partial fulfillment

of the requirements for the

degree of Doctor of

Philosophy

at the

Massachusetts Institute of

Technology

June, 1965

Signature of Author \_\_\_\_\_  
Department of Modern Languages and Linguistics  
May 14, 1965

Certified by \_\_\_\_\_  
Thesis Supervisor

Accepted by \_\_\_\_\_  
Chairman, Departmental Committee  
on Graduate Students

The Phonological and Morphological Structure of French  
Sanford A. Schane

Submitted to the Department of Modern Languages and Linguistics on May 14, 1965 in partial fulfillment of the requirement for the degree of Doctor of Philosophy.

The purpose of this work is to establish the interrelations between the phonology and morphology of contemporary French. The phonological and morphological aspects of the language are not treated as two separate levels, each functioning independently of the other, but rather they are shown to be integrated into an "overall" system. Since there are many morphological forms which exhibit phonological alternations, it is necessary to demonstrate how these various phonologic alternants are related to each other. One possible solution would be to list the various allomorphs of a given morpheme. However, in general, this solution has been rejected since a simple listing of alternating forms sheds little light on the structural mechanisms within the language which allow for particular alternations but exclude others. In the analysis morphemes have a single underlying representation and the diverse phonetic manifestations which a given morpheme may exhibit result from the application of an ordered set of phonological rules. These rules, which convert an abstract phonological representation of morphemes into an actual phonetic output, provide the structural explanation for the phonological and morphological processes observable in French.

In Chapter I ("Related forms") three morphological processes are examined: inflection, derivation, and etymological doublets. A formal basis for this traditional division is established and it is shown that such a classification is possible within a synchronic description without the necessity of introducing historical considerations.

Chapter II ("The vowel system") establishes the system of underlying vowels needed to account for the vocalic alternates observable both within the paradigm and in derivational forms. The underlying vowel pattern of French is a seven-vowel system. Each of these vowels may be tense or lax and it is generally the lax vowels which undergo vowel shift. Front rounded vowels are not found in the underlying representation. These vowels are in all cases derived from the corresponding back vowels. The schwa vowel similarly does not appear in the underlying forms. The particular vowel from which it is derived is a function of the vowel's position relative to the tonic syllable. Morphological alternations lead one to establish that nasalized vowels must be derived from a sequence of oral vowel plus nasal consonant. The "intricate" relation between the twelve oral vowels of French (at the phonetic level) and the four nasalized vowels is shown to be an automatic consequence of the rules previously established for the oral vowels. The "phonetic" and

"phonemic" long vowels are examined and it is demonstrated that vowel length does not need to be indicated in the phonological representation. The glides or semi-vowels are also shown to be "non-phonemic". In prevocalic position they are derived from the corresponding high vowels, whereas a post-vocalic glide has its origin as a liquid. The rules for stress are set forth, the assignment of stress within the word depending on the tenseness feature of the underlying vowels.

Chapter III ("Elision and liaison") is concerned with the syntactic constraints on particular phonological processes. It is shown that elision and liaison are in actuality a single phenomenon--the deletion or truncation of a segment when followed by another segment with similar features. Two relatively simple rules will account for the intricate interplay of elision and liaison within the phrase. The remainder of the chapter is devoted to conditions or restrictions which must be imposed on truncation. Words with pronounced final consonants and the "h aspiré" words are treated here. There is a discussion of the verb group, which has the peculiar property of exhibiting post-verbal stressed pronouns.

Chapter IV ("Verbs") develops the rules needed for producing the various paradigmatic forms. There is established a formal basis for the traditional classification of the "regular" forms into three principal conjugations. "Regular" verbs all have the structure: stem + conjugation marker + tense marker + person marker. Each of these constituents has an abstract phonologic representation which in many cases may be quite different from the final phonetic output. The tenses of French fall into three main groups which can be phonologically defined. Similarly, there is phonological structure imposed on the person markers and conjugation markers. The final section of the chapter deals with the so-called "irregular" verbs. Of striking interest is the observation that many "irregular" verbs--including some of the most anomalous forms--can be accounted for without the necessity of postulating additional rules, once it is established that these forms differ from the regular ones in that the former do not have a thematic vowel. The same set of rules applied to forms with or without a thematic vowel produces a totally different--although in each case the correct--final output.

Thesis Supervisor: Morris Halle  
Professor of Linguistics

BIOGRAPHY

The author was born in Detroit, Michigan on August 8, 1937. He attended public schools in Detroit and upon graduating entered Wayne State University. His undergraduate specialization was in French language and literature, and he received the B.A. degree in 1958. He spent the following academic year as a Fulbright fellow in France, where he pursued studies in French language and contemporary French philosophy at the Université d'Aix-Marseille in Aix-en-Provence.

Upon returning to the United States the author enrolled in the College of Education of Wayne State University and obtained state certification. The following year he taught French language at the secondary level and Spanish in the adult education program of Detroit. It was at this time that the author first became acquainted with linguistics. He became a graduate student in linguistics at the University of Michigan and obtained the M.A. degree in the summer of 1961. He held a Graduate School fellowship for the following academic year. While at the University of Michigan he participated as a linguist-instructor in two of the Peace Corps training programs which prepared volunteers for service in Thailand.

The author entered the graduate program in linguistics at M.I.T. in 1962. During his three years at M.I.T. he has been a research and teaching assistant within the department. In the summer of 1963 he taught French at the Colby College

Summer School of Languages. In 1964 he held a summer job with the United States Air Force where he worked on computer applications to natural language. He has been a consultant in linguistics for the Modern Language Project which produces the filmed course "Parlons Français", and for the Center for Applied Linguistics which is developing a self-instructional French course for the Department of Defense.

At the summer 1964 meeting of the Linguistic Society of America the author presented a paper entitled "The Historical Development of the French Syntactic Construction: Ce + ETRE + noun or pronoun". At the winter meeting of 1964 he read a paper entitled "Cyclic Rules in the Phonological Component of a Transformational Grammar of French". The author has accepted a position at the University of California, San Diego.

## INTRODUCTION

In French there are morphological forms which exhibit phonological alternation. Thus, to cite one example, the forms "sel" /sèl/ 'salt', "saline" /salin/ 'salty' both contain the morpheme 'salt'. There are several ways in which one could account for these phonological alternates. One possibility would be to say that this morpheme has two allomorphic variants: /sèl/ and /sal/, that the former occurs whenever the morpheme functions as a word, whereas the latter is found in derivational forms. In this type of statement the conditioning environment for the different variants is determined morphologically.

Alternatively one could phrase the environment in phonological terms and say that the allomorph /sèl/ occurs in tonic position whereas the alternant /sal/ appears in pre-tonic position. (For these examples one may assume that within the word stress is placed on the last pronounced vowel.) Yet the /a/ : /è/ alternation is not limited to this one morpheme. Within French can be found many pairs exhibiting this alternation: "clair" 'clear', "clarté" 'clearness'; "faim" 'hunger', "famine" 'famine'; "populaire" 'popular', "popularité" 'popularity'; etc. If one simply lists for each of these morphemes the alternating members,

one is unable to account for the generalization which is readily observable, namely, that the same two vowels always alternate with each other. This generalization can be obtained if the individual statements are replaced by a more inclusive morphophonemic statement: There is a class of morphemes--indicated in some manner--where the stem vowel appears as /è/ in tonic position and as /a/ in pre-tonic position. We shall refer to any morphophonemic statement which lists alternating members as the "allomorphic" method.

An alternative possibility--what we shall call the "monomorphic" method--is to postulate a single underlying form from which the various alternating members are derived by means of phonological rules. Thus, in the above examples, one could set up /sal/, /klar/, etc. as underlying or base forms and have a phonological rule which says that the stem vowel /a/ becomes /è/ whenever it is stressed. One could go a step further and state the difference between these two vowels in terms of the minimal phonological feature specification needed to convert /a/ to /è/; i.e., the stem vowel becomes front whenever it is stressed. Is this solution a more desirable one or is it simply restating the observed facts under a different guise?

If one considers other alternations in French of the type: "fleur" /flœr/ 'flower', "floral" /flòral/ 'floral'; "meurt" 'he) dies', "mortel" 'mortal; "seul" 'alone', "solitude" 'solitude'; etc., one notes that /œ/ alternates with

/ò/. In the "allomorphic" method one would simply note that in addition to the /è/ : /a/ alternation there is an /œ/ : /ò/ alternation. These different alternations must be separately noted and they have nothing in common other than that in both pairs there is a stressed and an unstressed member. In the "monomorphic" solution with feature specification one could postulate the underlying forms /flòr/, /sòl/, etc., and apply the rule previously formulated, namely, that the stem vowel becomes front whenever it is stressed. Then just as /a/ > /è/, so /ò/ > /œ/. The generalization and simplicity which result from this phonological rule become apparent.

In the "allomorphic" solution the various alternations are merely noted; in the "monomorphic" solution where features are utilized these different alternations are seen to be instances of the same general process, i.e., vowel fronting. However, of even greater interest is the fact that this "monomorphic" method provides insight into the phonological structure of the language, which is not possible with an "allomorphic" solution. In the latter one is limited to stating the observed data, i.e., that /a/ alternates with /è/. There is no explanation for the occurrence of this particular alternation rather than some other one. Why does there not occur, for example, the alternation /a/ : /á/ or /a/ : /ò/? In our "monomorphic" solution there is a rule which states that the stressed vowel is fronted. With such a rule in the



grammar just any alternation is no longer possible, for /a/ can only alternate with /è/, and /ò/ with /œ/. Thus, this approach allows one to provide an explanation for the particular alternations observed.

It is the purpose of this study then to determine the phonological rules which account for the morphological alternations found in French and to formulate these rules in such a way that they will provide insight into the phonological and morphological structure of French.

Within this "monomorphic" system the morphemes have an abstract phonological representation. Each morpheme is composed of a sequence of phonological segments; every segment is composed of a bundle of phonological features. The various rules act upon particular segments, changing individual features whenever the appropriate environmental conditions are met. Only after application of all the phonological rules is it necessarily the case that the correct phonetic output is obtained. In many cases particular phonological segments will be represented by the same set of features in both the underlying form and the phonetic output. This was the case with the consonantal segments in the previous examples. Other segments will have different representations at the abstract and phonetic levels, e.g., the tonic vowels in the above examples. It is these segments which of course have particular phonologic features changed in the course of the derivation. The abstract representation then will differ

from the phonetic output only when morphological considerations come into play or when phonological generalizations require a more "abstract" representation.

The choice of an underlying representation is by no means arbitrary for it is determined by the nature of the morphological processes, by the generality of the phonological rules, as well as by the simplicity of the underlying representation itself. From these considerations it can be ascertained that the phonology and morphology are not two separate systems, each functioning independently of the other, but rather they are interrelated in an "overall" pattern. It is this interplay between the phonology and morphology with which we shall be concerned and which will permit us to establish the fundamental phonological and morphological structure of French.

This study does not pretend to be a complete treatment of all aspects of French phonology and morphology. We shall treat in detail three major topics: the vowel system, elision and liaison, and the verb conjugation. However, within these areas can be found the principal phonological and morphological processes operating in the language.

May 14, 1965  
Cambridge, Massachusetts

ACKNOWLEDGMENTS

I should like to express my gratitude to Professor Morris Halle for the many hours which he was able to devote to me in the preliminary stages of this study, as well as for the clarification which he continually provided on theoretical issues. I should also like to thank Professor Edward S. Klima for suggestions which he made on an earlier version of this manuscript.

KEY

The following phonological symbols are used in the representations. The corresponding IPA symbols are given in the right-hand column.

	IPA
i	i
é	e
è	ɛ
u	u
ó	o
ó	o
ʎ	ɣ
ð	ð
œ	œ
ã	a
â	ɑ
e	ə
ẽ	ẽ
õ	õ
œ̃	œ̃
ã̃	ã̃
ɣ	ɣ
ʎ	ʎ
ʎ	ʎ
ʎ	ʎ
ʎ	ʎ

All other consonants are represented as in the IPA system.

The following junctures are used:

- + morpheme boundary
- ≠ word boundary
- ∕ phrase boundary

The following punctuation has been adopted.

"French orthography"  
'English glosses'  
/phonetic output/  
liaison\_occurs  
liaison\_does not/occur

In the underlying representation TENSE vowels are capitalized.

The stressed vowel is underscored.

Within rules, @ stands for the Greek letter alpha.

Brackets are placed around [bundles of features], angles around a <single feature>; (optional elements) are parenthesized; braces are used for the {subparts of a rule}.

CONTENTS

Chapter I.	Related forms	1
1.1.	Degrees of relatedness	1
1.2.	Historical factors	3
Chapter II.	The vowel system	16
2.1.	Oral vowels	16
2.1.1.	Stems exhibiting alternation	17
2.1.2.	Stems not exhibiting alternation	25
2.1.3.	Additional vocalic alternations	30
2.1.4.	Fronted vowels in pre-tonic position	34
2.2.	The schwa vowel	37
2.3.	Nasalized vowels	40
2.4.	Long vowels	49
2.4.1.	The vowel /ô/	49
2.4.2.	Vowel duration	52
2.5.	Semi-vowels (glides)	56
2.6.	Stress	53
2.7.	Summary	67
Chapter III.	Elision and liaison	91
3.1.	Truncation	91
3.1.1.	Truncation between words	91
3.1.2.	Truncation between morphemes	96
3.2.	Conditions on the truncation rule	99
3.2.1.	Pronounced final consonants	99

3.2.2.	Syntactic restrictions	100
3.2.3.	"H aspiré"	106
3.2.4.	Truncatable and non-truncatable vowels	109
3.3.	The verb group	111
3.4.	Summary	115
Chapter IV.	Verbs	133
4.1.	The tenses	134
4.1.1.	First and second conjugations	134
4.1.1.1.	Group A (present)	134
4.1.1.1.1.	Present tense	134
4.1.1.1.2.	Imperfect tense	139
4.1.1.1.3.	Present subjunctive	140
4.1.1.1.4.	Present participle	142
4.1.1.2.	Group B (future)	142
4.1.1.2.1.	The infinitive	142
4.1.1.2.2.	The future tense	146
4.1.1.2.3.	The conditional	153
4.1.1.3.	Group C (past)	153
4.1.1.3.1.	The preterite tense (passé simple)	153
4.1.1.3.2.	The past subjunctive	161
4.1.1.3.3.	The past participle	162
4.1.1.4.	Summary	166
4.1.2.	Third conjugation verbs	169
4.1.2.1.	Third conjugation (type "-oir")	169
4.1.2.2.	Third conjugation (type "-re")	174

4.2.	Irregular verbs	181
4.3.	Summary	199
Appendix A	The Phonological Rules	223
Appendix B	Verb Stems	234
Bibliography		244



## Chapter I

### RELATED FORMS

#### 1.1. Degrees of relatedness

Within French there are groups of words which are related to each other both semantically and phonologically. Thus, the morpheme 'die' occurs as the stem element in the forms "(il) meurt", "(nous) mourons", "mortel". As these examples show, the stem constituent exhibits different vowels in the various forms. It is the purpose of the phonological rules to specify those phonological alternations that take place in related words. Yet the question of relatedness is not so simple as it may at first appear to be. In order to illustrate the complexity of the problem we shall consider the following forms.<sup>1</sup>

- |     |                       |                |                         |               |
|-----|-----------------------|----------------|-------------------------|---------------|
| 1.  | (ils) <u>do</u> ivent | '(they) must'  | (nous) <u>de</u> vons   | '(we) must'   |
| 2.  | (ils) <u>me</u> urent | '(they) die'   | (nous) <u>mo</u> urons  | '(we) die'    |
| 3.  | <u>che</u> val        | 'horse'        | <u>che</u> vau <u>x</u> | 'horses'      |
| 4.  | <u>bon</u>            | 'good (masc.)' | <u>ben</u> ne           | 'good (fem.)' |
| 5.  | (ils) <u>ai</u> ment  | '(they) love'  | <u>am</u> our           | 'love (noun)' |
| 6.  | <u>fleur</u>          | 'flower'       | <u>flor</u> al          | 'floral'      |
| 7.  | <u>me</u> r           | 'sea'          | <u>mar</u> in           | 'sailor'      |
| 8.  | <u>fê</u> te          | 'holiday'      | <u>fest</u> ival        | 'festival'    |
| 9.  | <u>nuit</u>           | 'night'        | <u>noct</u> urne        | 'nocturnal'   |
| 10. | <u>frê</u> le         | 'weak'         | <u>frag</u> ile         | 'fragile'     |
| 11. | <u>raison</u>         | 'reason'       | <u>ratio</u> n          | 'ration'      |
| 12. | <u>naï</u> f          | 'naive'        | <u>natif</u>            | 'native'      |

These examples by no means illustrate morphological alternations of the same type. In 1) and 2) the differing forms show up in the verb conjugation (i.e., different persons or tenses of a given verb stem); 3) and 4) exhibit alternations in nouns and adjectives (i.e., singular/plural, masculine/feminine). In any case, the first four examples depict alternations within the same part of speech--alternations between forms which traditionally have been grouped into paradigms--what has generally been referred to as inflection. 5-7) represent vocalic alternations between different parts of speech (verb/noun, noun/adjective) or even sometimes the same part of speech. However, the various forms cannot usually be arranged in convenient paradigms and thus differ in this respect from the inflected forms. These forms illustrate what is generally called derivation. Examples 8) and 9) can also be considered as instances of derivational morphology. However, these forms are somewhat more complicated than the preceding ones since certain consonants, in addition to the vowels, are also affected. Examples 10-12) illustrate a third type of alternation--between forms that are doublets; etymologically both forms are derived from the same Latin word but have entered the language at different periods.<sup>2</sup>

We stated that alternating forms tended to be closely related both phonologically and semantically. The criteria

for what constitutes 'phonological' or 'semantic' similarity are by no means easy to establish.<sup>3</sup> Thus, in the first of our examples ("devons/doivent") the stem elements (dev-/doiv-) are quite similar phonologically (both forms have the same consonant segments and differ only in the vocalic segments); semantically, dev- and doiv- have the same meaning. Looking at the last example ("naïf/natif"), it is seen that both forms share certain phonological segments and one could doubtlessly attribute some vague semantic similarity to these forms, vague certainly in comparison to the first example.<sup>4</sup>

It appears to be the case that of the twelve forms cited at the beginning of this chapter, those at the top of the list are clearly related, whereas those near the bottom are more dubious. The traditional division of morphological forms into inflected, derivational, and doublet is of value in that the traditionalists recognized these different relationships between each of the categories. Inflected forms (those composing paradigms) comprise tightly knit systems. One might suppose that native speakers "intuit" the close relationship of the various forms within a paradigm and that these forms are related in a way in which, say, derivational forms are not. Among the derivational forms one could suppose further that certain ones (for example, "fleur/floral") are felt as being more closely related than others ("nuît/nocturne "). Finally, there are the

least clear cases--the doublets. One might expect speakers to differ radically in their reactions to pairs of this type.

If it is the case that there are varying degrees of relatedness between forms, then it would be of interest if the grammar were to reflect in some way this observation. That is, forms high on the list of relatedness should be explicated by quite general statements which would account for innumerable forms (for example, verb conjugations). As one progresses down the scale of relatedness, it would seem likely that the statements (rules for relatedness) should become less general in scope and might be applicable only to a few isolated cases.

Since the verbs of French form a rich morphological system, within the grammar one would expect to find rules for generating the various forms of the paradigm. Furthermore, a large number of the rules would probably be quite general since, as we said, they would have to handle a multitude of cases. In considering derivation one is confronted with two different problems: which affixes can be combined with a particular stem (we shall not treat this aspect of derivation here) and what phonological processes take place between the stem and the other constituents. Some of the rules to account for derivational forms would be identical to rules already set up for handling inflected forms. (For example, "fleur/floral" has the same vocalic alternation as "meurt/

mort" and consequently both cases would be handled by the same rule.) Here is an instance where no new rule has to be added to the grammar to handle derivation since the alternation exhibited is identical to that found in inflected forms. The fact that no new rule is needed could be advanced as an explanation for the native speaker's feeling that "fleur" and "floral" are also closely related forms.

If one considers derivational forms such as "nuit/nocturne", these forms can be related to each other only by adding additional rules. (The ui/oc alternation is not found within the inflectional system.) These rules would be of a less general nature than many of the rules needed for inflection, would handle fewer forms, and, therefore, would state less frequently encountered alternations. In fact, it could well be the case that there would be so few forms exhibiting a particular alternation that a set of rules to account for the alternation would be more complex than a simple listing of the alternate forms. Consequently, we might expect speakers of French to "feel" that forms such as "nuit/nocturne" are less closely related than, say, "fleur/floral".

Additional rules would be necessary to relate forms such as "frêle/fragile", "raison/ration"; again there would have to be a sufficient number of forms exhibiting the alternation to warrant setting up very specialized rules. Should the rules reach the point where they have become too indivi-

dualized or overly complicated, the linguist is probably approaching or may even have gone beyond the threshold of the native speaker's tolerance for relatedness.

In deciding whether words are related (i.e., constitute a "family" of morphologically related forms), either phonologic or semantic considerations by themselves are not sufficient. (See note 3.) Phonological similarity fails in the case of homonyms (i.e., forms with complete phonological agreement) and at the other extreme is negated in the case of suppletive forms (i.e., forms with little or no phonological agreement). Semantic considerations alone are equally of little value since semantic similarity is exhibited in the case of synonyms (i.e., forms which have a similar "meaning" but otherwise are unrelated morphologically). Therefore, we shall make use of the following criteria in order to determine whether two or more forms are morphologically related; that is, whether they all have the same underlying morpheme as a constituent.

If the forms can enter into a paradigmatic arrangement, we shall consider this sufficient reason for relating all the included members. In French, this will include the verbs, which can be inflected for tense, person, and number; the adjectives, which are inflected for gender and number; and the nouns, which are inflected for number (and sometimes gender).<sup>5</sup> In most instances we shall be able to show that the stem constituent of the various members of the

paradigm can be represented by a single underlying morpheme (sequence of segments). Whenever the final forms of the paradigm members show phonological alternations, these alternations will be produced by a set of phonological rules which operates on the underlying forms, converting them to their final forms. We shall list morphemic alternants (suppletive forms) only when it is the case that to list alternants is a simpler procedure (entails fewer features) than to postulate a single underlying representation plus a set of rules.<sup>6</sup>

For the other types of morphological processes (derivation and doublet forms), we do not generally have recourse to paradigms in order to determine whether forms are morphologically related.<sup>7</sup> Therefore, we shall have to determine such cases by the overall complexity of the grammar. Can the forms in question be explained by existent rules? Will additional rules explicate a large class of data which have not yet been accounted for or will they only explain some isolated forms? If rules account for a large body of data, they are evidently more highly valued since they are more general in scope and should accordingly state fewer environmental restrictions. Therefore, number and types of rules as well as considerations of overall simplicity will be used in deciding whether two or more forms are related.

#### 1.2. Historical factors

Of what value are historical considerations in estab-



lishing degrees of relatedness? Our original classification into inflected, derivational, and doublet forms was a temporary expedient for grossly organizing the data (see note 2). If one considers forms 6-12), those in column 2 were brought into the language after there had occurred various sound changes responsible for the phonological shape of the forms cited in column 1.<sup>8</sup> One might expect then that two forms based on the same lexical stem and entering the language at different periods of time would be proportionately less related as the period of time separating them was greater; that is, if the two forms are separated by a long interval of time, one could expect more sound changes to have taken place and the forms to be more disparate in appearance. Yet there is no absolute correlation between a time interval and the complexity or number of sound changes. Therefore, lapses of time are only of marginal interest in establishing a scale for degrees of relatedness.

In order to set up a scale of relatedness for a synchronic description, we have made use of such criteria as number of rules needed, simplicity of the rules, generality of application (the number of forms which undergo the rules), etc. In this way we are able to test the validity of our synchronic system without having recourse to historical considerations. However, one might argue that a historical basis for a synchronic degree of relatedness is possible if one takes into account such factors as type of sound change or

complexity of change. Thus, the change from Latin florem to French "fleur" is relatively uncomplicated: diphthongization and vowel shift of the tonic vowel when in a weak syllable. The change from Latin noctem to French "nuit" is more complex: palatalization of the velar stop before the dental stop, the palatalization resulting in a vowel shift with the development of a diphthong. Here, then, the time factor is replaced by considerations of the simplicity of the change, number of changes, etc., considerations which are similar to those criteria which we previously established purely on synchronic evidence. It is for this reason that a set of synchronic rules conforming to such criteria very often reflects the history of the language.

NOTES

1 Additional examples of the type 8, 9 can be found in Marouzeau, pp. 8-9; examples of the type 10-12, pp. 19-21.

2 We do not wish to imply that historical factors are to be considered in a synchronic description. At this point we are simply classifying the data; this is one way to talk about the various forms, in view of the fact that French is so well documented historically. We believe that a synchronic description should be motivated internally and should not rest on diachronic considerations. However, very often the rules--particularly ordered rules--of a synchronic description reflect certain changes which were known to have taken place in the history of the language. (This problem is discussed in more detail toward the end of the chapter. See also Chomsky and Halle (forthcoming).) This concept of ordered rules not only raises some interesting questions for synchronic studies but could also be highly significant in historical linguistics, particularly for those languages whose histories are not well known.

Throughout this study we shall occasionally make reference to various historical developments which have taken place in French. We refer to these developments either because they illustrate the types of problems with which we shall be confronted (particularly in dealing with residual forms), or because there is an interesting parallelism between our synchronic rules and certain historical changes.

But the synchronic description which we offer is to be judged solely by internal consistency and general considerations of simplicity rather than, say, by historical arguments.

3 This question has preoccupied much of American linguistics: what are the criteria for assigning allomorphs to the same morpheme? One cannot do research in morphology without running into the problem almost immediately and at every step of the way one is forced to make judgments on whether or not the forms are morphologically related. We suggest (toward the end of this section) that the grammar itself may be used to decide many of the questionable cases.

The problem is further complicated by the presence of homonyms ("vers" 'toward', "vers" 'verse') where there is an identical sequence of phonological segments but with totally different meanings. Contrast this with synonyms ("début" 'beginning', "initial" 'initial'), which are phonologically unrelated but very similar semantically. Now the criterion of "partial phonetic-semantic resemblance" (Bloomfield, p. 161) would presumably exclude grouping "vers" and "vers" or "début" and "initial" as members of the same morpheme. However, this criterion would also exclude grouping the stems of forms such as "(nous) allons" '(we) go', "(nous) irons" '(we) shall go'. Yet, one would want to relate these forms because of their role in the paradigm and therefore the notion of suppletive allomorphs has been advanced.

4 The Larousse dictionary (1961) gives as a definition of naïf: "Naturel, ingénu, sans artifice; qui retrace la vérité, la nature; inexpérimenté, crédule, sans finesse." One finds for natif: "se dit des personnes, en parlant du lieu où elles sont nées; Fig: Naturel; apporté en naissant." In both definitions one finds reference made to "naturel".

5 Inflection is productive; if a new verb is "coined" or otherwise brought into the language speakers will have no difficulty in conjugating it. The items may tend to be restricted to a particular morpheme class (e.g., in French new verbs are generally formed on the model of the first conjugation); but this is a separate matter and has nothing to do with the productivity of the person and tense system.

Furthermore, it is precisely the words that enter into a paradigmatic arrangement which are not individually listed (unless they exhibit "irregular" forms) in standard dictionaries. Thus, in French, verbs are cited in the infinitive, nouns in the singular, and adjectives in the masculine singular.

6 One could doubtlessly fabricate sufficiently intricate rules which would account for "anomalous" forms. However, such a procedure would be unmotivated since the purpose of rules should be to reflect generalizations observable in the language, to show the interconnections between the rules, and ultimately to reveal the simplicity of the total system.

Under such circumstances it is simpler to recognize "anomalous" forms as such and to note them in the lexicon, unless, of course, it can be shown that in actuality such forms do result from the "motivated" rules.

7 There are of course certain productive affixes in derivation (such as the agentive suffix "-eur" '-er'). Unlike the "inflected" words, all the "derived" forms generally have separate entries in standard dictionaries.

In all cases of derivation there must of course also be semantic evidence for establishing "related forms". As we have not carried out investigations in the realm of "semantics", we are unable to present semantic criteria for relatedness. Therefore, in the analysis we shall have to assume semantic relatedness as being given and accordingly we are forced to restrict ourselves exclusively to phonological considerations.

8 From a synchronic point of view the forms 6-12) of column 2 can be considered as "learned" words. Such "learned" forms will have to be noted in the lexicon. We shall show in Chapter II that it is possible to account for many of the observed phonological alternations only if one separates the "learned" vocabulary from the "non-learned", since the "learned" items often undergo sets of rules from which the "non-learned" items are exempt and vice versa. "Learned" forms are generally identifiable by their characteristic affixes.

By marking each form "learned" or "non-learned" one can predict the applicability or non-applicability of large blocks of rules. This is clearly a more desirable solution than the alternative of having to affix long lists of exceptions to the individual rules. Similarly, one would want to mark certain forms as "foreign" if they are loan words which do not follow the regular phonological rules.

Chapter II  
THE VOWEL SYSTEM

2.1. Oral Vowels

In most phonemic analyses of Standard French twelve oral vowels have been recognized:<sup>1</sup>

	front unrounded	front rounded	back rounded
high	i	y	u
high-mid	é	ø	ó
low-mid	è	œ	ò
low	à	(e)	â

The vowel /e/ (schwa), variously called "e muet", "e caduc", "e féminin", "e neutre", does not function like the other oral vowels. Within the word the latter set occurs in either tonic or pretonic position. /e/, on the other hand, never is found in tonic position and is the only vowel which may be post-tonic.<sup>2</sup> It may also appear in pretonic position, but may not be initial in the syllable. In terms of articulation, /e/ is probably somewhat more lax than the other vowels of French. Furthermore, it is the schwa vowel which always elides before other vowels and which can be deleted in certain other positions due to particular phonological conditions.



2.1.1. Stems exhibiting alternation

We want to be able to account for the vocalic alternations observable in morphologically related forms. Therefore, we must set up the underlying vowel system so that a set of alternating vowels will be derivable from a single underlying vowel. Furthermore, these underlying vowels must be chosen in such a way as to allow for the least complicated set of rules to make the proper conversions. Let us examine various occurrences of vocalic alternation.<sup>3</sup>

I. /a:/è/	clair faim aime populaire chantèrent	'clearness' 'famine' 'lover' 'popularity' '(we) should sing'	'clear' 'hunger' 'love (verb)' 'popular' '(they) sang'
II. /ɔ:/: /œ/	mortel volonté solitude floral horaire	'mortal' 'will' 'solitude' 'floral' 'time table'	'(they) die' '(they) want' 'alone' 'flower' 'hour'
III. /u:/: /œ/	ouvrage courage savoureux douloureux	'work' 'courage' 'tasty' 'sorrowful'	'work' 'heart' 'taste' 'sorrow'
IV. /é:/: /yè/	ciel bien piéd lièvre	'heavenly' 'bless' 'pedestrian' 'greyhound'	'sky, heaven' 'well' 'foot' 'hare'
V. /é:/: /wa/	créance espérance légal	'belief' 'hope (noun)' 'legal'	'believe' 'hope (verb)' 'law'

The forms cited in column 1 do not exhibit front rounded vowels. A simplification in the vowels will result if we eliminate all front rounded vowels from the underlying system. We shall attempt to derive the front rounded vowels of column 2 from the back rounded counterparts of column 1. Similarly, the diphthongs of column 2 will be derived from single vowels. We shall make a further simplification by eliminating schwa (/e/) (since it does not behave like the other vowels) and we shall replace the two a vowels (/â/ and /ã/) by a single central /a/.<sup>4</sup> The result is then a seven vowel system.

	front unrounded	central unrounded	back rounded
high	i		u
mid	é		ó
low	è	a	ò

We shall use the following four features to specify these vowels: diffuse, compact, grave, round. "High" vowels are diffuse; "low" vowels are compact; "mid" vowels are non-diffuse, non-compact. The feature grave will include both the "back" and "central" positions, which are opposed to "front" (non-grave). The feature round corresponds, of course, to the articulatory term "rounded".<sup>5</sup> The seven vowels, then, are composed of the following bundles of features:<sup>6</sup>

	i	é	è	a	ò	ó	u
diffuse	+	-	-	-	-	-	+
compact	-	-	+	+	+	-	-
grave	-	-	-	+	+	+	+
round	-	-	-	-	+	+	+

In the examples which we have cited, it is seen that one alternant occurs in tonic position (those in column 2), whereas the other alternant is found in pre-tonic position (column 1). Therefore, we shall tentatively establish stress as the conditioning environment (i.e., we shall need the feature stress), and shall attempt to derive the stressed vowel wherever possible from its unstressed counterpart.<sup>7</sup> In the first set of examples the alternation is /a/ (unstressed): /è/ (stressed). If we set up /a/ as the underlying vowel a comparison of the feature chart above shows that /a/ can be turned into /è/ by changing only one feature: namely, <+ grave> must become <- grave>:<sup>8</sup>

Rule 1.

+ stress + comp + grave - round	----->	<- grave>	(	<u>a</u>	>	/è/)
--	--------	-----------	---	----------	---	------

Thus given the two underlying forms:

klar      klar+té      (where + indicates morpheme boundary)

Rule 1 converts the a of the left form to /è/ since the vowel is under stress (the stressed vowel is underscored), yielding:

klèr      klar+té

If one looks at the second set of alternations (/ò/: /œ/) we note that /ò/ differs from /œ/ only in that /ò/ is back rounded (+ grave) whereas /œ/ is front rounded (- grave). Again we need only change the feature <+ grave>

to <- grave>.

Rule ii.

$$\left[ \begin{array}{l} + \text{ stress} \\ + \text{ comp} \\ + \text{ grave} \\ + \text{ round} \end{array} \right] \text{ -----} \rightarrow \text{ <- grave> } (\underline{\text{ò}} > / \underline{\text{œ}} /)$$

Rules i and ii are very similar for both change the gravity of an underlying vowel. It would be desirable to generalize both cases by a single rule. This can be done if one indicates all features which are common to both /a/ and /ò/ in rules i and ii; (i.e., /a/ and /ò/ only differ by the feature round; therefore, to generalize, we stipulate all features except rounding.) Rule iii replaces rules i and ii.

Rule iii.

$$\left[ \begin{array}{l} + \text{ stress} \\ + \text{ comp} \\ + \text{ grave} \end{array} \right] \text{ -----} \rightarrow \text{ <- grave> } \begin{array}{l} \text{(all stressed} \\ \text{low central and back} \\ \text{vowels are fronted)} \end{array}$$

One notes further that it is the feature <+ grave> which is changed. Additional simplification in the rule can be obtained if gravity is not indicated in the left half of the rule.

Rule iv.

$$\left[ \begin{array}{l} + \text{ stress} \\ + \text{ comp} \end{array} \right] \text{ -----} \rightarrow \text{ <- grave> } \begin{array}{l} \text{(all stressed} \\ \text{low vowels are fronted)} \end{array}$$

Which segments are represented by the features <+ stress, + comp>? These three features uniquely specify the segments è, a, ò. We have already established that if /a/ is made

<- grave> it becomes /è/; similarly, if /ò/ is made <- grave> it becomes /œ/. Since è is already <- grave> rule iv will apply vacuously to it. By allowing for vacuous application of rules, less features need to be stipulated and greater generality is obtained. Rule iv replaces rule iii.

The third set of examples illustrates the alternation /u/:/œ/. Although the stressed vowel of these examples is the same as the stressed vowel of set II, the unstressed vowel is different. Therefore, set III must have a different underlying representation from set II; otherwise the two forms would merge. Clearly we must derive /œ/ by fronting a back vowel. /ò/ has already been used (set II). If we were to select /u/ as the underlying vowel (since the unstressed vowel is /u/), it would be fronted to /u̟/, which of course is not the correct alternation; furthermore, it would also merge with another vowel of French. The only other vowel which can be considered is /ó/; yet /ó/ when fronted yields /u̟/ rather than /œ/. This minor difficulty is easily resolved, since /ó/ and /œ/ are often in complementary distribution. There will have to be a rule anyway in the grammar to account for this alternation.<sup>9</sup> Thus, rule iv can be made still more general and is replaced by rule v.

Rule v. Vowel fronting

<+ stress> -----> <- grave> (all stressed vowels are fronted)

However, /ó/ is not the vowel which appears in the forms of

column 1. We still need to change unstressed /ó/ to /u/ and this will require an additional rule:

Rule vi. Vowel raising

$\left[ \begin{array}{l} - \text{ comp} \\ + \text{ grave} \end{array} \right] \text{ -----} <+ \text{ diff}> (\acute{o} > /u/)$

We illustrate rules v and vi with the following derivation:

	"oeuvre"	"ouvrage"
underlying form	<u>ó</u> vr	<u>ó</u> vr+a <u>ž</u>
rule v	<u>ø</u> vr	---
rule vi	---	uvr+a <u>ž</u>
compl. distr.	<u>œ</u> vr	---

Rules v and vi have to appear in this order. Rule v makes ó <- grave>; rule vi fails for /ø/ since /ø/ is not <+ grave> (its gravity was changed by rule v). However, if rule vi (as it is here stated) were to apply first in the derivation, it would convert both stressed and unstressed ó to /u/.<sup>10</sup>

The alternations in IV and V are between /é/ and /yè/ on the one hand, and between /é/ and /wa/ on the other. Although the pre-tonic vowels of IV and V are identical, the stressed vowels are different. Accordingly, we shall require two different vowels in the underlying representations of IV and V. We have already established ó, ò, and a as underlying vowels. Therefore, pattern pressure as well as the phonetic manifestation of the pre-tonic vowels in IV and V indicates that the underlying vowels must be é and è, the non-diffuse, non-grave vowels. It is these front vowels which are diphthongized under stress. In pre-tonic position both

vowels merge to /é/. This merging will be discussed in the third section (note 16). As for the diphthongization, we shall convert é to /wa/ and è to /yè/. In our formalized rules we shall consider diphthongization to be the insertion of a glide before a vowel.

Rule vii. Diphthongization

Insert a glide before a stressed vowel which is <- diff, - grave>. The non-compact vowel (é) takes on a /w/ glide, whereas the compact vowel (è) takes on a /y/ glide.

According to the diphthongization rule a glide is inserted before a vowel; however, the quality of the vowel is in no way affected. Therefore, è will become yè and é will become wé.<sup>11</sup> This will require us to postulate a rule which further changes wé to /wa/.<sup>12</sup>

Rule viii. Wa-adjustment

$$\boxed{- \text{ comp} } \text{ -----} \rightarrow \boxed{ \begin{array}{l} + \text{ comp} \\ + \text{ grave} \end{array} } \text{ in the environment } \underline{\text{w}} \underline{\quad}$$

The diphthongization rule must precede the vowel fronting rule; otherwise, all the shifted vowels would diphthongize. Furthermore, the wa-adjustment rule must follow vowel fronting, otherwise the wé which becomes wa would be further shifted to wè.

We shall impose the following order on the rules which we have postulated so far.

1. diphthongization
2. vowel fronting
3. vowel raising
4. wa-adjustment
5. phonetic vowel adjustments



We have presented five sets of tonic and pre-tonic vowel alternations. The underlying vowel of each set is represented by a different non-diffuse vowel and it is this vowel which undergoes change under stress. At first glance the alternations within one set may have appeared to be quite unrelated to those of another set. Yet after a close investigation of the types of changes involved and consideration of the appropriate underlying vowels one begins to notice a general pattern emerging: The front vowels (i.e., <- grave>) develop glides; then all vowels are fronted--this applies vacuously to the front vowels. It is these two rules which are of primary interest in the vowel system. In addition, there are other minor vocalic adjustments which may be made.

2.1.2. Stems not exhibiting alternation

In the preceding section we showed that stress was the conditioning environment for certain vowel changes. Yet there are innumerable instances where vocalic change does not occur under stress.<sup>13</sup>

/a/	planer	plane
/ɔ̃/	coller	colle
/u/	prouver	prouve
/é/	espérer	espère

It is imperative that these vowels be differentiated from those which change or alternate. Therefore, all vowels will have to be marked as to whether or not they undergo change in tonic position. This means that an additional feature will be required within the vowel system. Since

ultimately, at the phonetic level, it will be necessary to state for all vowels whether they are tense or lax, we can make use of the tenseness feature at the more abstract level of representation in order to differentiate the vowels which undergo vowel alternation from those which do not. Then in the underlying representation all vowels will be marked either <+ tense> or <- tense>, with the imposed condition that only the lax vowels (i.e., <- tense>) undergo diphthongization and vowel fronting.<sup>14</sup>

We contrast the derivation of "clair" with that of "plane" (tense vowels are capitalized).

	klar	pl <u>A</u> n
fronting	kl <u>ɛ</u> r	---

How many tense vowels are needed in addition to the five lax vowels? We have already established the necessity for A ("plane"), ɔ ("colle"), U ("prouve"), and É ("espère"). So far we have said nothing about the high front unrounded and rounded vowels (i.e., /i/ and /ɥ/). Since these vowels do not shift under stress (e.g., "cite: citer", "dur: durable"), they must accordingly be tense in their underlying representations. The addition of I to the above cited set of vowels yields the following tense vowel pattern.

I	U
É	ɔ
A	

it remains to establish the underlying representation for /ɥ/. /ɥ/ is a high front rounded vowel. We have shown

that the other two front rounded vowels /ø/ and /œ/ are derived from the underlying back vowels ó and ò. This fact suggests the possibility of an underlying back vowel for /ʊ/. Such a solution would be attractive since it would entail a simplification in the dictionary entries; one could then predict the fronting of all vowels. The logical choice would be U for it would be this vowel which, if fronted, would yield /ʊ/. However, we have already tentatively assigned U to the vowel in "prouve". The only other tense back vowel which we have not yet incorporated into the system is ó. If we were to represent the output /ʊ/ as underlying ó, a special rule would be needed to convert ó to /ʊ/. This change involves both fronting and raising. Yet for the lax vowels only one or the other of these processes took place: ò and ó were fronted to /œ/ and /ø/ respectively, while pre-tonic ó was raised to /u/.

Since pre-tonic /u/ is derived from ó it would be of structural interest to entertain the possibility of also deriving tonic /u/ from ó, for then all /u/ would of course be similarly derived. If this notion is considered the vowel of "prouve" would be represented not as U, but rather as ó, and consequently the vowel U would then be available for the representation of "dur". Adopting this particular solution, the following regularities emerge: (1) all front rounded vowels are derived from the corresponding back vowels; (2) the mid back vowels (ó and ó) undergo raising.

(Additional motivation for this solution will be found elsewhere in the chapter where we discuss alternations of the type: "prouve:prouvons;preuve".)

The rules for vowel fronting and vowel raising will have to allow for these observations.

Rule for vowel fronting (revised)

$$\left\{ \begin{array}{l} <+ \text{ stress}> \\ <+ \text{ diff}> \end{array} \right\} \text{ -----} <- \text{ grave}>$$

The rule states that either a stressed or a diffuse (high) vowel becomes fronted (<- grave>). There are only two underlying diffuse vowels in the system: tense I and U. (There are no lax diffuse vowels.) The vowel fronting rule converts U in all positions to /ɥ/. Since I is already <- grave>, the rule applies vacuously to it.

The rule for vowel raising does not require revision since in the form in which it was previously stated it would convert Ó to /u/.

Rule for vowel raising

$$\left[ \begin{array}{l} - \text{ comp} \\ - \text{ grave} \end{array} \right] \text{ -----} \left[ + \text{ diff} \right]$$

It is imperative that the ordering of the two rules remains as before (i.e., vowel fronting, vowel raising), since U must be converted to /ɥ/ before Ó can be raised to /u/.<sup>15</sup>

We have established the necessity for six tense vowels.

I		U
E		Ó
	A	o

This asymmetric six vowel scheme leads one to suspect that there must be a tense E to fill out the pattern. We have already shown that tense E is the vowel which occurs in "espérons"; that is, E = /é/. Now, if E occurs in the underlying system, one would expect its phonetic manifestation to be also a vowel with e-quality. Within the verb system there are alternations of the type "menons:mène" /menõ/: /mèn/. In the phonetic output the tonic vowel of "mène" is the same as that of "espère". However, the pre-tonic forms "menons", "espérons" exhibit different vowels, which can only mean that their underlying representations cannot be the same. Accordingly, we shall postulate E as the underlying vowel in "menons:mène". We shall of course need a rule which converts E to /e/ in certain pre-tonic environments. We shall deal with this rule later in the chapter when we discuss the vowel schwa.

The tense vowels form a symmetric seven-vowel system. The lax vowels, on the other hand, comprise a five-vowel system, the diffuse (high) members being absent. It is the lax vowels which undergo diphthongization and vowel fronting in tonic position, whereas all vowels may undergo vowel raising (ó, ó > /u/) and other phonetic adjustments (for example, the effects of open vs. closed syllable). It must be emphasized that the tense and lax vowels do not form two separate systems, having nothing in common and functioning independently. In the following section we shall show the

relation between each lax vowel and the corresponding tense vowel of the same quality, thus providing additional evidence for the analysis presented here.

### 2.1.3. Additional vocalic alternations

The vocalic alternations which were cited at the beginning of this chapter represented a restricted body of data. We established, for example, that the lax vowel  $\text{ò}$  shifted under stress to  $/\text{œ}/$ , in order to account for alternations of the type: "volonté : veulent". However, within the verb conjugation  $/\text{œ}/$  also alternates with  $/\text{u}/$ : e.g., "veulent : voulons" or "mortel : meurent : mourons". The non-rounded vowels also exhibit a second set of alternations. In addition to  $\acute{\text{e}} > /wa/$  "espérance : espoir",  $\acute{\text{e}} > /e/$ ; (i.e., the alternation  $/wa/ : /e/$  "doivent ; devons", "reçoivent : recevons".) Similarly, whereas  $\grave{\text{e}} > /y\grave{\text{è}}/$  "bénir : bien", one also finds  $\grave{\text{e}} > /e/$  (i.e., the alternation  $/y\grave{\text{è}}/ : /e/$ , "viennent : venons", "tiennent : tenons".) Finally in addition to  $\text{a} > /è/$  "parlâtes : parlèrent",  $\text{a} > /e/$ , "parlerons".

It is seen that whenever the underlying lax vowel is non-round ( $\acute{\text{e}}$ ,  $\grave{\text{e}}$ ,  $\text{a}$ ), the vowel becomes a schwa in pre-tonic position; however, for the round vowel ( $\text{ò}$ ) the pre-tonic alternate is  $/\text{u}/$ .

#### Rule for pre-tonic adjustment

- Lax vowels in pre-tonic position become:
- a) diffuse (i.e.,  $/\text{u}/$ ) when the vowel is rounded
  - b)  $/e/$  (schwa) when the vowel is unrounded.

Do these examples force us to recognize a third set of vowels? We have tentatively set up two classes of vowels-- tense and lax--and we have said that only the lax vowels regularly undergo diphthongization and fronting when stressed. (It will be recalled that the tense vowels exhibited the same vowel in both tonic and pre-tonic positions.) The new set of alternations takes place in the verb conjugation (inflection); the examples cited earlier in the chapter illustrate alternations observable in derivation. Yet we should like to be able to account for both types of alternations and to relate all the forms.

As an example of these inflectional/derivational differences we cite the forms: "meurent : mourons : mortel". The underlying form is mɔr with a lax vowel. This vowel will front to /œ/ under stress ("meurent") and will become /u/ by the pre-tonic adjustment rule ("mourons"). These two rules will handle the inflected forms. Let us assume that in derivation the lax vowel becomes tense (i.e.,  $\delta > \delta$ ). If we permit the tensing to take place before  $\delta > /œ/$  (vowel fronting) and  $\delta > /u/$  (pre-tonic adjustment), then the vowel of "mortel" (a derivational form) will not undergo shift since it has become a tense vowel and we have already shown that the tense vowels are impervious to the tonic/pre-tonic alternations.<sup>16</sup>

Interestingly enough, there are also cases where underlying tense vowels become lax. This seems to occur with

certain stems and the corresponding nouns: "prouve" 'proves' : "preuve" 'proof'; "joue" 'play' : "jeu" 'game'; "sale" 'salts(verb)' : "sel" 'salt (noun)'; "espère" 'hopes (verb)' : "espoir" 'hope (noun)'. These forms must have tense vowels in their underlying representations since the vowels of the verb stem do not exhibit alternation in the paradigm nor are they ever front rounded or diphthongized. The laxing which occurs in the nouns is a peculiarity of the particular stem and the forms which undergo this laxing will need to be noted in the lexicon.<sup>17</sup>

We have set up two types of vowels: lax and tense. The lax vowels are fronted in tonic position; whenever they are pre-tonic they undergo the rule for pre-tonic adjustment (rounded > /u/, unrounded > /e/). Therefore, in the case of the lax vowels, from a single abstract representation two different phonetic forms result, depending on the location of the stress. The tense vowels, on the other hand, have the same phonetic manifestation in both tonic and pre-tonic positions. Therefore, from a single abstract representation only one phonetic form results. This does not mean, of course, that the tense vowels do not undergo vowel shift (we have already shown that ū > /ɥ/ and ô > /u/), but rather that whenever vowel shift occurs it takes place everywhere regardless of stress conditions. Yet, as we have shown, the tense and lax vowels do not function as two completely independent systems, for there are interesting interrelations between



the inflectional and the derivational forms. We shall therefore demonstrate these interconnections. We cite each tense vowel with the corresponding lax vowel in both tonic and pre-tonic positions, except for the high vowels which, according to the present analysis, occur only tense.

Tense vowel	Lax vowel - Tonic	Lax vowel - Pre-tonic
I = /i/		
<u>c</u> ite		
É = /é/	é > /wa/	é > /e/
esp <u>é</u> rer	espo <u>i</u> r	
cr <u>é</u> ence	cro <u>i</u> ent	
de <u>t</u> te	do <u>i</u> vent	de <u>v</u> ons
re <u>ç</u> eption	re <u>ç</u> oivent	re <u>ç</u> e <u>v</u> ons
È > /e/	è > /yè/	è > /e/
È > É > /é/		
re <u>l</u> evons	re <u>l</u> ief	
b <u>é</u> nir	bi <u>e</u> n	
av <u>è</u> nement	vi <u>e</u> nnent	ve <u>n</u> ons
	ti <u>e</u> nnent	te <u>n</u> ons
À = /a/	a > /è/	a > /e/
<u>m</u> arine	<u>m</u> er	
imi <u>t</u> ation	imi <u>t</u> èrent	imi <u>t</u> erons
ò = /ò/	ò > /œ/	ò > /u/
sol <u>i</u> tude	se <u>u</u> l	
vo <u>l</u> onté	ve <u>u</u> lent	vo <u>u</u> lons
co <u>l</u> oré	co <u>u</u> leur	co <u>u</u> leur
mo <u>t</u> ion	me <u>u</u> vent	mo <u>u</u> vons
ó > /u/	ó > /ø/	ó > /u/
jo <u>u</u> ent	je <u>u</u>	
pro <u>u</u> ve	pre <u>u</u> ve	
U > /u/		
du <u>r</u> e		

#### 2.1.4. Fronted vowels in pre-tonic position

According to our rules vowel fronting and diphthongization take place only under stress, so that diphthongs and fronted vowels should appear only in tonic position. Yet one finds fronted vowels and diphthongs in pre-tonic position: "pleurer" /ploere/ 'to cry', "aimer" /èmé/ 'to love', "nettoyer" /nètwayé/ 'to clean', etc. As the rules are presently formulated, we should derive the forms \*/pluré/ (like "mourir"), \*/emé/ and \*/nèteyé/ (all by pre-tonic adjustment).

These forms, which do not exhibit vocalic alternation in pre-tonic and tonic positions but show the "tonic" vowel throughout, are typical of the verbs of the first conjugation, the so-called "productive" conjugation of French.<sup>18</sup> Those verbs which do exhibit alternation in the stem vowel ("meurent : mourons", "doivent : devons", etc.) are not of the first conjugation but rather are the traditional "irregular" verbs, generally considered to be members of the third conjugation. However, there are certain verbs of the third conjugation which exhibit the "tonic" vowel throughout: "vois : voyons" 'see', "crois : croyons" 'believe'. Also one finds the "tonic" vowel in some derivational forms: "aimable" 'likeable', "fleurir" 'to flourish', "bleuâtre" 'bluish', "poilu" 'hairy' (alongside "pelu", the older form), etc.

When these various forms are included in the corpus,

the rules for diphthongization and vowel fronting can no longer be restricted to tonic position. In these rules it becomes necessary to do away with the feature <+ stress>, thus permitting diphthongization and vowel fronting to take place in all positions. Yet, we do not want forms such as "meurent : mourons" to have a fronted vowel everywhere. Therefore, the rule for pre-tonic adjustment will have to precede the rules for diphthongization and fronting. This ordering allows the pre-tonic forms to be changed first; then all lax vowels not in pre-tonic position subsequently will undergo diphthongization or fronting.<sup>19</sup> If the latter rules were to be applied first, then all lax vowels in all positions would be diphthongized or fronted. Since this is precisely what we do want to have happen for those forms which exhibit the "tonic" vowel throughout, it becomes evident that the rule for pre-tonic adjustment cannot be applied to these forms. All such forms must be considered as exceptions to the rule for pre-tonic adjustment.

Whether or not a particular morpheme is an exception to a rule is an idiosyncratic property of that morpheme. This fact (i.e., the particular rule to which the morpheme is an exception) has to be indicated in the lexicon. Therefore, those third conjugation and derivational forms which show diphthongized or fronted vowels in pre-tonic position will have to be marked as being exceptions to the pre-tonic adjustment rule (i.e., <- pre-tonic adjustment>).

For example, the stem am is marked <- pre-tonic adjustment> when it is combined with the suffix Abl (i.e., am+Abl). Accordingly, the lax vowel of am does not undergo pre-tonic adjustment but does undergo vowel fronting yielding: èm+Abl.<sup>20</sup>

When we consider first conjugation verbs of the type "aimer", etc., the dictionary marking is of a somewhat different nature. Since first conjugation verbs always show the same stem vowel in all positions (we disregard the minor phonetic adjustments due to open or closed syllable (e.g., "espérer : espère", "mener : mène")), it should not be necessary to mark the individual stems as being exceptions to the pre-tonic adjustment rule for if a stem is of the first conjugation one can predict that it will not show vocalic alternation in the paradigm. For these verbs, then, failure to undergo the pre-tonic adjustment rule is not a property of the individual stem but rather of the conjugation class to which the stem belongs. Here is an instance where morphological class membership plays a decisive role in determining phonological processes. (Other cases of this type will be found when we treat the verb conjugation (Chapter 4).) Since in the lexicon all verb stems must be marked for morpheme class membership or conjugation, e.g., plôr <1 conj>, we do not need to mark each form as an exception but rather may state the exception as applying to the whole class of forms.<sup>21</sup> Then the phonological rules can be prefaced with a list of such generalized exceptions: e.g.,

<l conj> -----> <- pre-tonic adjustment>

which is to be read: No first conjugation stems undergo the pre-tonic adjustment rule.

This rule may be viewed as a formalized means of stating the observation made for first conjugation verbs; namely, that they exhibit the same stem vowel throughout the paradigm. The above rule is similar to the redundancy rules for phonological segments, except here the whole morpheme is marked rather than a single segment.

2.2. The schwa vowel

We shall assign the following features to schwa /e/:

[ - tense  
+ comp  
+ grave  
- round ]

(I.e., it is similar to /a/ except for tenseness.)<sup>22</sup>

We have established that the source of pre-tonic schwa is either an unrounded vowel which results from the rule for pre-tonic adjustment or else it is derived from tense E. A rule is therefore needed to convert E to /e/.

Rule for pre-tonic schwa conversion

[ + tense  
+ comp  
- grave ] -----> [ - tense  
+ grave ] (E > /e/)

This rule must follow the rule for vowel fronting; otherwise, the E which becomes lax a (schwa) would be subsequently fronted to /è/.

In the phonetic output schwa is the only lax vowel.

All other vowels will have to be made phonetically tense. Vowels which are already tense in their underlying form will of course not need to have their tenseness changed. The underlying lax vowels, on the other hand, will have to be made tense, but this tensing must be done only after all the vowel shift rules have applied since many of the vocalic changes affect only the lax vowels.

It is to be recalled that after the diphthongization and fronting of lax vowels the following vowels (still lax) are obtained:

é	è	a	ò	ó
wé	yè	è	œ	ø

It is these non-grave (fronted) vowels which must be made tense.

Rule for phonetic vowel tensing

<- grave> -----> <+ tense>

This rule imposes the condition that a lax vowel must be non-grave in order for it to become tense. This requirement is essential so that schwa, which is <+ grave>, does not become tense. The rule for phonetic vowel tensing must be applied after the rules for vowel fronting and schwa conversion.

The other source of pre-tonic schwa resulted from the operation of the pre-tonic adjustment rule, which converts unrounded lax vowels to schwa (e.g., "venons", "devons", etc.). In the preceding section we showed that the rule for pre-

tonic adjustment must precede the rules for diphthongization and vowel fronting. Therefore, if the rule for pre-tonic adjustment converts unrounded lax vowels to schwa (equivalent to lax a), the subsequently applied vowel fronting rule would cause lax a (schwa) to shift to è. This particular difficulty can be obviated if the lax unrounded vowels are not directly turned into schwa but are first converted to tense Ē. Since there is already a rule (i.e., the rule for pre-tonic schwa conversion) which converts Ē to schwa, the correct final form will be obtained.<sup>23</sup>

In the final phonetic output schwa is the only vowel which may appear in post-tonic position. When we consider the stress rules, it will be shown that the vowels which ultimately become post-tonic schwa must be lax in their underlying form if, within the word, stress is to be assigned to the correct vowel. Therefore, we shall require a rule which converts any post-tonic (lax) vowel to schwa.<sup>24</sup>

Rule for post-tonic schwa conversion

< > ----->  $\begin{bmatrix} + \text{comp} \\ + \text{grave} \\ - \text{round} \end{bmatrix}$  in the env.  $\check{V}C_0$  (all vowels become /e/ when post-tonic)

So far in the analysis the following ordered rules are required:

1. Pre-tonic adjustment

- a)  $\begin{bmatrix} - \text{tense} \\ - \text{round} \end{bmatrix}$  ----->  $\begin{bmatrix} + \text{tense} \\ + \text{comp} \\ - \text{grave} \end{bmatrix}$  (é, è, a > Ē)
- b)  $\begin{bmatrix} - \text{tense} \\ + \text{round} \end{bmatrix}$  ----->  $\begin{bmatrix} + \text{tense} \\ - \text{comp} \end{bmatrix}$  (ó, ò > ò)

2. Diphthongization

- a)  $\emptyset$  -----> w in the env. \_\_\_ é (é > wé)
- b)  $\emptyset$  -----> y in the env. \_\_\_ è (è > yè)

3. Vowel fronting

{ <- tense> } -----> <- grave> (ó > ø, ò > œ, a > è,  
 { <+ diff> } U > œ)

4. Vowel raising

[ - comp ] -----> <+ diff> (ó > /u/)  
 [ + grave ]

5. Schwa conversion

< > -----> [ - tense ] in the env. { [ - stress ]  
 [ + comp ] [ + tense ]  
 [ + grave ] [ + comp ]  
 [ - round ] [ - grave ]  
 (pre-tonic È, all post-tonic vowels > /e/)  $\nabla c_p$  —

6. Phonetic vowel tensing

<- grave> -----> <+ tense> (front vowels become tense)

7. Wa-adjustment

<- comp> -----> [ + comp ] in the env. w\_\_\_  
 [ + grave ] (wé > wa)

2.3. Nasalized vowels

In French four nasalized vowels occur in the phonetic output: /ẽ/, /ã/, /õ/, /œ̃/. In addition to being nasalized we shall assume that these four vowels are all low (as indicated in the IPA transcription) and are differentiated from each other by the following features:



ẽ    ã    õ    œ

grave	-	+	+	-
round	-	-	+	+

That is, /ẽ/ is front unrounded, /ã/ is central, /õ/ is back rounded, and /œ/ is front rounded.<sup>25</sup>

Is nasalization an inherent feature of these vowels or is it predictable? The following examples show an oral vowel plus nasal consonant alternating with a nasalized vowel.

/i/ < I : /ẽ/

div <u>ine</u>		div <u>in</u>	'divine' (f, m)
f <u>ine</u>		f <u>in</u>	'fine' (f, m)

/é/ < Ê : /ẽ/

pl <u>én</u> itude	pl <u>ein</u> e	pl <u>ein</u>	'fullness'    'full'
effr <u>é</u> ner		fr <u>ein</u>	'to brake'    'brake'

/e/ or /é/ < È : /ã/

pr <u>en</u> ez	pr <u>en</u> nent	pr <u>en</u> d	'take' 2 pl, 3 pl, 3 sg)
s <u>é</u> n <u>ér</u> ique		s <u>en</u> re	'generic'    'kind'

/a/ < A : /ã/

pl <u>a</u> ne		pl <u>a</u> n	'even' (f, m)
art <u>is</u> ane		art <u>is</u> an	'artisan' (f, m)

/ò/ < ò : /õ/

bon <u>ne</u>		bon	'good' (f, m)
t <u>on</u> alité		t <u>on</u>	'tonality'    'tone'

/ũ/ < Ū : /œ/

un <u>e</u>		un	'a, one' (f, m)
br <u>un</u> e		br <u>un</u>	'brown' (f, m)

/wa/ < é : /wẽ/

so <u>ign</u> er		so <u>ign</u>	'to care for'    'care'
élo <u>ign</u> er		lo <u>ign</u>	'to move away'    'far'

/yè/ < è : /yě/

<u>vienn</u> ent	<u>vien</u> t	'come' (3 pl, 3 sg)
<u>mienne</u>	<u>mien</u>	'mine' (f, m)

/a/ < a : /ã/

<u>famine</u>	<u>fain</u>	'famine' 'hunger'
<u>humanité</u>	<u>humain</u>	'humanity' 'human'

/œ/ < ó : /œ̃/

<u>jeûne</u>	(à) <u>jeun</u>	'fast' 'fasting'
--------------	-----------------	------------------

From the above data we establish that oral vowel and nasal consonant alternates with nasalized vowel. If we set up the stem forms which appear in column 1 as basic, i.e., the underlying representation appears as vowel plus nasal consonant, we can obtain a nasalized vowel by the following rule:

Rule for Vowel nasalization

V -----> <+ nasal> in the environment  $\text{--- N} \begin{Bmatrix} \text{C} \\ \# \end{Bmatrix}$

This rule is to be read: A vowel (V) becomes nasalized whenever it is followed by a nasal consonant (N) which is before another consonant (C) or whenever it ends the word; i.e., before word boundary (#). A nasal consonant is subsequently deleted if the preceding vowel has been nasalized.

Rule for Nasal consonant deletion

N -----> ∅ in the environment  $\begin{Bmatrix} \text{V} \\ \text{+ nasal} \end{Bmatrix}$  ---

It must be noted that nasalization does not take place when the nasal consonant is followed by a vowel. Therefore, the forms cited in column 1 will always require a vowel after

the nasal consonant and words such as "fine", "brune", etc. must terminate in a lax vowel in their underlying forms.<sup>26</sup>

Once it has been demonstrated that nasalized vowels do not appear in the underlying representation but rather are derived from oral vowel plus nasal consonant, this assumption then holds for all nasalized vowels in the language, even where there are no pairs exhibiting alternation.<sup>27</sup> However, it is not sufficient simply to nasalize the vowel. The nasalized vowel must also be adjusted for vowel quality, since there are only four nasalized vowels as against twelve oral vowels; that is, one or more of the oral vowels when nasalized merge into the same nasalized vowel. One finds the following mergings:

1. /ẽ/ < ĩ, ě, ã, (w)ã, (y)ẽ
2. /ã/ < ã, ẽ (schwa)
3. /õ/ < õ
4. /œ/ < ũ, œ

We shall examine the above vowels in terms of underlying representations:

1. /ẽ/ < I, Ę, a, é, è
2. /ã/ < A, ɛ
3. /õ/ < ɔ
4. /œ/ < U, ó

Let us subject these underlying vowels to the vowel shift rules (i.e., diphthongization, vowel fronting, schwa conversion). (We shall permit nasalized Ě to become lax a

in all positions.)<sup>28</sup>

	1 > ē					2 > ā		3 > ǫ	4 > œ	
	I	É	a	é	è	A	Ē	ǫ	U	ó
diphthong	-	-	-	wé	yè	-	-	-	-	-
fronting	-	-	è	-	-	-	-	-	ɥ	ø
schwa conv.	-	-	-	-	-	-	a	-	-	-
	I	É	è	wé	yè	A	a	ǫ	ɥ	ø

For set I it is seen that as a result of the vowel shift rules, all vowels have become front unrounded. They must be converted into /ē/, a low (<+ comp>) front unrounded vowel. This conversion can be accomplished by the following simple merging rule.

Rule for nasal quality adjustment

$$\left[ \begin{array}{c} \text{V} \\ + \text{nasal} \end{array} \right] \text{-----} \rightarrow \left[ \begin{array}{c} - \text{diff} \\ + \text{comp} \end{array} \right]$$

Both the vowels of set 2 have become central. Since they are already low, the rule for nasal quality adjustment will apply vacuously to them, yielding /ā/. The same observation can be made for the unique back rounded vowel of set 3, which is /ǫ/. After application of the vowel shift rules the vowels of set 4 become front rounded. If these vowels are lowered the correct nasalized vowel is obtained, namely /œ/.

From these four nasal mergers we can establish the following principle: Nasal vowel quality must be adjusted after all the vowel shifts have taken place; then the resultant segment is made low (<+ comp>) if it is not already low.

The above very general rule accounts for the quality of

all nasalized vowels, once it is accepted that nasalized vowels are derived from underlying oral vowels. The rule for nasal quality adjustment can be stated in such generalized terms only because the various vowel shift rules also play a role in determining the final quality of nasalized vowels. However, the vowel shift rules were motivated independently of nasalization. The fact that these rules, which were originally set up to handle alternations observable in oral vowels, also account for the nasalized vowels can only lend support to the underlying vowel system which we have established. Some of the more questionable vowel shifts, e.g.,  $U > /d̃/$ ,  $\bar{E} > a$ ,  $\acute{e} > w\acute{e} > /wa/$ , are justified when one sees the effects on nasalized vowels. Without the vowel shifts as we have formulated them, the rule for nasal quality adjustment would be more intricate than a mere lowering of the vowel.<sup>29</sup>

Following are the ordered rules so far developed in the analysis. In the rule for pre-tonic adjustment we have added the necessary environment which will allow this rule to apply to nasalized vowels even in tonic position. Since all nasalized vowels (including nasalized schwa, e.g., "prenons , prend") must be made phonetically tense, the rule for phonetic vowel tensing will also have to include the nasal environment.

1. Vowel nasalization

$V \text{ -----} \rightarrow \langle + \text{ nasal} \rangle$  in the environment  $\text{--- } N \left\{ \begin{array}{c} C \\ \# \end{array} \right\}$

2. Pre-tonic adjustment

a)  $\begin{bmatrix} - \text{ tense} \\ - \text{ round} \end{bmatrix} \text{ -----} \rightarrow \begin{bmatrix} + \text{ tense} \\ + \text{ comp} \\ - \text{ grave} \end{bmatrix} \quad (\acute{e}, \grave{e}, a > \acute{E})$

b)  $\begin{bmatrix} - \text{ tense} \\ + \text{ round} \end{bmatrix} \text{ -----} \rightarrow \begin{bmatrix} + \text{ tense} \\ - \text{ comp} \end{bmatrix} \quad (\acute{o}, \grave{o} > \acute{O})$

3. Diphthongization

a)  $\emptyset \text{ -----} \rightarrow w$  in the env.  $\underline{\quad} \acute{e} \quad (\acute{e} > w\acute{e})$

b)  $\emptyset \text{ -----} \rightarrow y$  in the env.  $\underline{\quad} \grave{e} \quad (\grave{e} > y\grave{e})$

4. Vowel fronting

$\left\{ \begin{array}{l} <- \text{ tense} > \\ <+ \text{ diff} > \end{array} \right\} \text{ -----} \rightarrow <- \text{ grave} > \quad (\acute{o} > \ddot{o}, \grave{o} > \text{œ}, a > \acute{e}, \text{U} > \text{#})$

5. Vowel raising

$\begin{bmatrix} - \text{ comp} \\ + \text{ grave} \end{bmatrix} \text{ -----} \rightarrow <+ \text{ diff} > \quad (\acute{o} > /u/)$

6. Schwa conversion

$V \text{ -----} \rightarrow \begin{bmatrix} - \text{ tense} \\ - \text{ diff} \\ + \text{ comp} \\ + \text{ grave} \\ - \text{ round} \end{bmatrix}$  in the env.  $\left\{ \begin{array}{l} \check{V}C_0 \text{ ---} \\ \begin{bmatrix} + \text{ tense} \\ + \text{ comp} \\ - \text{ grave} \\ \text{---} \end{bmatrix}$  in the env.  $\left\{ \begin{array}{l} <- \text{ stress} > \\ <+ \text{ nasal} > \end{array} \right\}$  \end{array} \right\}

(post-tonic lax vowels, unstressed or nasalized  $\acute{E} > /e/$ )

7. Phonetic vowel tensing

$\left\{ \begin{array}{l} <- \text{ grave} > \\ <+ \text{ nasal} > \end{array} \right\} \text{ -----} \rightarrow <+ \text{ tense} > \quad (\text{front vowels and nasalized vowels are made tense})$

8. Nasal consonant deletion

$N \text{ -----} \rightarrow \emptyset$  in the env.  $\begin{bmatrix} V \\ + \text{ nasal} \end{bmatrix} \text{ ---}$

9. Nasal quality adjustment

$\begin{bmatrix} V \\ + \text{nasal} \end{bmatrix} \text{ -----} \rightarrow \begin{bmatrix} - \text{diff} \\ + \text{comp} \end{bmatrix}$  (nasalized vowels are made low)

10. Wa-adjustment

$\langle - \text{comp} \rangle \text{ -----} \rightarrow \begin{bmatrix} + \text{comp} \\ + \text{grave} \end{bmatrix}$  in the env. w \_\_\_\_  
(wé > wa)

The following chart shows the changes from the underlying vowels to their final forms. In the case of the oral vowels we have omitted pre-tonic vowel adjustment (rule 2). Also the rule for nasal consonant deletion is not included since it is not relevant for these isolated vowels. We assume that the nasalized vowels have already been made nasal by the rule for vowel nasalization (rule 1).

The Oral and Nasalized Vowels of French

- Rules: 3. Diphthongization      6. Schwa conversion  
 4. Vowel fronting            7. Phonetic vowel tensing  
 5. Vowel raising              9. Nasal quality adjustment  
 10. wa-adjustment

	<u>Oral Vowels</u>										<u>Nasalized Vowels</u>													
	I	É	E	-	-	-	A	ò	ó	u	é	è	a	ò	ó	ü	ë	ẽ	ã	õ	ø			
3.	-	-	-	-	-	-	-	-	-	-	wé	yè	-	-	-	-	wé	yè	-	-	-			
4.	-	-	-	-	-	-	-	-	-	ü	-	-	-	-	-	-	-	-	-	-	-			
5.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
6.	-	-	a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
7.	-	-	-	-	-	-	-	-	-	-	wÉ	yÈ	œ	ø	-	-	wÉ	yÈ	ẽ	õ	ø			
9.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	œ	wÈ	-	-	-			
10.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
	/ɪ/	/é/	/e/	/ə/	/a/	/ò/	/u/	/u/	/wa/	/yè/	/è/	/œ/	/ø/	/ø/	/e/	/ã/	/õ/	/õ/	/œ/	/wé/	/yè/	/ẽ/	/õ/	/ø/



2.4. Long vowels

2.4.1. The vowel /ó/

We have shown that underlying lax ó and ò are fronted to /ø/ and /œ/ respectively, whereas tense ó is raised to /u/; tense ò is the /ò/ of "col /kòl/ 'collar', "sotte" /sòt/ 'stupid (f)', "hotte" /òt/ 'hood', etc. What is the source of /ó/ in such words as "sot" /só/ 'stupid (m)', "chose" /šó:z/ 'thing', "saute" /só:t/ 'jump', "haute" /ó:t/ 'high (f)', etc.? (/ó/ is always long in a closed syllable. This lengthening will be dealt with in the next section.)

It is necessary to distinguish between those /ó/ which occur in final position and those which are found in a closed syllable. Phonetically, /ò/ never occurs finally and in all cases becomes /ó/. This is a phonetic adjustment rule and accounts for the alternation: "sotte" /sòt/ (closed syllable) : "sot" /só/ (open syllable), "idiote : idiot", etc. Therefore, forms such as "métro" 'subway', "auto" 'auto', "moto" 'motor scooter', etc. will have their final vowel represented as ò: mÉtrò, etc.

ò also becomes /ó/ before /z/: "chose" /šó:z/ 'thing', "pose" "pó:z/ 'pose', etc. This phenomenon is similarly a case of phonetic adjustment. We give the following rule:<sup>30</sup>

$\left[ \begin{array}{l} + \text{grave} \\ + \text{round} \end{array} \right] \text{ -----} \leftarrow \text{comp} \text{ in the env. } \text{ --- } \left\{ \begin{array}{l} \# \\ z \end{array} \right\}$

(/ò/ > /ó/ in final position (#) or before /z/.)

In order to handle those cases where there is an /ó/

before a consonant other than /z/, it will be necessary first to consider paradigmatic forms in which final /ó/ frequently alternates with /al/:

cheval /ševal/	chevaux /ševó/	'horse' (sg, pl)
journal	journaux	'newspaper' (sg, pl)
amical	amicaux	'friendly' (sg, pl)
cordial	cordiaux	'cordial' (sg, pl)
valent	vaut	'be worthy' (3 pl, 3 sg)
falloir	faut	'be necessary' (inf, 3 sg)

The first four forms of column 2 are plurals; the last two forms are third person singular verbs. Let us assume that the forms of column 2 are equivalent to the corresponding forms of column 1 (they end in Al) with the addition of the plural morpheme z or the third person singular morpheme t.<sup>31</sup>

Thus:        šÉvAl+z                    AmIkAl+z                    fAl+t

We shall then say that Al > /ó/ when followed by a consonant. (A later rule will drop the final consonant under particular conditions.) Such a rule becomes imperative if we are to relate these paradigmatic forms.

The /al/ : /ó/ alternation is also found among derivational forms: "altitude" 'altitude' : "haut" 'high', "falsifier" 'to falsify' : "fausse" 'false (f)', etc. Here, too, the forms exhibiting /ó/ can be represented as containing an underlying Al (e.g., Alt, fAls); the Al becomes /ó/ by the same rule which handles the inflected forms.<sup>32</sup> The rule which converts Al to /ó/ must of course occur after the vowel raising rule, which converts ó to /u/.

Suppose one wishes to relate such pairs as "côte" /kó:t/

'coast, rib', "costal" /kòstal/ 'costal' or "hôte" /ó:t/ 'host', "hospitalité" /òspitalité/ 'hospitality'. One could, for example, set up kòst as the underlying form and a rule would be needed which converts òs to /ó/ (except in learned derivation).<sup>33</sup> Is this representation justified and if one accepts both òs and Al as possible sources of /ó/, will "pôle" /pó:l/ 'pole' be represented as pAl or pòsl, "pauvre" /pó:vr/ 'poor' as pAlvr or pòsvr?

To answer this question, it will be instructive to note the behavior of /ó/ and /ò/ in pre-tonic position. Underlying ò shows up as phonetic /ò/: "joli" /žòli/ < žòli 'pretty', "photographe" /fòtògraf/ < fòtò+grAf 'photographer'. Words which have phonetic /ó/ before /z/ in tonic position generally have /ó/ also in pre-tonic position: "pose : poser" /pózé/, "rose : rosier" /rózyé/ 'rose bush'.<sup>34</sup> Those forms which clearly are derived from Al have /ó/ in pre-tonic position: "hauteur" /ótœr/ 'height', "faudra" /fódra/ 'will be necessary', "fausseté" /fósté/ 'falseness', etc. However, besides "côte" /kó:t/ 'hill', one finds "coteau" /kòtó/ 'hillside' with the open vowel; similarly, "pôle : polaire" /pó:l/ : /pòlèr/, "diplôme : diplomate" /diplóm/ : /diplòmát/, as well as "hôte : hôtel" /ó:t/ : /òtèl/.<sup>35</sup>

This leads us to postulate that whenever tonic /ó/ alternates with pre-tonic /ò/, the underlying representation is òs. Such a representation will also permit us to account for the possessive pronouns "nôtre, vôtre" /nó:tr/, /vó:tr/

(which are always tonic) in contrast to the possessive determiners "notre, votre" /nòtr/, /vòtr/ (which are always atonic).

The underlying source of /ó/, then, is (1) ò in final position or before /z/ if there is no /al/ or /òs/ alternation; (2) Al if there is an /al/ : /ó/ alternation or for pre-tonic /ó/; (3) òs if there is an /òs/ : /ó/ alternation or a pre-tonic /ò/ : tonic /ó/ alternation.

Additional motivation for deriving /ó/ from a vowel plus consonantal segment will be found in the next section where we shall discuss why /ó/ is always lengthened in a closed syllable.

#### 2.4.2. Vowel duration

Delattre (p. 15) gives the following rules for vowel duration:

1. Stressed vowels in a closed syllable are:

- a) short before /p, t, k, rp,<sup>rt,</sup>ark, kt/: "tape, rate, attaque, carpe, carte, arc, acte, vite, cirque, sec, certes, secte".
- b) long: i) before /r, z, <sup>ʒ</sup>, v/: "rare, rase, rire, grise, tige, rive, neige";
  - ii) /ó, ø, ã, õ, õe, ë/: before all consonants: "zone, neutre, pense, montre, humble, plainte".
- c) normal otherwise: "robe, sud, bague, tasse, riche, dame, fine, coule, feuille, gagne".

He goes on to say that although there are differences in length in unstressed vowels, these differences are less per-

ceptible and for all practical purposes one can consider all unstressed vowels as short.

It is seen that for all stressed vowels in a closed syllable the following consonant or consonants determine the duration of the vowel, except for those vowels in l.b.ii. which are inherently long. Let us for the moment exclude these "inherently" long vowels since they do not behave like the others. Then for the remaining cases we can consider the underlying vowel as being basically normal in length; it will then become either short or long depending on its phonetic environment. We shall need the following phonetic adjustment rule:<sup>37</sup>

Rule for vocalic duration

A stressed vowel in a closed syllable becomes:  
a) short if followed by (liquid) + voiceless stop;  
b) long if followed by voiced continuant.

Why should the nasalized vowels and /ó/ always be lengthened in a closed syllable? We showed that nasalized vowels do not occur in the underlying representation but are always derived from an oral vowel plus a nasal consonant; the vowel is nasalized and the nasal consonant is deleted. Similarly, /ó/ in a closed syllable (except before /z/) is derived from either Al or òs . The vowel is shifted to /ó/ and the following consonantal segment is deleted. What is common to both /ó/ and the nasalized vowels is the shift in vowel quality with deletion of the following segment. We propose then the following rule:

Rule for Vowel lengthening

Within the word, whenever a consonantal segment is deleted, the preceding vowel becomes lengthened.

This rule must follow the rule for vocalic duration; otherwise a long /ó:/, for example, would be shortened before a voiceless stop (e.g., "côte").

We shall also need a phonetic adjustment rule which makes vowels normal in length in final position (for those vowels which have become long or short by previous rules and which eventually occur as final).

Rule for final vowel length

A vowel in final position becomes normal in length.

In addition, there will have to be a vowel length rule for unstressed vowels.

Rule for unstressed vowel length

An unstressed vowel becomes short.

By the vowel lengthening rule all nasalized vowels and /ó/ are made long in a stressed closed syllable. In orthoepic French one finds other oral vowels which are long.

Minimal pairs such as the following are often cited:

/è/	/è:/		
faite	fête	'done'	'holiday'
bette	bête	'beet'	'animal'
mettre	maître	'to put'	'master'
/a/	/a:/		
patte	pâte	'paw'	'paste'
mal	mâle	'badly'	'male'
dame	âme	'lady'	'soul'
/œ/	/ø:/		
jeune	jeûne	'young'	'fast (noun)'

One would suspect that these long vowels are perhaps also due to the deletion of a consonant. For some of the forms this assumption is borne out: e.g., "béstial, bête" 'beastly, beast'; "festin, fête" 'feast, holiday'. If one wished to relate these forms, the underlying representations for column 2 would be: bÉst, fÉst; the long vowels would be produced as a result of the vowel lengthening rule.

It is of interest to note that an alternation of this type is found also in the verb conjugation: e.g., "connais-sent" /kònè:/ 'know' : "connaître" /kònè:tr/ 'to know'.

When we treat the verbs we shall show that the underlying base must be kònÉss , that the infinitive is kònÉstr .

The vowel lengthening rule of course will lengthen the stressed stem vowel and delete the following s .

This observation for vowel lengthening suggests the possibility of representing even words like "maître, mâle, âme, jeûne" (which are not paired with easily relatable forms) with an underlying consonant which becomes deleted and causes the preceding vowel to be lengthened.<sup>36</sup> We illustrate with several examples. (For these examples only we shall represent long vowels with two dots, normal vowels with one dot, and short vowels without any mark.)

	"sot"	"sotte"	"fête"	"maux"	"chose"
	sò.t	sò.t+e	fÈ.st+e	mA.l+z	šò:ze
1. Al > ól	---	---	---	mó.l+z	---
2. Vocalic duration	sòt	sòt+e	---	---	šò:ze
3. Vowel lengthening	---	---	fè:t+e	mó:+z	---
4. Final cons. del.	sò	---	---	mó:	---
5. Final schwa del.	---	sòt	fè:t	---	šò:z
6. Final vowel length	sò.	---	---	mó.	---
7. ò > ó	só.	---	---	---	šó:z
	só.	sòt	fè:t	mó.	šó:z

#### 2.5. Semi-vowels (glides)

In French there are three semi-vowels or glides: /y, w, #/. These glides correspond in point of articulation to the high vowels /i, u, ŷ/, so that /y/ is front unrounded, /w/ is back rounded, and /#/ is front rounded.

	/y/	/w/	/#/
grave	-	+	-
round	-	+	+

We have already shown that one source of /y/ and /w/ is the diphthongization of a lax front unrounded vowel. This accounted for the glide in such words as: "ciel, bien, pied, croire, espoir, loi", etc. It remains to determine the source of the glide before other vowels, e.g., "idiot, diab-  
le, viande, action; oui, ouest, Louis; suivre, lui, persuader", etc. Within the paradigm one finds many examples of the high vowel alternating with the corresponding glide.<sup>38</sup>



/i/ : /y/

"scie"	"scier"	/sɪ/	/syé/	'saw'	'to saw'
"étudie"	"étudier"	/étɥdi/	/étɥdyé/	'study'	'to study'

/u/ : /w/

"joue"	"jouer"	/ʒu/	/ʒwé/	'play'	'to play'
"loue"	"louer"	/lu/	/lwé/	'praise'	'to praise'

/ɥ/ : /ʔ/

"tue"	"tuer"	/tɥ/	/tʔé/	'kill'	'to kill'
"pue"	"puer"	/pɥ/	/pʔé/	'smell'	'to smell'

We shall therefore need a rule which states that whenever an unstressed diffuse (high) vowel is followed by another vowel the diffuse vowel becomes a glide. In distinctive feature theory a vowel is defined as being <- cons, + voc>, whereas a glide is <- cons, - voc>. (Consonants are <+ cons, - voc>; liquids are <+ cons, + voc>.) Vowels then differ from glides by the feature vocality.

Rule for glide formation

$$\left[ \begin{array}{l} - \text{ cons} \\ + \text{ voc} \\ - \text{ stress} \\ + \text{ diff} \end{array} \right] \text{ -----} \rightarrow \left[ \begin{array}{l} - \text{ voc} \\ - \text{ tense} \end{array} \right] \text{ in the env. } \underline{\quad} \left[ \begin{array}{l} - \text{ cons} \\ + \text{ voc} \end{array} \right]$$

This rule changes the feature <+ voc> of the underlying form to <- voc>, converting the vowel to a glide. (All glides are furthermore lax.) The glide formation rule must of course follow the rule which fronts U to /ɥ/ and raises Ó to /u/. The latter phenomenon presupposes that the underlying "glide" vowels must be tense, which they are unquestionably in the above paradigmatic forms.

We have suggested the possibility of representing all

glides as underlying vowels. If this solution is adopted the result is a considerable simplification in the underlying representations, for if glides are eliminated from the system only vowels remain to contrast with the consonants and the liquids (which are both <+ cons>). Therefore, vowels need be marked only for the feature <- cons> and the feature <+ voc> can be introduced by a redundancy rule which must occur before the glide formation rule.

Rule for vocalic redundancy

<- cons> -----> <+ voc>

In the above examples the high vowel which becomes a glide precedes the other vowel. There are also instances of post-vocalic glides. It is precisely examples of this type which are adduced for establishing "phonemic" contrast, at least between /i/ and /y/.

"oui"	"houille"	/w <u>i</u> /	/ <u>y</u> /	'yes'	'coal'
"pays"	"paye"	/p <u>e</u> i/	/p <u>e</u> y/	'country'	'pay (subj)'
"naïf"	"travail"	/n <u>a</u> if/	/v <u>a</u> y/	'naive'	'work'

The problem is, of course, that if the post-vocalic glide is also derived from a vowel, then, for example, "oui" and "houille" would be indistinguishable since both would be represented as ÓI (the Ó is raised to U).

From the above one can conclude either that i and y are distinct segments or that post-vocalic /y/ has a different origin from pre-vocalic /y/. There is no similar problem with the glides /w/ and /ʍ/, since they only occur pre-vocally and hence there is no difficulty in deriving them

from underlying vowels. The fact that all glides occur pre-vocalically but only /y/ is found post-vocalically leads one to suspect that its origin is quite different from that of its pre-vocalic confrere.

Since phonological alternation is of such prime importance in determining the underlying representation, to find paradigmatic alternations with post-vocalic /y/ would be of interest. One observes that /l/ alternates with /y/ in the subjunctive of certain verb forms.

"veulent"	"veuillent"	/vœ <u>l</u> /	/vœ <u>y</u> /	'want'
"valent"	"vailleent"	/v <u>al</u> /	/v <u>ay</u> /	'be worthy'
"falloir"	"faille"	/fal <u>war</u> /	/f <u>ay</u> /	'be necessary'
"aller"	"aille"	/al <u>é</u> /	/ <u>ay</u> /	'go'

The /l/ : /y/ alternation is also found in derivation:

"feuille, foliation" 'leaf, foliation', "fille, filial" 'daughter, filial', etc.

Furthermore, in certain nouns /ay/ becomes /ó/ in the plural.

"travail"	"travaux"	/trav <u>ay</u> /	/trav <u>ó</u> /	'work'
"vitrail"	"vitraux"	/vit <u>ray</u> /	/vit <u>ró</u> /	'window'
"bail"	"baux"	/b <u>ay</u> /	/b <u>ó</u> /	'lease'

The alternation /ay/ : /ó/ is reminiscent of /al : /ó/. The similarity of behavior between /l/ and /y/ when after /a/ and the fact that /l/ and /y/ alternate in certain verb forms and in derivation suggests that post-vocalic /y/ may be a type of l. (Let us call it l<sub>2</sub> for the moment to distinguish is from l<sub>1</sub>, regular l.) Then the rules which we have previously established will convert A to /ó/ before

either type l when the latter is followed by a consonant. The l are of course subsequently deleted by the vowel lengthening rule. Any l<sub>2</sub> which have not been subjected to the above rules will ultimately become /y/.

What kind of l is l<sub>2</sub>? l<sub>1</sub> is dental in articulation; l<sub>2</sub> of course must be kept distinct from the dental l. We know that l<sub>2</sub> will eventually become /y/ which is a palatal glide (high front semi-vowel). It is therefore desirable that l<sub>2</sub> should have as many of the features of /y/ as is possible yet still retain its l-like identity. This suggests then that l<sub>2</sub> is a palatal l ( $\tilde{l}$ ). If post-vocalic /y/ is derived from palatal l, do these palatal l occur in the underlying representation? The alternation which takes place between dental l and palatal l in certain subjunctive and in derivational forms leads us to go a step further and to derive the palatal l from the dental l. It remains to determine the environment which converts l to  $\tilde{l}$ .

When we consider the verbs we shall show that the mark of the subjunctive is the lax low front unrounded vowel  $\tilde{e}$ . When one examines the derivational forms "feuille, foliation", etc., the l is also followed by a front unrounded vowel ( $\tilde{i}$ ). Therefore, we shall tentatively say that  $l > \tilde{l}$  whenever it is inter-vocalic and followed by a front unrounded vowel which is lax. There will then be a rule which deletes a vowel whenever it is post-tonic and non-low (<- comp).<sup>39</sup>

Rule for post-tonic vowel deletion

$$\left[ \begin{array}{c} V \\ - \text{comp} \end{array} \right] \text{-----} \rightarrow \emptyset \text{ in the env. } \left[ \begin{array}{c} V \\ + \text{stress} \end{array} \right] C_0 \text{ --- } C_0^I$$

(When we consider the verb conjugation we shall show the significance of this rule.) The above rules must precede the rule for glide formation, which was developed earlier in this section.

We contrast the derivation of "feuille" with that of "foliation". "Feuille" has the following underlying representation:  $f\grave{o}l\tilde{i}a$ .<sup>40</sup> (1) Since the  $\underline{l}$  is followed by a lax front vowel it becomes palatalized:  $f\grave{o}l\tilde{i}a$ ; (2) post-tonic non-low vowels are deleted:  $f\grave{o}l\tilde{a}$ ; (3) vowel fronting:  $f\text{œ}l\tilde{a}$ ; (4)  $l\tilde{ } > y$  :  $f\text{œ}ya$ ; (5) final schwa deletion:  $/f\text{œ}y/$ .

The form "foliation"  $/f\text{b}lyasy\text{õ}/$  also has  $f\grave{o}l\tilde{i}a$  as one of its underlying morpheme constituents. However, when this morpheme is combined with the "learned" suffix ("-tion"), all the vowels become tense:  $f\text{ò}l\tilde{i}a+s\text{I}\text{ò}n$ . (See section 2.1.3.) Due to the tense vowels certain phonological processes will not take place. The  $\underline{l}$  will not be palatalized since the rule for palatalization requires that the following front vowel be lax. Similarly, vowel fronting will not take place, nor will vowel deletions since the stem vowels are no longer in post-tonic position. However, pre-vocalic  $\underline{l}$  will be converted to  $/y/$  by the rule for glide formation and, of course, nasalization will take place in the vowel of the suffix.

Having established that post-vocalic  $/y/$  is derived from

an intervocalic l before a front unrounded vowel, we shall represent "travail" as trAVAli, "houille" as ɔlia ("oui" will be ɔI), etc.

In summary, glides do not occur in the underlying morphemic representations. What appears as a pre-vocalic glide in the output has as its origin either a lax front vowel which diphthongizes or else a diffuse (high) vowel (I in the case of /y/, ɔ in the case of /w/, and U in the case of /W/) which is immediately before another vowel. (Within a morpheme the tenseness of the "glide" vowel is predictable.) Glide formation takes place after the rules for vowel fronting and vowel raising. Post-vocalic /y/ results from an underlying l which is followed by a lax front vowel. The l is palatalized (l̃) and then changed to /y/. The following vowel--if it is non-low (<- comp>)--is deleted.

We conclude this section with the derivations of the following forms:

	"animal"	"travail"	"animaux"	"travaux"
	AnIm <u>Al</u>	trAV <u>Al</u> i	AnIm <u>Al</u> +z	trAV <u>Al</u> i+z
1. l > l̃	---	trAV <u>Al̃</u> i	---	trAV <u>Al̃</u> i+z
2. post-tonic deletion	---	trAV <u>Al̃</u>	---	trAV <u>Al̃</u> +z
3. A{ <u>l̃</u> } C > ó C	---	---	AnIm <u>ó</u> +z	trAV <u>ó</u> +z
4. l̃ > y	---	trAV <u>Ay</u>	---	---
5. del. of final C	---	---	AnIm <u>ó</u>	trAV <u>ó</u>
	/anim <u>al</u> /	/trav <u>áy</u> /	/anim <u>ó</u> /	/trav <u>ó</u> /

## 2.6. Stress

For French it is usually stated that within the word stress is predictable, being placed in all cases on the last pronounced vowel, e.g., "petit" /peti/, "petite" /petit/, "profond" /prɔ̃fɔ̃/ɔ̃/, "profonde" /prɔ̃fɔ̃d/, etc.<sup>41</sup> This observation is valid only for the type of French where final schwas are not pronounced and only if the rule is formulated in terms of the final output.

If one considers those dialects or styles in which final schwas are pronounced a different rule is required: Within the word stress is placed on the final vowel; however, if the final vowel is schwa, the stress is placed on the penultimate: "petit" /peti/, "petite" /petite/, "profond" /prɔ̃fɔ̃ɔ̃/, "profonde" /prɔ̃fɔ̃de/. In order to account for both styles it would probably be simpler to postulate the forms with final schwa. (and the corresponding stress rule) as being basic. To obtain the forms without final schwa one would simply need to delete the post-tonic vowel.

The stress rule which allows for post-tonic schwas is still based on a possible output (i.e., final form). In our analysis we have been representing morphemes in a more "abstract" manner, the output being the result of the rules which the forms undergo. If stress placement were a late phonological phenomenon we could of course state the rule as given above, since toward the end of the rules the forms would be quite close to the final output. However, it has

been shown that many of the phonological changes are closely linked to pre-tonic, tonic, or post-tonic position. Therefore, stress placement must be a relatively high-ordered phonological rule.

We would represent the four words cited above as: #pÈtIt# , #pÈtIt+a# , #pròfònd# , #pròfònd+a# , (where + represents morpheme boundary and # word boundary). Since the lax a in the above forms is equivalent to schwa, the forms will be correctly stressed according to the rule.

The representation for "travail" is #trAVAli# with a post-tonic vowel which is not a. (The lax i palatalizes the i and is deleted.) Perhaps then any lax vowel in the final syllable causes the stress to be placed on the penultimate vowel. However, the word "fille" has as its underlying form: #fIlIa# ; the stress must be placed on the tense I; yet, according to the rule as stated above, the lax i would get stressed. Comparing #fIlIa# with "pÈtIt+a#" suggests that stress should be placed on the last tense vowel. This observation is essentially correct. Yet there are words with no underlying tense vowels, e.g., "fleur" #flòr# , "vaine" #van+a# , "feuille" #fòlia# . In such cases the left-most vowel is stressed. Therefore, we need a rule which reads: Place stress on the right-most tense vowel; if there is no tense vowel place stress on the left-most (lax) vowel; or equivalently: Place stress on the first vowel in a sequence such that no tense vowel follows.



Rule for stress

V -----> <+ stress> in the env.  $\text{--- } C_0 \left( \begin{array}{c} V \\ - \text{ tense} \end{array} \right) C_0)_0 \#$

Several conventions have been adopted: "V" signifies a true vowel; i.e., a segment which is <- cons, + voc>; "C" includes all non-vowels; i.e., true consonants, liquids, and glides. The subscript  $_0$  means zero or more of the subscripted entities; thus,  $C_0$  is equivalent to C, CC, CCC, etc. or no segment; similarly  $\left( \begin{array}{c} V \\ - \text{ tense} \end{array} \right) C_0)_0$  is equivalent to the syllables  $\left[ \begin{array}{c} V \\ - \text{ tense} \end{array} \right] C_0$ ,  $\left[ \begin{array}{c} V \\ - \text{ tense} \end{array} \right] C_0 \left[ \begin{array}{c} V \\ - \text{ tense} \end{array} \right] C_0$ , etc., or no syllable. The rule is valid both for segments of the same morpheme and between segments of different morphemes (i.e., the juncture + may or may not be present). Furthermore, the longest possible environment is to be tried first (i.e., one includes in the environment the maximum number of lax vowels).<sup>42</sup>

According to the stress rule final underlying lax vowels cannot be stressed. Yet the following forms which all show diphthongization or vowel fronting must have had an underlying stressed vowel which was lax.

"chanteur"	/šātœr/	'singer'
"pâtissier"	/patisyé/	'baker'
"Danoise"	/danwaz/	'Dane (fem)'
"devient"	/devyẽ/	'becomes'

These forms are all composed of more than one morpheme and are derivational in nature. In the first three examples the derivational suffix bears the stress. However, in a

form such as "petite" the inflectional suffix, "e féminin", would never be stressed. Therefore we shall make a formal distinction between inflectional and derivational affixes. This difference will be indicated by the type of juncture by which the affix is separated from neighboring constituents. Inflectional suffixes will be separated from other elements by a + juncture while the derivational affixes will be separated from the other constituents by a different juncture = . The above words are then represented as follows:

#sAnt=òr#  
#pAtIs=èr#  
#dAn=éZ+a#  
#dE=vèn+t#

The stress rule considers the longest environment working back from the final # . The environment includes contiguous segments as well as segments separated by + juncture. The environment does not include other junctures. Therefore in the above examples the environment can extend only from the final # to the left as far as the = ; the appropriate vowel will accordingly be stressed.<sup>43</sup>

We have shown that in the underlying representation the placement of stress is correlated with the tenseness feature of vowels, provided that a formal distinction is made between inflectional and derivational affixes. This distinction is signaled by the type of juncture accompanying the affix. Stress is placed on the first vowel in a sequence such that no tense vowel or juncture other than + follows.

2.7. Summary

In the morphemic (abstract phonologic) representation we have employed a seven vowel system. Each of the seven vowels may be tense or lax, which is equivalent to recognizing a total of fourteen distinctive vowel segments. The feature tenseness is not simply an arbitrary marker for distinguishing two types of vowels. We have chosen this particular feature--and not some other one--since ultimately at the phonetic level we will have to state whether the vowels are tense or lax. In many cases the underlying specification of tenseness corresponds to that of the output. Thus, underlying post-tonic lax vowels become lax schwa if they are not deleted; similarly, tonic or pre-tonic tense vowels remain tense. However, the underlying tense vowel E and the lax vowels in tonic or pre-tonic position may change their tenseness at the phonetic level.

The lax vowels undergo diphthongization and vowel fronting; the tense vowels tend to be somewhat more stable although certain ones do undergo particular vowel shifts. That the lax rather than the tense vowels must undergo diphthongization and fronting can be verified by examining "learned" words, which do not usually exhibit diphthongization or vowel fronting. However, such words are often polysyllabic and hence must have tense vowels in their non-initial syllables if stress is to be assigned correctly.

Pairs of corresponding tense and lax vowels account for

a great deal of the phonological alternations observable in related forms. There are many stems exhibiting underlying lax vowels. The lax vowels of these stems become tense whenever the stem is combined with certain ("learned") derivational affixes. Once the vowels have become tense they will not undergo the various rules which affect only lax vowels. This phenomenon compels us to make a formal distinction between "learned" and "non-learned" derivational affixes. In addition, we have found instances of underlying tense vowels which become lax, particularly in the case of verb stems functioning as nouns.

The schwa vowel does not occur in the underlying representation but is in all cases derived from other vowels, its origin depending on its position relative to the tonic syllable. Pre-tonic schwa results from an unrounded vowel subjected to pre-tonic vowel adjustment or it has its inception in tense  $\bar{E}$ . Post-tonic schwa, on the other hand, is always derived from an underlying lax vowel.

By means of paradigmatic evidence we have shown that nasalized vowels are not found in the underlying representations, but rather are derived from an oral vowel followed by a nasal consonant, the latter being either in word final position or followed in turn by another consonant. The quality of the nasalized vowel results from a rule which makes all nasalized vowels low. This relatively uncomplicated rule is attributed to the fact that the nasalized vowels first

undergo all of the previously established rules for vowel shift. The "inherent" length of nasalized vowels when in a stressed closed syllable is due to the deletion of the nasal consonant. In an analogous manner we have established that the "inherent" non-nasalized long and so-called "phonemic" long vowels of French also are due to consonant deletion. This fact coupled with observed paradigm alternations led us to derive /ɔ̃/ from an underlying Al or Os , at least for those instances where /ɔ̃/ did not come from o .

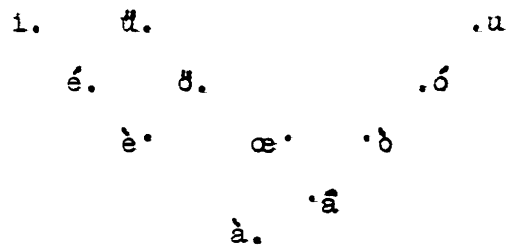
We have been able to eliminate semi-vowels or glides from the underlying representation. This permits one to mark vowels only for the feature <- cons>, this feature alone serving to differentiate vowels from true consonants and liquids, the latter being marked <+ cons>. The fact that vowels are also <+ voc> is then completely predictable. Pre-vocalic glides are derived from diffuse (high) vowels, whereas the unique post-vocalic glide /y/ results from palatalization of an underlying intervocalic l; this palatalization is induced by a following lax front vowel.

Since many of the vocalic changes are conditioned by the relation of a particular vowel to the tonic syllable, stress must be assigned to one of the vowel segments. The location of the stress depends on the tenseness feature of the underlying vowels as well as on the presence or absence of various junctures, so that stress is placed on the first vowel in a sequence such that no tense vowel or juncture other than + follows.

NOTES

1 See the introduction for the equivalent IPA symbols. This twelve vowel system is for orthoepic French and is the system used in most standard dictionaries to indicate the pronunciation of words. However, for many speakers /é/ and /è/ are in complementary distribution with /é/ occurring in an open syllable and /è/ in a closed syllable. Similarly for /ø/ and /œ/; however, /ø/ also occurs before /z/. /ó/ rather than /ò/ similarly occurs before /z/ and /ò/ always becomes /ó/ in final position. There is also considerable fluctuation between /à/ and /â/.

The symmetric twelve vowel system shown at the beginning of this chapter is the one set up by Hall, 1948. We have put the schwa in parentheses, since its place of articulation is not so low as he indicates but rather varies between that for /œ/ and /ø/, (See note 22) and its erratic behavior places it somewhat apart from the other vowels. It appears that Hall is desirous of presenting a symmetrical pattern. Delattre gives the following vowel triangle:



"Le schéma figuratif ... donne une idée combinée de l'ouverture et de l'antériorité des voyelles orales: (L'ouverture

se lit dans le sens vertical et l'antériorité dans le sens horizontal.) Comme nous ne considérons ici que les positions de la langue--dont l'antériorité est sensiblement la même pour /ɥ/ que pour /i/, pour /ø/ que pour /é/, pour /œ/ que pour /è/--il faut supposer que les lignes ɥ-ø-œ et i-é-è sont superposées sur le schéma." (Delattre, p. 13.)

2 It is often cited that there is one exception to the observation that schwa does not appear as the stressed vowel of a word, namely in imperatives of the type: "Dites-le" 'Say so', where the schwa of "le" bears stress. However, we shall show in Chapter III that this case is not an instance of stress within the word (which we are discussing here) but rather is due to the position of "le" within the phrase.

3 We have restricted the body of data. To be sure other alternations occur which we have not cited here. We shall consider some of these later in the chapter. This initial small set suffices to delimit the problem. For the present we ignore the nasal "coloring" on some of the vowels. For additional examples of alternations, see Nyrop, Vol. II, pp. 18-24.

4 "Le timbre de l'a est moins fixe que celui des autres voyelles fermes. <C'est pour l'a que les divergences individuelles de prononciation ou les flottements sont les plus fréquents>, dit M. Grammont (1934). Dans ces conditions,

toute classification des a en plusieurs timbres distincts est vouée à ne concorder qu'avec la prononciation de bien peu de gens. Il est préférable de considérer toutes ces variations comme les nuances acceptables d'une seule couleur, celle d'un a bien central. Cet a est acceptable dans tous les mots." (Delattre, p. 22.)

5 For representing phonological segments in terms of binary features, see Jakobson, Fant, Halle, 1951; Jakobson and Halle, 1956; Halle, 1957, 1959, 1962. For a representation in distinctive features of the twelve-vowel system of French, see Jakobson and Lotz, 1962.

6 One can eliminate redundant features:

	i	é	è	a	ò	ó	u
diffuse	+	-				-	+
compact	-	-	+	+	+	-	-
grave			-	+			
round	-	-	-	-	+	+	+

The redundant features are then introduced by the following rules:

```

<+ comp> -----> <- diff>
<+ round> -----> <+ grave>
[- round] -----> <- grave>
[- comp]

```

One could alternatively mark all vowels for gravity and then predict the roundness feature from the gravity. One could also predict <- comp> if everything is marked for diffuseness; however the latter possibility would entail stipulating 21



features in the above matrix instead of 20. We have chosen the above specification since (as we shall show) French alternations center around the opposition round : unround. Furthermore, we have reason to believe that the redundancy rules based on roundness follow morphophonemic rules which change vowel rounding. However, the redundancy rules would precede the rules for vowel change which are expounded in this chapter.

7 One could legitimately ask why the forms in column 1 are taken as being basic. Could one not consider the stressed vowels as the underlying ones and derive the unstressed vowels from them? Actually there is no a priori reason for preferring either set of forms as basic, since a more "abstract" representation is indeed required in many cases. We start with the pre-tonic forms for convenience of presentation and because it happens that the pre-tonic are in a sense closer to the underlying representation. However, the rationale behind this choice can be fully appreciated only when the entire vowel system is exposed and the details of vowel fronting, schwa formation, vowel nasalization, and stress placement have been set forth.

3 In Rule 1 it is unnecessary to state that a is <- diff> since one knows that if it is <+ comp> it must of necessity be <- diff> (see redundancy rules, note 6). One need only indicate the minimum subset of features which is sufficient

to distinguish that vowel from the other vowels of the system. Unless stated otherwise it will be assumed that all rules developed in this chapter apply only to segments which are vowels.

9 As we stated in note 1, /ø/ occurs in an open syllable and in a closed syllable before /z/; /œ/ is found in closed syllables but not before /z/. However, in orthoepic French there are a few contrasts between /ø/ and /œ/ in a closed stressed syllable, e.g., "jeûne" /ʒø:n/ 'fast (noun)' vs. "jeune" /ʒœn/ 'young'. We shall discuss these in the section on vowel duration.

10 As this example shows it is imperative that certain rules be ordered. Without ordering, the rules would become more complex (one would have to place additional restrictions on environments). This can be demonstrated by attempting to restate the five rules given at the end of this section so that they can be applied in any random order.

In the derivation the a of "ouvrage" should become /è/ by Rule v. This difficulty arises because Rule v is not yet stated in its final form. This problem will be resolved in the next section.

11 It appears that one would need two different rules to account for diphthongization: one rule for è > yè, the other for é > wa. To show the parallelism (i.e., glide insertion)

of the two forms, we have stated the glide formation rule in such a way that the particular glide results from the compactness feature of the stressed vowel. To express generalities of this type in terms of distinctive features requires a special notation (the alpha-rule) which will be developed in the next chapter; there this rule and similar ones will be restated using features. The justification for why  $\acute{e} > w\acute{e}$  ,  $\grave{e} > y\grave{e}$  , rather than the opposite situation, will be found elsewhere in this chapter when we discuss families of related words and will be dealt with again in Chapter IV when we consider the verbs. The choice is by no means arbitrary.

12 This rule is to be read: A vowel which is <- comp> (i.e.,  $\acute{e}$ ) becomes <+ comp, + grave> (i.e., /a/) when preceded by the glide /w/. Although  $\underline{u}$ ,  $\underline{o}$ , and  $\underline{i}$  are also <- comp> they would not occur in the environment after  $\underline{w}$  when this rule applies. This rule could be eliminated if there were two separate diphthongization rules:  $\grave{e} > y\grave{e}$  and  $\acute{e} > wa$  (without the intermediate  $w\acute{e}$  as is presently stated). However, the  $\acute{e} > w\acute{e} > wa$  stages not only allow one to generalize the diphthongization rule (see note 11) but become imperative when we consider nasalized vowels where the nasalized counterpart of /wa/ is /wẽ/.

13 The / $\acute{e}$ / : / $\grave{e}$ / alternation which one finds in "espérer : espère" is predictable and is to be handled by a phonetic

adjustment rule, i.e.,  $\acute{e} > \grave{e}$  in a closed syllable.

14 That the lax vowels, rather than the tense ones, undergo vowel change will be justified toward the end of this chapter when we consider the role of stress within the word. There we shall show that in polysyllabic words the stress is placed on the last vowel, and it is precisely these vowels which do not exhibit vocalic alternation. Furthermore, post-tonic schwa (schwa is phonetically lax) is in all cases derived from a lax vowel, so that in this instance there is a direct relation between the laxness of the underlying vowel and that of the final phonetic output. Of course, it is not the case that all underlying lax vowels are lax in their final form. Only those which become schwa remain lax; the vowels which undergo diphthongization or fronting must become tense. Therefore, we shall require a phonetic adjustment rule which renders all vowels (except schwa) as tense. (See rule 26, Appendix A.) When we consider the verbs (Chapter IV) we shall find additional evidence in the verb conjugation to substantiate the claim that only the lax vowels diphthongize and are fronted. James Foley ("Spanish Morphology", M.I.T. doctoral thesis, 1965) has shown that in Spanish it is also the underlying lax vowels which diphthongize.

15 Historically,  $\# < u$  and  $u < \acute{o}$ . Similarly, when stressed in a weak syllable the non-high back rounded vowels

became front (*ô* had an intermediate diphthongization) and *a* > *è* ; under the same conditions the non-high front unrounded vowels were diphthongized. That similar rules should exist in a synchronic description of Modern French is not too surprising, since the historical changes are responsible for many of the alternations (apophony) observable in the present-day language.

16 In derivation both lax *é* and *è* of the stem vowel become tense *É* (e.g., "croire : créance, bien : bénir"). If *è* simply became *È*, it would ultimately become /e/. This phenomenon is characteristic of learned words where the vowels of the stem rarely exhibit schwa but are represented as /*é*/.

What we have been saying about vowels becoming tense in derivation and remaining lax in inflection are general tendencies. To be sure the situation is not so simplified. One finds, for example, the pair "main" 'hand' (with a fronted vowel) and "manuel" 'manual' with a tense (unshifted) vowel in accordance with the rule. Yet there also occurs the form "menotte" 'handcuff', which, although it is a derived form, must have retained the lax vowel and undergone the pre-tonic adjustment rule which converts the lax vowel to /e/. Similarly, "chien" 'dog', but "chenet" 'dog house'. This seems to suggest that for derivational forms it may be necessary to state for each stem whether in a given environment it becomes tense or remains lax. Such a procedure

would be quite cumbersome. Yet we know that in learned words (i.e., "manuel, floral, volonté", etc.) vowel tensing is generally the rule. Since learned words often contain characteristic affixes, instead of marking stems for vowel tensing, one could mark the affixes. Then if a marked affix is present in a word, the vowels of the stem to which the affix is attached will become tense. This is a desirable solution since it would not only be more economical to mark affixes than stems (there are presumably less of the former), but even more important, the grammar would show that the output form of the stem vowels in derivation is partly a result of the particular affix with which the stem is combined, so that all words containing the same affix should show the same phonological tendencies in their stem constituents.

It might even be possible not to have to mark the affixes. Within the grammar there will have to be rules which concatenate the appropriate stems and affixes. These same rules might also predict whether the stem vowels of the concatenated stem should be tense or lax.

17 It is these alternations which substantiate the forms with an underlying ó. The verb forms "joue : jouer" do not exhibit vocalic alternation and therefore must have an underlying stem vowel which is tense. We assigned the vowel ó which was then raised to /u/. When this stem is a noun its vowel becomes lax (i.e., ó > ó). The lax vowel is then

fronted to /ø/ "jeu". Similarly, one finds "sale : saler" with A = /a/, but in the noun, A > a > è "sel", or "espère : espérer" with É = /é/, but "espoir", where É > é > wé > /wa/. Likewise, È > /e/ in "relève : relever" 'raise, relieve', but in the noun È > è > /yè/: "relief" 'relief'. The verb forms "pèse : peser" 'weigh' show the same vowel (È) as "relève : relever". However, the noun form is "poids" 'weight' and not \*/pyè/ as would be expected. The form "poids" suggests that the vowel of the verb should be É. However, this would give \*"pésons". We have no explanation other than to say that these forms are an exception to the general tendencies which we have been noting. That there may be exceptions or that there are exceptions to rules should not be too surprising. In the present case we should have to list the alternate forms in the lexicon (similar to suppletive allomorphs). To find exceptions to a rule is not of much interest, unless one can show that there is a more inclusive (and more general) rule where there would be no exception.

18 In Middle French alternations took place in first conjugation verbs, e.g., "je treuve : nous trouvons" 'find'; "je pleure : nous plourons" 'cry'. (Pope, p. 351.) In Modern French the first conjugation has been regularized. Some verbs have generalized the pre-tonic form (e.g., "je trouve : nous trouvons"), others the tonic form (e.g., "je

pleure : nous pleurons"). We have represented the first type with an underlying tense vowel.

19 The pre-tonic adjustment rule will have to be slightly revised. As the rule is presently stated the lax rounded vowels become /u/; however, /u/ would be subsequently shifted to /ʉ/ by the fronting rule since diffuse (high) vowels are always fronted. This situation can be remedied if we allow the pre-tonic adjustment rule to convert the lax rounded vowels to tense ó. Since ó is neither lax nor diffuse it will not become fronted. The vowel raising rule will then convert ó to /u/. A similar revision will need to be made for the conversion of pre-tonic lax unrounded vowels to schwa. This revision is dealt with in the following section.

20 Just as vowel tensing (e.g., "fleur : floral") can probably be accounted for by the type (i.e., morpheme class) of affix with which the stem may be combined, it might equally be the case that those stems which do not undergo the pre-tonic adjustment rule in derivation could also be recognized by their particular affixes. As we have primarily been concerned with inflection, we have not undertaken any detailed investigation in the realm of derivation and cannot offer any definite solution to this question at this point.

21 We use the traditional designations: 1st conjugation, 2nd conjugation, etc. Information as to morpheme class membership will be needed for determining the thematic vowels



which occur with a given verb stem (Chapter IV).

22 The features which have been assigned to schwa phonetically depict it as a neutral vowel (i.e., central unrounded). In the literature can be found diverse views as to the exact phonetic nature of this vowel. Armstrong describes it as similar to the final vowel of English sofa but with lip rounding. Delattre, Fouché, and Grammont consider "e caduc" to be part of the front rounded series. Bruneau and Martignon, on the other hand, are of the opinion that it is a neutral vowel. An interesting discussion concerning these two points of view can be found in Martinet, pp. 63-66, (although Martinet does not commit himself to either position). Since we are not concentrating on fine phonetic details, the exact phonetic manifestation of schwa is not crucial for the present analysis. We have chosen to represent it as a lax central unrounded vowel for structural reasons. When we study the verbs we shall demonstrate that a striking number of generalizations emerge in the conjugation if schwa has the same features (except for tenseness) as /a/. If it should be confirmed phonetically that /e/ is front rounded, this fact would in no way affect the structural basis for schwa which we have established. We would simply need to add a phonetic adjustment rule which would make lax a <- grave, + round>.

Within our analysis we shall postulate post-tonic

schwa. We have found sufficient structural evidence for having final schwas in the underlying forms even though in various speech styles they do not appear at the phonetic level. Therefore, there will have to be a set of phonetic adjustment rules for the dropping of schwa. This question is taken up again in the next chapter.

In the derived forms (i.e., at the phonetic level) we have chosen to represent schwa either as /e/ or as lax a. The two symbols, of course, refer to the same phonetic entity and are therefore completely interchangeable. The choice of one or the other is purely for presentational purposes.

23 The necessity for an intermediate tense E in the case of those pre-tonic vowels which become /e/ parallels the situation found in the pre-tonic rounded vowels; the latter become /u/ by way of an intermediate Ó. (See note 19.) What is of interest here is that the rounded and unrounded sets of vowels require this intermediate tense vowel stage for quite independent reasons. Yet the similarity of structure between the two types is apparent. It is this parallelism which will allow us (in the next chapter) to state both instances of pre-tonic adjustment by a single generalized rule which will capture the observed structural similarities.

24 The rule for post-tonic schwa conversion can be com-

bined with the rule for pre-tonic schwa conversion, yielding a single schwa conversion rule. (See rule 5 at the end of this section.)

Some words such as "table, arbre, double", etc. do not terminate in a lax vowel in the underlying representation (i.e., tAbl, Arbr, dÓbl, etc.), since any form that ends in a consonant plus a liquid always has a "supporting" schwa, which is predictable.

Rule for supporting vowel insertion

∅ -----> [ V ] in the env. CL \_\_\_ #  
                  [ + comp ]

This rule is to be read: A low vowel is inserted in word final position whenever the form terminates in a consonant plus liquid cluster. In the above rule we have to stipulate the compactness feature of the inserted vowel. This stipulation is necessary so that the vowel will not be deleted by a rule (to be developed later in the chapter) which deletes post-tonic non-compact vowels. If this rule precedes the rule for schwa conversion, the latter will add the remaining appropriate features to the inserted vowel.

25 These features indicate the minimal set of binary oppositions operating in the language and do not necessarily reflect fine phonetic details. /ẽ/ is considered to be slightly more open than /è/; for /ã/ the tongue is more retracted and the mouth more closed than for the central /a/; the articulatory position of /õ/ is between /ò/ and

/ɛ̃/, but nearer to the latter; while /œ̃/ is quite close to /œ/. (Delattre, p. 23.) These phonetic details would be indicated in a narrow phonetic transcription but are not relevant for defining the structural oppositions with which we are concerned.

26 These forms terminate in the so-called "e féminin". "Fine" will be represented as fInta, "brune" as brUnta, etc. (where ta is the morpheme which indicates feminine gender). Postulating final schwa is not only imperative in order to prevent nasalization but will also account for the retention of final consonants in feminine adjectives and in present singular verb forms of the first conjugation. Deriving the nasalized vowels from an underlying oral vowel plus nasal consonant is by no means a novel approach. Everyone who reads the standard orthography employs these rules.

We have said that nasalization takes place whenever the nasal consonant is followed by a word boundary. A more refined statement is actually required, since this rule holds only when the nasal consonant is in phrase-final (which includes utterance final) position, e.g., "C'est bon" /bɔ̃/ 'It's good', but not always within the phrase if the next word begins with a vowel, e.g., "bon ami" /bɔ̃nami/ 'good friend'. In addition, there is a certain class of forms (determiners, some adverbs, etc.) where the vowel is nasalized and the nasal consonant is also retained, e.g., "un

ami" /õenami/ 'a friend'. Here we are considering words in isolation and the simplified rules which we have given will suffice.

Historically, of course, nasalized vowels developed from oral vowels plus nasal consonant. All vowels were nasalized with subsequent denasalization in the case of a nasalized vowel followed by a nasal consonant followed by a vowel.

27 Once we have established the necessity for having underlying oral vowels and nasal consonants instead of underlying nasalized vowels, a simpler description results if all nasalized vowels have as their origin vowel plus nasal consonant. Words such as "sombre" /sõbr/ 'dark', "vendre" /vãdr/ 'sell' will have in the underlying representation an oral vowel plus some nasal consonant, even though these forms do not exhibit vocalic alternation as does "fine, fin". Suppose one were to postulate underlying nasalized vowels for those words which do not exhibit alternation. Then nasalization would be a feature of vowels and it would be necessary to mark every vowel (except those occurring before a nasal consonant) of every word + or - nasalization, which would add a considerable number of features to the lexicon. Once it has been shown that nasalization is not distinctive for many of the forms, but is predictable from an underlying representation and a set of rules, then all instances of

nasalization must be similarly derived.

28 It is to be recalled that E shifts to lax a in non-tonic position ("mener : mène"); however when E is nasalized it shifts to ã everywhere and is made tense ("prenez : prend"). These changes will be incorporated in the rules which appear at the end of this section. Nasalization provides further evidence then for the change E > a .

29 Nasalization provides the motivation for having the diphthongization of é take place in two steps: é > wé > wa . It is the intermediate nasalized wé which is lowered to wē . If one were to change é directly to wa one would no longer have the front unrounded vowel which is needed for the nasalized form. The wé > wa change must of course take place after nasal quality adjustment.

30 Under the same conditions /œ/ becomes /ø/. The rule can then be generalized to handle both /ø/ and /œ/:

<+ round> -----> <- comp> in the env.       $\left. \begin{array}{c} \# \\ z \end{array} \right\}$

31 The physical reality of a "plural" or "person" morpheme is found in the style of speech where liaison is made between plural noun and following adjective or between finite verb and following word: "des chevaux\_espagnols" 'Spanish horses', "il faut\_être ici" 'you must be here'.

32 A morpheme boundary may or may not be present between the /l/ and the following consonant. Although the forms "altitude, falsifier" also contain Al + consonant, the Al does not become /ó/. Just as certain (learned) affixes cause vowel tensing, similarly there are affixes which render the Al > /ó/ rule inoperative.

The /ó/ which comes from Al is represented by "au" in the standard orthography. Historically, the change was al > au > ó .

33 Historically, of course, words such as "côte, hôte", etc. did at one time have an s . The loss of s is generally indicated in the current orthography by means of a circumflex accent over the o, the accent mark serving also to indicate the long close vowel.

34 Grammont (1961) cites, however, the following words with /ò/: "roseau, rosette, rosace, philosophe, losange, cosaque, myosotis". The /ò/ here might be attributable to the lowness of the vowel in the next syllable. Most dictionaries cite the first three words with /ó/, so that the related "rose" words all have the same vowel quality.

35 Grammont notes that there is hesitation between /ó/ and /ò/ for the words: "côté, côtelette, hôtel, hôtelier, hôpital, rôtir". "Mais la tendance générale à ouvrir les o inaccentués triomphe de plus en plus...; la prononciation

avec  $\grave{o}$  ouvert est plus fréquente et plus spontanée; ceux qui mettent dans ces mots un  $\acute{o}$  fermé, bien que nombreux, sont visiblement influencés par l'accent circonflexe."

(1961, p. 22.)

36 There is considerable fluctuation among speakers as to whether pairs of the type "bête : bette" are differentiated. For many speakers they are the same. For those speakers who do make the differentiation, some will have one set of words with long vowels, while others will have a different set. How many and how often such distinctions are made seems to depend on style, education, region, and age of speaker. This situation reminds one of the controversy over "a antérieur" and "a postérieur", which again is more a question of style than say of "phonemic" contrast.

37 The four vowel shift rules presented in this section are stated informally. A formalized version of these rules can be found in Appendix A.

38 The bi-morphemic forms may also be disyllabic /sié/ or /siyé/, /žué/ or /žuwé/, /té/ or /té/. The glide between the high vowel and the following vowel is predictable. If the high vowel is preceded by a consonant plus liquid cluster only the disyllabic form occurs, e.g., "crier" /krié/ or /kriyé/ 'cry' but not \*/kryé/.

39 The rule for post-tonic vowel deletion imposes the



condition that there may be no more than one consonant after the post-tonic vowel. This restriction is indicated in the environmental part of the rule where  $C_0^1$  signifies no consonant (i.e., the subscript zero) or one consonant (i.e., the superscript one).  $C_0$  (with no superscript) signifies zero or more consonant segments. Using this notation the subscript numeral then sets the lower limit, the superscript numeral the upper limit for number of same segments. The reason for this environmental restriction will be seen when we consider the verb conjugation.

40 Adopting this analysis compels us to admit lax high vowels into the system. Previously, we only had lax non-high vowels since we did not present alternations between the high vowels and other vowels. Yet one might wish to recognize underlying lax i if one were to relate pairs such as "moins, minimum" 'less, minimum', "vierge, virginal" 'virgin, virginal', "cierge, cire" 'candle, wax'. When we consider the verbs we shall show the necessity of recognizing lax high vowels for forms of the second and third conjugations.

41 "Dans les mots français prononcés isolément et sans mouvement affectif, l'accent d'intensité frappe la dernière syllabe à voyelle prononcée." (Grevisse, p. 54.)

42 In verbs there may be as many as four lax vowels after the stressed vowel, e.g., "bâillent (subjunctive)" 'yawn'

#bAli+a+e+unt# (stem + thematic vowel + subjunctive marker + 3rd person plural) (see Chapter IV). In noun stems there does not appear to be more than two, e.g., #fòlia# . However, this is an observational restriction and in no way impinges on the rule. Theoretically, the rule allows for any number of successive lax vowels.

43 The stress rule will not account for proper names of the type: "Alboin, Benoît, Choiseul, Montreuil, Montpellier", etc. (assuming that these are mono-morphemic). Suppose these forms appear as follows in their underlying representations: #Albén# , #bÈné# , #šézól# , #mòntroíli# , #mònpÉlè# . Let us further place a restriction on the stress rule: with proper names a lax mid vowel may be stressed (i.e., é or ó). This will place the stress correctly for "Alboin, Benoît, Choiseul" and "Montreuil", but not "Montpellier" since its final vowel is lax and low. However, if one were to represent "Montpellier" as #mònpÉlIÉ# , stress would be assigned to the last tense vowel and the preceding I would become a glide. Here is a case where the glide is not derived from a lax front vowel but rather must appear as a vowel in the underlying representation if we are to account for all the examples. It is not surprising that proper names or foreign words may have certain restrictions placed on them since they often exhibit characteristics which are outside of the regular system.

Chapter III  
ELISION AND LIAISON

3.1. Truncation

3.1.1. Truncation between words

In French the phonological adjustments made between one word and the next are referred to as "elision" and "liaison". In most grammars and handbooks dealing with pronunciation these have generally been treated as two opposing phenomena.<sup>1</sup> Elision is defined as the suppression or dropping of the final vowel of a word before another word also beginning with a vowel sound, e.g.

le ami > /lami/      petite amie > /petitami/

Liaison, on the other hand, has been defined as the linking of a word final consonant before a word beginning with a vowel sound, the consonant otherwise being mute or dropped, e.g.

les camarades /lékamarad/    les amis /lézami/

Such a view implicitly recognizes that the underlying form of those words which can undergo liaison must in all cases terminate in a consonant, and that this consonant is dropped in utterance final position or else before a word beginning with a consonant sound.<sup>2</sup> Let us suppose that this view concerning the underlying forms is the correct one. Then

elision and liaison can be considered as the same process: namely, in word final position, a vowel is deleted or truncated before another word beginning with a vowel and a consonant is deleted before another word beginning with a consonant; that is, vowels are truncated before vowels and consonants before consonants. In order to be neutral between the terms elision and liaison, we shall hereafter refer to this one and the same process as truncation.<sup>3</sup>

In addition to a vowel or a consonant, a word could also terminate or begin with a liquid or glide. The effects of truncation on these last two classes of sounds have usually been ignored, it being assumed that liquids are simply a type of consonant and glides a subclass of the vowels. This view is not entirely incorrect; nonetheless, it is necessary to treat liquids and glides separately since (as we shall show) in final position liquids do not act like consonants and glides do not act like vowels.

Since it is possible for a word to terminate in a consonant, vowel, liquid, or glide and for the next word to begin with any one of these four classes of sounds, there are then a total of sixteen possibilities. These sixteen combinations with relevant examples are shown in the following matrix. (# indicates word boundary. The vertical columns represent word initial position and the horizontal rows word final position.) Truncation has been indicated by a slant line through the appropriate letter.<sup>4</sup>

	#C	#V	#L	#G
C#	les camarades	les amis	les roses	les oiseaux
V#	le camarade	l'ami	la rose	l'oiseau
L#	pour toi	pour elle	pour lui	bel oiseau
G#	chandail bleu	chandail orange	chandail rouge	vieil oiseau

From the above data the following rules can be formulated:

- 1) Consonants are truncated before consonants and liquids.  
Vowels are truncated before vowels and glides.  
Liquids and glides are never truncated.

In terms of distinctive features, the four classes of segments referred to above can be differentiated one from the other by making maximal use of just two features: consonantal and vocalic; each feature having the value + or - .

Consonant	Liquid	Vowel	Glide
+ cons	+ cons	- cons	- cons
- voc	+ voc	+ voc	- voc

From an examination of the above distribution of features, it can be seen that consonants and liquids have the feature <+ cons> in common, whereas vowels and glides share the feature <- cons>.

By making use of distinctive features, 1) above can be stated as follows:

- 2) Consonants are truncated before <+ cons> segments.  
Vowels are truncated before <- cons> segments.  
Liquids and glides are never truncated.

These statements are represented as follows in the distinctive feature notation:

- 3) a)  $\left[ \begin{array}{l} + \text{ cons} \\ - \text{ voc} \end{array} \right]$  ----->  $\emptyset$  in the env.  $\underline{\quad}$   $\neq$  <+ cons>
- b)  $\left[ \begin{array}{l} - \text{ cons} \\ + \text{ voc} \end{array} \right]$  ----->  $\emptyset$  in the env.  $\underline{\quad}$   $\neq$  <- cons>

By using features nothing need be said about the liquids and glides not being truncated; that is, the third statement of 2) is automatically subsumed by the two rules of 3). Not

only are rules such as 3) simpler than statements such as 2) but they also express important generalizations to be found in the language. Thus, 3) explicitly states in what way consonants and liquids are related and how they define a class of segments which truncates a preceding consonant; that is, word initial consonants and liquids are related in a way in which word final consonants and liquids are not. A similar statement can be made for the vowels and glides.

The two parts of rule 3) are very similar and one is therefore led to ask whether the rule could not be simplified still further with consequent generalization. One observes that wherever we have a + in part a) of the rule there is a - in part b) and vice versa; that is, a) and b) differ only in the value assigned to each feature but not in the features themselves. It is this complete symmetry in the two rules on which we wish to base the generalization.<sup>5</sup> Therefore, we shall replace the value (i.e., sign of the feature) by a variable (the Greek letter @), it being understood of course that if @ is assigned the value + in one part of the rule, @ must accordingly be + wherever else it appears in the rule; similarly, if the initial value of @ is -, it must be - everywhere.<sup>6</sup> In an alpha-rule one may wish to refer to a value opposite to that which is initially assigned to alpha. This can be done by using -@.<sup>7</sup> The two subrules of 3) are then expressed as follows:

4) Rule for truncation

$$\left[ \begin{array}{l} @ \text{ cons} \\ -@ \text{ voc} \end{array} \right] \text{-----} \rightarrow \emptyset \text{ in the env. } \_\_\_\# \langle @ \text{ cons} \rangle$$

The left side of the rule states that if @ is + then -@ is - (i.e., the consonants); on the other hand, if @ is - then -@ is + (i.e., the vowels); liquids and glides are excluded since they would have to be alpha, alpha. (Liquids are + + ; glides are - - .) Similarly, if @ is + on the left side of the rule then it must be + on the right side (the class of consonants and liquids) and if @ is - on the left side it is - on the right (the class of vowels and glides).

To be sure, 4) is more concise than the two rules of 3) since fewer features are mentioned. To save a few features is not of much interest in itself. But rather we wish to emphasize that rules such as 4) make important generalizations about the language which cannot be stated otherwise. Rule 4) states that in French vowels and consonants form a class of segments which can be truncated whenever the following segment agrees in consonantality and that this class is opposed to the class of liquids and glides, which does not undergo truncation.

3.1.2. truncation between morphemes

The sequence adjective plus noun has the following forms in the masculine, depending on the nature of the initial segment of the noun and on whether the noun phrase is singular or plural.



- a) "petit camarade" /peti kamarad/
- b) "petit ami" /petit ami/
- c) "petits camarades" /peti kamarad/
- d) "petits amis" /petiz ami/

These forms would have the following representations:<sup>8</sup>

- a) petit # kamarade#
- b) petit # ami#
- c) petit+S # kamarade+S#
- d) petit+S # ami+S#

We have shown that truncation affects the segment which immediately precedes the word boundary, so that for the singular forms the final t of petit is deleted only when the next word begins with a <+ cons> segment. If we allow the truncation rule to apply not only between words but also between morphemes (thus making the rule more general) we can also account for the plural forms. In "petits camarades" the final t and the plural s will both be truncated, since they precede a juncture which is in turn followed by a consonant. In "petits amis" only the final t fits the required environment of juncture followed by a <+ cons> segment.<sup>9</sup>

In the feminine the final t is not deleted.

- "petite camarade" /petit kamarad/
- "petite amie" /petit ami/
- "petites camarades" /petit kamarad/
- "petites amies" /petitz ami/

Since the t appears throughout the paradigm for the feminine, this segment must be followed by a vowel which protects it from truncation. The vowel in the underlying representation is the morpheme which indicates feminine gender

in adjectives and certain nouns. The above feminines would have the following representations:<sup>10</sup>

petit+e # kamarade #  
 petit+e # ami+e #  
 petit+e+S # kamarade+S #  
 petit+e+S # ami+e+S #

In the above derivations we have not yet accounted for the absence of the plural marker in final position, e.g., "camarades" kamarade+S# /kamarad/; or for that matter any consonant in final position, e.g., "il est petit" /peti/. Since this phenomenon is not a case of truncation between words we shall require a rule which deletes consonants in utterance (or phrase) final position.

Rule for phrase final consonant deletion

$\left[ \begin{array}{l} + \text{ cons} \\ - \text{ voc} \end{array} \right] \text{-----} \rightarrow \emptyset \text{ in the env. } \underline{\quad} \# \bar{\quad}$

where  $\bar{\quad}$  indicates phrase (or utterance) final position.

The truncation rule must be applied before the rule for phrase final consonant deletion.<sup>11</sup> This ordering can be determined by noting the derivation of "ils sont petits".

- a) underlying      il+S # sɔ̃t # petit+S # %  
 truncation        il # sɔ̃ # peti +S # %  
 phrase final    il # sɔ̃ # peti # %
- b) underlying      il+S # sɔ̃t # petit+S # %  
 phrase final    il+S # sɔ̃t # petit # %  
 truncation       \*il # sɔ̃ # petit # %

If the rule for phrase final consonant deletion is applied first (b) one obtains the wrong result. The final s of petit+S is deleted; however, the truncation rule will not delete the second t of petit as it would no longer be

followed by a <+ cons> segment.

### 3.2. Conditions on the truncation rule

#### 3.2.1. Pronounced final consonants

In some words the final consonant is pronounced both before a following consonantal segment and in final position.

"avec vous"	/avèk/
"sept camarades"	/sèt/
"sens"	/sãs/
"fils"	/fis/
"chef"	/šef/
"sec"	/sèk/, etc.

Therefore, words such as these will have to be marked in the lexicon as being exceptions to the deletion rules.<sup>12</sup> However, it is not necessary to mark all such words as being exceptions to both the truncation rule and the phrase final consonant deletion rule. Rather, the forms need to be marked as being exceptions only to one rule or the other. This phenomenon can be best illustrated by comparing the behavior of the numerals "3", "6", and "7" before a vocalic segment, before a consonantal segment, and in isolation.

"trois amis" /trwaz/	"trois camarades" /trwa/	"trois" /trwa/
"six amis" /siz/	"six camarades" /si/	"six" /sis/
"sept amis" /sèt/	"sept camarades" /sèt/	"sept" /sèt/

"Trois" trés is not an exception to either rule; the final segment is deleted before a consonantal segment as well as in final position. "Six" sís, on the other hand, is truncated before a consonantal segment, but not in final position; hence it is an exception to the rule for phrase final consonant deletion. "Sept" sÈt never has its final consonant

deleted and accordingly is an exception to both rules. However, all morphemes which do not undergo truncation (like "sept") also do not undergo final deletion; therefore, if one knows that a form is an exception to the truncation rule one can predict that it will also be an exception to the rule for phrase final consonant deletion. The converse, of course, is not true as we showed in the case of "six". Therefore, in the lexicon "six" will be marked <- phrase final consonant deletion> whereas "sept" will be marked <- truncation>. The fact that "sept" is also an exception to the other consonant deletion rule will be predicted by the following redundancy rule: <- truncation> -----> <- phrase final consonant deletion>.<sup>13</sup>

The above examples provide further motivation for two separate deletion rules, otherwise forms such as "six" and "sept" would be treated identically and one would be unable to account for the differences observed.<sup>14</sup>

### 3.2.2. Syntactic restrictions

Truncation does not take place between just any two contiguous words. There are restrictions which are syntactically determined.<sup>15</sup> For example, liaison is made between a pronoun subject and the finite verb, but very often not between a pronoun subject and a participle.

Vous\_avez\_été en France. Avez-vous/été en France?  
Or liaison is made between an adjective and a noun but not

between a singular noun and an adjective, so that one can find such minimal pairs as:<sup>16</sup>

Un savant_anglais	A wise Englishman
Un savant/anglais	An English scholar

Since these restrictions on the truncation rule are syntactically determined we should like to suggest that certain of the transformational rules, in addition to arranging constituents of the sentence, also introduce in particular syntactic environments the juncture  $\xi$ , the same juncture which appears in final position for all sentences. This has the effect of causing words which appear before this juncture to be treated analogously (in the phonological component of the grammar) to words appearing in final position, so that the final consonant will be appropriately deleted. The forms cited above would be represented as follows:

Tous avez été en France $\xi$	Avez-vous $\xi$ été en France $\xi$
Un savant anglais $\xi$	Un savant $\xi$ anglais $\xi$

In many cases it is optional whether or not liaison takes place.<sup>17</sup> Thus, liaison may or may not occur between a plural noun and a following adjective:

"des camarades_anglais"	/de kamaradez $\tilde{a}$ glè/
"des camarades/anglais"	/de kamarad $\tilde{a}$ glè/

Accordingly, the underlying representations for the two possibilities would differ only through the presence or absence of the  $\xi$  juncture after the noun. If the  $\xi$  juncture is not present (output with liaison) and the rules are applied in the order: truncation rule, phrase final consonant

deletion, the correct output is derived.

underlying	déS	#	kamarade+S	#	ãglèz+S	#	ɤ
truncation	dé	#	kamarade+S	#	ãglè +S	#	ɤ
final	dé	#	kamarade+S	#	ãglè	#	ɤ

However, if the ɤ juncture is present (output without liaison) and the rules are applied in the order which we have established (namely, truncation rule, phrase final consonant deletion), the wrong result is obtained.

underlying	déS	#	kamarade+S	#	ɤ	ãglèz+S	#	ɤ
truncation	dé	#	kamarade+S	#	ɤ	ãglè +S	#	ɤ
final	*dé	#	kamarade	#	ɤ	ãglè	#	ɤ

The word "camarade" still has its final schwa. However, in the type of style where schwas are pronounced the schwas must either be followed by a consonant or else appear in utterance final position, but under no conditions is the schwa pronounced if the following segment is a vowel. This particular difficulty can be rectified if we change the ordering of our two rules, allowing the rule for final consonant deletion to be applied first.

underlying	déS	#	kamarade+S	#	ɤ	ãglèz+S	#	ɤ
final	déS	#	kamarade	#	ɤ	ãglèz	#	ɤ
truncation	*dé	#	kamarad	#	ɤ	ãglèz	#	ɤ

The final S and schwa of "camarades" are appropriately deleted. However, in resolving this problem we have created a new one, for now the word "anglais" is handled incorrectly; the final consonant segment has been retained whereas it should not have been.

The difficulty, of course, is that we have certain forms where we require that the rules be applied in the

order a, b and other forms where we need the order b, a. More specifically, as our example shows, truncation between morphemes must precede 'final' deletion. On the other hand, 'final' deletion has to precede truncation between words. That is, we need the order : truncation between morphemes, 'final' deletion, truncation between words. Further, we prefer not to have to set up three different rules, for then the first and third would be identical except for the juncture and consequently we would destroy the generalization which we previously established.

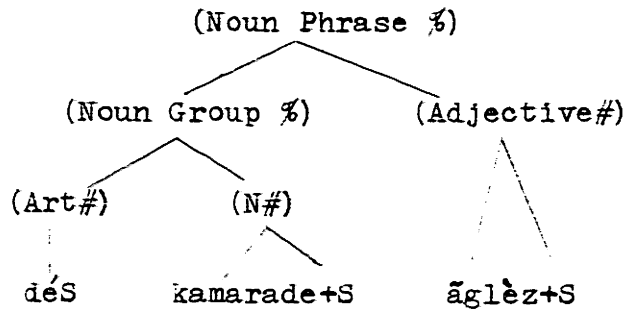
We are faced then with two problems: 1) to find a way to allow the truncation rule to be applied more than once; 2) to apply the truncation rule to morphemes before applying it to words.

Both of these problems can be resolved if we capitalize on the constituent structure provided by the syntactic component of the grammar. The syntax provides a parsing of each sentence into its various constituents (morphemes, words, phrases, etc.), these constituents being appropriately labeled and bracketed. It is this information that is needed in the phonological component and which will resolve those difficulties noted earlier.

The noun phrase "des camarades/anglais" has the constituent structure shown below; a) and b) are merely different ways of representing the same structure, a) being a diagram with labeled branching, whereas b) is with labeled

bracketing.<sup>18</sup>

a)



b) (((dés #) Art (kamarade+S #) N%) NG (āglèz+S #) Adj%) NP

First the phonological rules are applied to the innermost bracketed (or smallest) constituents of a sentence; that is, words comprised of morphemes. Then the same rules are reapplied to the next larger constituents, i.e., the noun group "des camarades". Finally, the same set of rules is again applied, this time to the complete noun phrase. This is what is meant by a cycle, since the set of rules is applied more than once and the domain of application is predetermined by the constituent structure.<sup>19</sup>

The complete cycle is illustrated below. Bracketing has been used to delimit the various constituents; the labeling has been omitted. After each application of the rules the innermost parentheses will be erased. The cycle is terminated after all parentheses have been removed. We shall adopt in addition the following convention: Whenever a right parenthesis is erased, we shall also erase an immediately preceding %. This maneuver will become clear during the course of the derivation.



1	(( (dés #) (kamarade+s #) %)	(ãglèz+s #) %)	underlying form
2	(( (dés #) (kamarade+s #) %)	(ãglè +s #) %)	truncation
3		----- 'final'	
4	(( dés # kamarade+s #) %)	(ãglè +s #) %)	remove inner parentheses
5	(( (dés #) (kamarade+s #) %)	(ãglè +s #) %)	truncation
6	(( (dés #) kamarade #) %)	(ãglè +s #) %)	'final'
7	( (dés # kamarade #)	ãglè +s # %)	remove inner parentheses
8	( (dés # kamarad #)	ãglè +s # %)	truncation
9	( (dés # kamarad #)	ãglè # %)	'final'
10	dés # kamarad #	ãglè #	remove final parentheses

In line 7 the inner parentheses and the preceding  $\%$  are erased. The final vowel of "camarade" is then found in the appropriate environment for truncation to apply. In line 9 the final d of "camarade" is not deleted by the rule for phrase final consonant deletion, since it is no longer followed by  $\%$ .

### 3.2.3. "H aspiré"

There is a class of words which have a vowel as their initial segment in the output form, but do not permit a preceding word to enter in liaison or elision with them: These are the words which begin with the so-called "h aspiré".<sup>20</sup>

"le héros"	/le éro/
"les héros"	/lé éro/
"une honte"	/une òt/

In the above examples the vowel of "le" or "une" is not truncated whereas the final consonant of "les" is. This fact suggests that in the underlying form the noun must begin with a consonant even though the consonant has no phonetic value in the output. The consonant becomes null only after the truncation rule has been applied.

The orthography would of course lead one to postulate that the initial segment should be h. Although the orthography may provide insight about the language, such information is of little value in the linguistic description unless one can demonstrate synchronic evidence for it. Is the h of

more than just orthographic or historical interest? In the eastern section of France as well as in a certain type of "theater pronunciation" a phonetic h is actually heard as the initial segment of these words; other speakers will have a glottal stop in this position.<sup>21</sup> This dialectal or idiolectal phonetic evidence coupled with the previously observed structural pressure for a consonantal segment (i.e., failure of these words to undergo liaison and elision) confirms then that in the underlying form these words do in effect have an initial non-vowel segment.<sup>22</sup>

However, h or glottal stop is not possible as the initial segment, since both of these entities are glides; we have already established that truncation takes place before glides (cf. "l'oiseau"). Therefore, the initial segment has to be a true consonant (i.e., a segment which is <+ cons, - voc>). Yet it would be desirable that this consonant have as many features as possible in common with h or glottal stop, so that the underlying segment could be converted to h or glottal stop--in those dialects which show one or the other--with the minimum of feature specification.

In terms of distinctive features h and glottal stop differ only in that h is a continuant whereas glottal stop is a non-continuant.

	h	ʔ
cons	-	-
voc	-	-
comp	+	+
grave	+	+
strid	-	-
cont	+	-

If one were to change the feature <- cons> to <+ cons> (i.e., converting a glide to a consonant), then h would become x (a non-strident velar fricative) and ʔ would become k. It is fairly easy to make the proper choice between these two segments. Since k already occurs as one of the consonants of French we must use x as the underlying representation for the first segment of the "h aspiré" words.

There are then four continuants in the underlying consonant system: f, s, ʃ, and x. The first three are strident, the fourth one is not. It is the stridency feature which sets x apart from the other continuant consonants. Since in the output only strident fricatives can occur, we shall attribute the deletion of x--for those dialects which have neither h nor ʔ--to its non-strident character.<sup>23</sup> This rule must be applied at the phrase level and after truncation.

Rule for deletion of non-strident continuants

+ cons - voc + cont - strid	----->	∅
--------------------------------------	--------	---

We shall also require such a rule in the verb conjugation (Chapter IV).

3.2.4. Truncatable and non-truncatable vowels

We have shown that certain words have final consonants which are an exception to either the truncation rule or the rule for phrase final consonant deletion or else both rules. Are there instances of final vowels which do not undergo truncation? Such seems to be the case if one considers examples of the type:<sup>24</sup>

"Papa va à Arras." /papa va a aras/

At first it might appear that monosyllabic words which terminate in a vowel do not undergo truncation. This restriction can be easily built into the truncation rule. Each word would have received stress in the first cycle by the rule for stress placement, e.g.,<sup>25</sup>

((#papa#) (#va#) (#a#) (#aras#)%)

If we revise the truncation rule so that only unstressed segments are truncated, the above forms cease to be exceptions.<sup>26</sup>

Rule for truncation (revised)

$\left[ \begin{array}{l} @ \text{ cons} \\ -@ \text{ voc} \\ - \text{ stress} \end{array} \right] \text{ -----} \rightarrow \emptyset \text{ in the env. } \text{---} \left\{ \begin{array}{l} + \\ \# \end{array} \right\} (\#) <@ \text{ cons}>$

Yet this solution is not entirely adequate since there are monosyllabic forms that terminate in a truncatable vowel, i.e., "le, la (articles); je, me, te, le, la, se, ce (pronouns); de (preposition); que (conjunction); ne (negative particle)".<sup>27</sup> Leaving aside for the moment the last three forms one could add the stipulation that articles and pronouns

are never stressed (i.e., mark these two morphological classes as being exceptions to the rule for stress placement). However, we wish to propose an alternative solution.

In the first cycle stress is placed on each word. It is to be recalled that the rule for stress placement requires that the final # be present as part of the environment. If, in the case of the articles and pronouns, the final # were to be erased, then these morphemes would not satisfy the appropriate environmental conditions of the rule and they would automatically fail to receive stress. The deletion of the final # would take place at the syntactic level: A phrase structure rule would introduce the article without a final # ; the deletion of the juncture in the case of the pronouns would result from the transformational rules which bring about pronominalization. In an analogous way the conjunction or relative "que" and the negative particle "ne"--both introduced transformationally--would have their final # deleted.<sup>28</sup>

We already noted that the preposition "à" does not undergo truncation. However, the vowel of the preposition "de" does become truncated:

"Papa va à Arras."      "Papa vient d'Arras."

From what we have just established it would appear that "à" must retain its final # if it is to receive stress, e.g., #A#, whereas "de" would seem not to have the final #, e.g., #de. Yet we should like to treat all prepositions similarly.

Let us assume that all prepositions retain the final # . We note further that the preposition "de" has schwa as its vowel. We have shown in Chapter II that schwa may be introduced as a supporting vowel in word final position after a consonant plus liquid (e.g., tAbl /table/). Suppose the vowel of "de" were also a supporting vowel; then "de" could be represented without a vowel (i.e., #d# ). The form of course would not receive stress. The schwa would be inserted only after the stress rule had applied. We would then need to revise the rule for schwa insertion to include also those words which have no vowel.

Rule for supporting vowel insertion (revised)

$$\emptyset \text{ -----} \rightarrow \begin{bmatrix} - \text{ cons} \\ + \text{ voc} \\ + \text{ comp} \end{bmatrix} \text{ in the env. } \left\{ \begin{array}{l} <+ \text{ cons}> \\ \# \\ <+ \text{ cons}> \end{array} \right\} \begin{bmatrix} + \text{ cons} \\ + \text{ voc} \\ - \end{bmatrix} \left\{ \begin{array}{l} \# \\ \% \end{array} \right\}$$

We have proposed two somewhat radical notions: 1) that certain monosyllabic "words" emerge from the syntactic component without a final # ; 2) that other monosyllabic forms do not have a vowel in the underlying representation. Both of these assumptions would be entirely ad hoc unless we are able to find other structural evidence for them.

### 3.3. The verb group

We have established that pronouns are normally unstressed. However, in imperative and interrogative sentence types (where pronouns follow the verb) the final pronoun bears the phrase stress (forms in column II).<sup>29</sup>

I

Vous le regardez.  
 Vous la regardez.  
 Vous nous regardez.  
 Vous me parlez.  
 Vous en parlez.  
 Vous m'en parlez.

Vous parlez.  
 Tu parles.  
 Ils parlent.

II

Regardez-le.  
 Regardez-la.  
 Regardez-nous.  
 Parlez-moi.  
 Parlez-en.  
 Parlez m'en., etc.

Parlez-vous?  
 Parles-tu?  
 Parlent-ils?

We shall consider the stressed pronoun to be a special characteristic of the verb group. A verb group (VG) is defined as being composed of a verb plus those constituents which enter into close syntactic union with it. It is precisely the same constituents for which we have proposed no final #.<sup>30</sup>

We shall require the following stress rule:

Rule for verb group stress

V -----> <+ stress> in the env. Q) VG , such that Q does not contain a V or have its final segment followed by a # .

The rule states that within a verb group stress is placed on the final vowel provided that the final segment of the verb group is not followed by a # .

We shall illustrate with the declarative and interrogative forms.

((#tU) (#pArLa#)) VG                      ((#pArLa#) (#tU)) VG

In the first cycle only the stem vowel of "parle" receives word stress; the form "tu" does not receive stress since it does not contain a final # . The inner parentheses are then removed.



(#tU #pArla#) VG

(#pArla# #tU) VG

In the second cycle the vowel of "tu" in the interrogative form will be stressed since it is the final vowel of a verb group which does not terminate in #. In the declarative the final # after "parles" protects the final schwa from being stressed.

Two forms appear to contradict this observation concerning the position of stress in the verb group.

Parle-t-elle?

Parle-je?

In both forms the stress is on the penultimate vowel. Yet the rule for verb group stress stipulates that the final vowel receives the stress. As the rule is presently stated we would obtain the incorrect forms \*parle-t-elle and \*parle-eje. However, one notes that "elle" and "je" both terminate in schwa; if schwa were a supporting vowel it would not need to be indicated in the underlying forms.

(#pArla+t# #Ell%) VG

(#pArla# #Z%) VG

The stress would then accordingly be placed on the last vowel.

(#pArla+t# #Ell%) VG

(#pArla# #Z%) VG

Since "elle" and "je" are in phrase final position, the required environment is met for the insertion of schwa.<sup>31</sup>

Further justification for the verb group can be found by comparing the following sentences.

I	II
a) Il vit_en France.	Vit-il en France?
b) Il va en France.	Va-t-il en France?
c) Il écrit_en français.	Ecrit-il en français?
d) Il parle en français.	Parle-t-il en français?

The interrogative forms in column II establish that the third singular verb has t as its liaison consonant. (In the chapter on verbs we shall show that +t is the third singular person marker for all verbs.) In the declarative forms of column I the verbs in b) and d)--unlike their interrogative counterparts--do not have a liaison consonant. Yet we should like to postulate the same structure for all verb forms (i.e., the structure stem + person marker). Then "va" would be represented as #vA+t# and "parle" as #pArLa+t#.<sup>32</sup> We would then require a rule which deletes the person marker whenever the preceding vowel is low and central. However, the person marker is only deleted if the verb is the final constituent of the verb group.<sup>33</sup>

Rule for person marker deletion

$$\text{ɔ} \text{ -----} \rightarrow \emptyset \text{ in the env. } \left[ \begin{array}{c} \text{V} \\ + \text{grave} \\ + \text{comp} \end{array} \right] \text{ --- } \neq \text{ ) VG}$$

The deletion of a stem final consonant after a low central vowel (at the end of a verb group) is further corroborated by the imperative forms. In column I (below) the verb is the last constituent of the verb group and hence the singular person marker is deleted; in column II the verb is not the final constituent of the verb group, so

correspondingly the person marker is retained.

I	II
Va à Paris.	Vas-y.
Parle en français.	Parles-en.

### 3.4. Summary

Strings of elements appropriately bracketed and separated by junctures constitute the input to the phonological component of the grammar. These strings are then subjected to a sequence of rules, some of which are applied more than once. The cyclic reapplication of a small number of rules simplifies considerably the description of phonological processes. Following this approach, we have shown that the complex system of elision and liaison, which takes place between words in spoken French, can be characterized in a concise manner. The truncation rule and the rule for phrase final consonant deletion, both of which operate within the cycle and delete segments in certain simply statable environments, account for the intricate interplay of elision and liaison. In addition, the truncation rule also explains some of the morphophonemic processes which take place within the word. When we consider the verb conjugation, the central role played by the truncation rule will become apparent.

We also suggested that certain monosyllabic "words" do not have a final # . This view was adopted so that such forms would not be stressed at the word level and hence

could undergo truncation; in addition, it was the absence of the juncture which permitted the last vowel to be stressed in the verb group (e.g., (#paries# #tu)). Other words retained their word boundaries and accordingly received stress at the word level; yet the same juncture (when final in the verb group) prevented the last vowel from being stressed (e.g., #tu #parles#). We also advocated that certain forms may not have a vowel in the underlying representation. This observation allowed us not only to deal with "à Arras" and "d'Arras", but coupled with the rule for verb group stress, we were able to account for "parle-t-elle" and "parlé-je". Of particular interest is the latter form where the anomalous stressed conjugation marker vowel follows as an automatic consequence of the rules. Finally, the concept of the verb group permitted us to account for the presence or absence of a person marker after low central vowels.

NOTES

1 Grevisse gives the following definitions of elision and liaison: "L'élision est l'amplissement d'une des voyelles finales a, e, i, devant une initiale vocalique. L'élision n'est pas toujours marquée dans l'écriture; quand elle l'est, la voyelle qui s'élide est remplacée par une apostrophe." (p. 60.) "Une consonne finale, muette dans un mot isolé, se prononce dans certains cas, devant la voyelle ou l'h muet initial du mot suivant et s'appuie même si intimement sur ce mot que pour la division en syllabes, elle lui appartient: c'est ce qui s'appelle faire une liaison." (p. 56.)

2 "La liaison consiste par conséquent à prononcer devant un mot commençant par une voyelle une consonne finale, muette en dehors de cette condition." (Fouché, p. 434.)

3 Meigret (16th century) recognized the similarity between elision and liaison: "Si une voyelle se retranche devant une autre voyelle, une consonne qui ne se prononce pas, devra se supprimer devant une autre consonne." (Levet, p. 62.) Meigret's statement is in reference to a spelling reform which he was proposing.

4 In the preceding chapter we showed that initial glides are derived from vowels and that there are accordingly no glides in the underlying representation. We shall show

elsewhere in this chapter that the phonological rules must be applied cyclically from smaller to larger constructs. Therefore, the rules which convert vowels to glides would have taken place at the word level. The truncation, which we are considering here, operates at the phrase level (i.e., between words); hence at this stage glides would be present in the representation.

5 If the following two rules were to appear in a language:

- a)  $\begin{bmatrix} + \text{ cons} \\ - \text{ voc} \end{bmatrix} \text{-----} \rightarrow \emptyset \text{ in the env. } \underline{\quad} \# \langle + \text{ nasal} \rangle$
- b)  $\begin{bmatrix} + \text{ cons} \\ + \text{ voc} \end{bmatrix} \text{-----} \rightarrow \emptyset \text{ in the env. } \underline{\quad} \# \langle + \text{ voc} \rangle$

these would be simply two unrelated instances of truncation. When this hypothetical case is contrasted with the situation which is actually found in French:

- a)  $\begin{bmatrix} + \text{ cons} \\ - \text{ voc} \end{bmatrix} \text{-----} \rightarrow \emptyset \text{ in the env. } \underline{\quad} \# \langle + \text{ cons} \rangle$
- b)  $\begin{bmatrix} - \text{ cons} \\ + \text{ voc} \end{bmatrix} \text{-----} \rightarrow \emptyset \text{ in the env. } \underline{\quad} \# \langle - \text{ cons} \rangle$

the symmetrical relation between the latter two truncation rules is apparent. It is symmetry of this type that we want the rules of the grammar to reflect. The alpha-notation provides a formal means for stating such symmetrical relations.

6 The alpha-rule can perhaps be best illustrated by considering a case of simple assimilation. In English the "plural" morphophoneme S is implemented as voiceless after

voiceless segments and as voiced after voiced segments, e.g., "backs" /bæks/ "bags" /bægz/. A possible set of rules (much simplified) would be the following:

- a) S -----> <+ voiced> in the env. <+ voiced> \_\_\_\_  
 b) S -----> <- voiced> in the env. <- voiced> \_\_\_\_

Rather than to make two separate statements one would prefer to say that S has the same voicing as the preceding segment; i.e., to state this fact by a single rule. Since the two rules above are very similar and differ only in the value of the signs, they can be collapsed to a single rule if the individual values are replaced by a variable.

S -----> <@ voiced> in the env. <@ voiced> \_\_\_\_ ,

where @ is either + or - , observing the convention that if @ is assigned the value + on one side of the rule it must also be + on the other side and likewise for - .

7 For the use of the alpha-notation in phonological statements, see Halle, 1962b.

The rules for pre-tonic vowel adjustment and diphthongization (Chapter II) can be formalized using the alpha-notation. The rule for pre-tonic vowel adjustment states that a pre-tonic lax vowel becomes tense and low front (compact, non-grave) if the vowel is unrounded but mid (non-diffuse, non-compact) if the vowel is rounded:

$$\left[ \begin{array}{c} \text{V} \\ \text{@ round} \end{array} \right] \text{----->} \left[ \begin{array}{c} \text{+ tense} \\ \text{-@ comp} \\ \text{@ grave} \end{array} \right] \text{ in the env. } \text{--- } \text{C}_0 \text{ + } \checkmark$$

The rule for diphthongization states that a lax front (non-grave) vowel diphthongizes and develops a glide opposite in gravity and roundness to the lowness (compactness) of the vowel:

$$\emptyset \text{ -----} \rightarrow \left[ \begin{array}{l} + \text{ voc} \\ + \text{ cons} \\ + \text{ diff} \\ -@ \text{ grave} \\ -@ \text{ round} \end{array} \right] \text{ in the env. } \text{---} \left[ \begin{array}{l} \text{V} \\ - \text{ tense} \\ @ \text{ comp} \\ - \text{ grave} \end{array} \right]$$

8 We represent the "plural" morpheme by +S (an archi-phoneme which is not marked for voicing), since in liaison the voicing is predictable.

Rule for voicing in liaison

$$S \text{ -----} \rightarrow \langle + \text{ voiced} \rangle \text{ in the env. } \text{---} \# \text{ V}$$

In some styles all the liaison continuants are voiced whereas the liaison stops are voiceless, e.g., "neuf heures" /nœv œr/ "grand ami" /grāt ami/, "sang impur" /sāk ēpūr/. These cases would be accounted for by an alpha-rule:

$$\left[ \begin{array}{l} + \text{ cons} \\ - \text{ voc} \\ @ \text{ cont} \end{array} \right] \text{ -----} \rightarrow \langle @ \text{ voiced} \rangle \text{ in the env. } \text{---} \# \text{ V}$$

9 The truncation rule must accordingly allow for either juncture, i.e.,

$$\left[ \begin{array}{l} @ \text{ cons} \\ -@ \text{ voc} \end{array} \right] \text{ -----} \rightarrow \emptyset \text{ in the env. } \text{---} \left\{ \begin{array}{l} + \\ \# \end{array} \right\} \langle @ \text{ cons} \rangle$$

10 The output of our rules produces forms such as /petite kamarade/ where schwas are pronounced. This pronunciation, of course, is not standard colloquial but rather typifies



slowed-up speech, formal styles such as oratory and declamation, singing and versification, as well as certain dialectal varieties of the south of France. It is the type of pronunciation which Hall referred to in his monograph as archaic. We would derive the more colloquial styles by means of a set of phonetic adjustment rules which would stipulate the conditions under which schwas are optionally or obligatorily dropped. For rules on the dropping of "e muet", see de Félice, Delattre, Fouché and Grammont. Postulating final schwas serves a dual purpose: 1) they are structurally imperative if the truncation rule is to operate in the simplest fashion; 2) we are able to account for the appearance of schwa in dialects, more formal styles, songs and poetry. In the case of poetry underlying schwas are of conceptual importance in determining the meter, for schwas in certain positions are counted as syllables.

In our analysis the underlying form of an adjective such as "petit" terminates in a consonant, e.g., pÈtIt . Whether or not the consonant remains depends on the nature of the following segment. Therefore, the underlying base form gives priority to neither the masculine nor the feminine; that is, we do not derive one gender from the other. (The feminine is derived from the masculine in traditional grammar, the masculine from the feminine in Bloomfieldian linguistics.) Thus, Bloomfield says: "...if we take the feminine form as our basis, we can describe <the formation

of the masculine> by the simple statement that the masculine form is derived from the feminine by means of a minus-feature, namely, loss of the final consonant...." (p. 217.) Harris remarks: "The interchange may be between any phoneme in a given position and zero in that position; i.e., it may consist of omitting a phoneme." (p. 168) However, Harris notes the difficulties encountered in this type of description: "This analysis ceases to be applicable if we take into consideration forms in which the 'mute e' is pronounced, as in poetry; if we consider forms in which the final consonant is pronounced, as in liaison, it is the masculine pre-consonantal form which is derived from the masculine pre-vocalic form...." (p. 168, Note 28.) By having abstract underlying representations these difficulties do not arise.

11 From a historical point of view truncation between words and phrase final consonant deletion were two separate developments with phrase final consonant deletion occurring later. It appears that phrase final consonants were pronounced in the sixteenth century. "En terminant, il <Dubois> ajoute cette double règle: 'A la fin des mots, on ne prononce aucune consonne, à moins qu'une voyelle ne suive, ou que la phrase ne soit terminée.' ... la dernière partie de la règle posée par Dubois ... peut se formuler ainsi: les consonnes finales se prononcent à la fin des phrases: Dans: les femmes sont bones, la consonne finale se prononce seulement dans

bones." (Livet, pp. 8-9.) For further discussion see Pope, pp. 219-220.

12 To say that a word is an exception to a rule implies that there is no structural reason for its erratic behavior; rather its failure to undergo a rule is just an idiosyncratic fact about the word and this observation must be noted in the lexicon. That words with pronounced final consonants are indeed exceptions to the deletion rules rather than, say, instances of some undiscovered rule can be ascertained by looking at those words with fluctuating forms, i.e., where the final consonant may or may not be pronounced. Grammont cites: "sens, donc, soit!, granit, but, fat, fait, accessit, vivat, aconit, exact, porc, cerf, mœurs, ours". He also lists quite a large number of words where the treatment of final consonants by southern speakers differs from the standard norm. (Grammont, 1961, pp. 93-95.) Hence speakers will have different sets of words which are exceptions to the deletion rules, so that what is an exception for one speaker is not necessarily an exception for some other.

13 Similarly, forms which are an exception to the truncation rule are also an exception to the rule which voices word final sibilants before a vowel, e.g., "sens" /sãs/ 'sense, direction', "sens unique" /sens #nik/ 'one way'; compare this with a form which undergoes truncation, e.g., "sans" /sã/ 'without', "sans amour" /sãz amur/ 'without love'.

14 Two separate deletion rules permit us to explain the few "irregular" nouns where the stem final consonant is pronounced in the singular but not in the plural"

"boeuf"	/bœ f/	"boeufs"	/bø/	'steer(s)'
"oeuf"	/œ f/	"oeufs"	/ø/	'egg(s)'
"nerf"	/nɛrf/	"nerfs"	/nɛr/	'nerve(s)'
"os"	/ɔs/	"os"	/ô/	'bone(s)'

These words are exceptions only to the rule for phrase final consonant deletion. Therefore, in the singular where the final consonant of the noun is in final position, the consonant is retained. In the plural (e.g., #bøf+S#%) the final consonant is no longer in phrase final position. Since these words are not exceptions to the truncation rule the stem consonant will be accordingly deleted; the S is subsequently deleted since this morpheme is in final position and is always deleted in this environment. Similarly, in compound nouns of the type: "boeuf gras" /bø gra/ 'fatted ox', "cerf-volant" /sɛr volã/ 'kite' the stem final consonant of the first word of the compound is deleted; the first word is not in phrase final position.

15 "Words which have preserved a liaison form are generally words which occur in close grammatical relationship with the following word, or words for which liaison performs a special function, e.g., indicates the plural, expresses a change of meaning. Thus it is not surprising to find that many of them are adjectives which can precede nouns, pronouns, adverbs of degree, prepositions, verbs of very common use, plural

nouns." (Armstrong, p. 161.)

16 "La liaison ne se fait jamais après la consonne finale d'un nom au singulier...." (Grevisse, p. 60.) "Des expressions comme 'le sang\_humain, le respec(t)\_humain' sont livresques." (Grammont, 1961, p. 132.) Forms such as "Champs\_Elysées, accent\_aigu" are probably best regarded as compound words analogous to "pied-à-terre, cerf-volant", etc. (see note 14).

17 There are grammatical environments in which liaison is obligatory, others where it is not permitted, and still others where it is optional. Optional liaison is often a question of style. "La liaison dépend du style. Elle se fait d'autant moins que le style est plus familier. On peut distinguer au moins quatre styles;

1. La conversation familière
2. La conversation soignée
3. La conférence
4. La récitation des vers

Dans la conversation familière, on ne fait pas ou presque pas de liaisons facultatives: Des\_hommes/illustres/ont/attendu. Dans la conversation soignée, on en fait une petite proportion: Des\_hommes/illustres/ont\_attendu. Dans la conférence, on en fait la majorité: Des\_hommes\_illustres/ont\_attendu. Dans la récitation des vers, on les fait toutes: Des\_hommes\_illustres\_ont\_attendu." (Delattre, pp. 26-27.)

18 We have initially divided the noun phrase into a noun

group (article plus noun) and an adjective; i.e., a post-posed adjective modifies in a sense the entire noun group. A preposed adjective (e.g., "un bon camarade") is itself part of the noun group. Our constituent analysis is an attempt to formalize the traditional observation of "rhythmic group" and the claim that a postposed adjective belongs to a separate rhythmic group. "Ainsi l'adjectif qui précède le nom fait partie du même groupe rythmique que le substantif qu'il qualifie...; mais quand l'adjectif est placé après le nom il est attribut, et il appartient à un autre groupe rythmique...." (Grammont, 1960, pp. 416-417.)

19 For cyclic rules in phonology, see Chomsky, 1962, Chomsky and Miller, Chomsky and Halle (forthcoming).

20 Fouché cites about 700 words which begin with "h aspiré". This list does not include proper names or foreign borrowings.

21 "Ce n'est que dans le français régional (en Gascogne, en Saintonge, en Bretagne et surtout en Lorraine dans la Wallonie Orientale) que l'h aspiré se prononce avec un souffle, comme l'h allemand ou anglais par exemple. Exceptionnellement, même en français correct, l'h aspiré se prononce avec un souffle dans le cas d'exclamations poussées avec force (cf., han! hola! hep! hop! hue! halte!, etc.), dans le cas de sentiments violents (cf., je te hais, c'est une honte, etc.), et, comme moyen expressif, lorsqu'on veut donner

de l'accent à tel ou tel mot, par exemple dans le cas des verbes halter, se hisser, hurler, etc." (Fouché, p. 252.)  
See also Martinet, pp. 185-187.

22 Another peculiar property of the "h aspiré" words is that a preceding schwa is always pronounced; "... il <l'h aspiré> ne permet pas, comme le fait n'importe quelle consonne simple, la chute d'un e final devant lui: tandis que l'on dit 'un(e) tache' sans e, on prononce l'e de 'une' dans 'une hache.'" (Grammont, 1961, p. 124.) Evidently then, there must be some unique initial segment if one is to account for this phenomenon. This observation concerning schwa before "h aspiré" also provides further justification for having schwas in the representation (particularly in final position where they are practically always deleted). Such forms as "le oui, le onze, le yacht", etc. could reasonably be regarded as "h aspiré" words.

23 The four fricatives are differentiated from each other by the following features:

	f	s	ʃ	x
diff	+	+	-	-
grave	+	-	-	+

The stridency feature is introduced by redundancy rules:

[ + cons - voc @ cont ]	----->	<@ strid>
[ - diff + grave ]	----->	<- strid>

The first rule makes all stops non-strident and all continu-

ants strident. The second rule makes the velar continuant non-strident; it applies vacuously to the velar stops.

24 At the phonetic level the three identical vowels in hiatus may become a single extra-long vowel with pitch modulation. At the level of analysis with which we are dealing, there would still be theoretically three consecutive vowels.

25 Each word is preceded and followed by a # juncture. These junctures serve to delimit the beginning and end of a word. Hence between two consecutive words there will be ## . In previous examples, for facility of presentation, we used a single # to separate words.

26 The added condition that a segment must be unstressed in order to be truncated would apply vacuously to consonants. The latter are inherently unstressed. Thus, stress at the word level has two important functions: 1) it conditions the various vowel shifts which occur, and 2) it keeps certain vowels from being truncated in subsequent cycles. However, it has been noted for French that at the phrase level the individual words are not stressed; all syllables except the final one have more or less the same intensity, the final being somewhat louder. (We are not considering here contrastive stress or "l'accent d'insistance".) "Toute suite de mots qui exprime une idée simple et unique constitue un seul élément rythmique et n'a d'accent



que sur sa dernière syllabe.... L'accent n'appartient donc pas au mot, mais au groupe, et un mot donné le porte ou ne le porte pas, selon la place qu'il occupe dans le groupe et le rôle qu'il y joue." (Grammont, 1961, p. 196.) Therefore, we would require a rule which would delete all word stresses of a group except that of the last word.

27 The conjunction "si" has a deleted vowel before the third person masculine subject pronouns but not before other words beginning with a vocalic segment (e.g., "s'il, s'ils, si elle", etc.). This phenomenon is not a case of pre-vocalic truncation but rather is a special fact about "si" whenever it is followed by one of the third person masculine subject pronouns.

28 In the sentence (#je #aime# #la #musique#) the vowel of "je" will not receive stress and will be truncated at the phrase level. Analogously in (#tu #aimes# #la #musique#) the vowel of "tu" should be truncated. However, this vowel is pronounced. Therefore, we must say that "tu" is an exception to the truncation rule. It is interesting, though, that in colloquial speech the vowel of "tu" is in effect truncated before another vowel, e.g., "t'aimes la musique." This is by no means a recent innovation. Dubois already observed it in the Hainaut dialect: "t ne s'élide pas en français: dans le Hainaut on dit t'es sagè pour tu es sagè." (Livet, p. 23.) The tendency then is to treat "tu" like the

other pronouns and to have it not be an exception to the truncation rule.

29 When the pronouns "me, te, se" (also the interrogative "que") receive stress they undergo vowel shift and become "moi, toi, soi, quoi". Therefore, they must all have é as their underlying vowel. The fact that these pronouns do not undergo vowel shift in preverbal position corroborates the observation that pronouns do not receive stress at the word level and that only stressless vowels are truncated.

30 The non-verb elements of the verb group include the personal pronouns (both subject and object), the indefinite pronoun "on", the adverbial particles "y" and "en", and the negative particle "ne". Of syntactic importance is that the elements of the verb group occur in a fixed order and that the verb group is fused (i.e., no other elements may be inserted (for example, adverbs) within the verb group). This latter fact has raised some questions as to whether the non-verb constituents are words or particles. If we define the word as a sequence of segments preceded and followed by a #, then these elements would not have the status of full words.

31 In the form (#pAr1a# #Z)VG the final lax a (i.e., schwa) receives the stress; therefore, it will undergo vowel shift and be fronted to è. The optative forms would be handled in

the same way: e.g., "puissé-je, dussé-je", etc. Forms such as "suis-je, ai-je, puis-je", etc. would redundantly be stressed on the already stressed stem vowel. The above forms are not colloquial. Yet it is interesting to see how they fit into the overall system.

The pronoun "elle" has El as its underlying representation; the two l are needed in order to fulfill the environmental condition for schwa insertion, i.e.,

— <+ cons>  $\left[ \begin{array}{l} + \text{ cons} \\ - \text{ voc} \end{array} \right]$  . The two l are reduced to a single

l by a degemination rule.

Rule for degemination

$C_1C_2 \text{ -----} \rightarrow C_1$  , where the features of  $C_1$  and  $C_2$  are identical

This rule is not formulated uniquely to reduce the two l of "elle". One needs such a rule in any event to account for those styles where there is a single consonant in the output of forms such as "innombrable" /inõb'rabl(e)/, "illégal" /ilégál/, which must have the prefix In: i.e., #In=nOmĀr=Abl#, #In=lĒg=Al# (cf. "inoublable").

The rule for supporting vowel insertion must of course follow the rules for stress placement but must precede the truncation rule. Thus, the form "je parle" has as its underlying representation ((#Z)(#pArLa#)%)<sub>VG</sub> . In the first cycle (at the word level) the stem vowel becomes stressed. The schwa of "je" is not inserted at this point since the rule for supporting vowel insertion (p. 111) requires a juncture

after the lone consonant. The inner parentheses are then removed: ( $\overset{\sim}{z}$  #pArla#%)<sub>VG</sub> . In the second cycle (at the phrase level) the  $\overset{\sim}{z}$  is followed by a # ; therefore the schwa is appropriately inserted: ( $\overset{\sim}{z}$ e#pArla#%)<sub>VG</sub> . The form "parlé-je" has as its underlying representation:

((#pArla#) (# $\overset{\sim}{z}$ )%)<sub>VG</sub> . The first cycle is the same as in the preceding example: ((#pArla#) (# $\overset{\sim}{z}$ )%)<sub>VG</sub> . The inner parentheses are removed: (#pArla## $\overset{\sim}{z}$ %)<sub>VG</sub> . The rule for verb group stress places stress on the last vowel of the verb group: (#pArla## $\overset{\sim}{z}$ %) . Since the  $\overset{\sim}{z}$  is now followed by a juncture (%) the schwa is inserted: (#pArla## $\overset{\sim}{z}$ e%)<sub>VG</sub> .

32 "L'orthographe traditionnelle ne met de -t à la 3<sup>e</sup> personne du singulier qu'à la forme interrogative. C'est en effet le seul cas où il apparaisse. Il est plus simple de l'indiquer dans la forme normale..."; that is, in the underlying representation. (de Félice, p. 35.)

33 The rule for singular person marker deletion accounts for the absence of a person marker after schwa and stressed a, i.e., in the first conjugation present "il parle"; the subjunctive for all verbs "il parte, il doive"; the future for all verbs "il finira, il parlera"; and the first conjugation preterite "il parla".

## Chapter IV

### VERBS

Verbs in French can be conjugated for six persons and seven tenses. In addition there are three non-finite forms. This yields a total of 45 possible forms for a given verb stem.<sup>1</sup> The tenses, participles, and infinitive are often divided into three subgroups, the forms within each subgroup exhibiting similarities in behavior.<sup>2</sup>

A (present)	B (future)	C (past)
Present	Future	Preterite
Present subjunctive	---	Past subjunctive
Imperfect	Conditional	---
Present participle	Infinitive	Past participle

There are three principal verb conjugations: the first or "productive" conjugation (e.g., "parler" 'speak'); the second conjugation with two subclasses, those forms which insert "-iss" in certain persons and tenses (e.g., "finir" 'finish'), and those which do not (e.g., "partir" 'leave'); the third conjugation with two subclasses, those forms which have infinitives in "-re" (e.g., "vendre" 'sell') and those with infinitives in "-oir" (e.g., "savoir" 'know').<sup>3</sup> We believe that the partitioning of verbs into three principal conjugations and the subgrouping of tenses which we noted above are the correct classifications for the verbal forms

of French. It remains to show how our underlying representations provide a formal means of accounting for this traditional observation.

#### 4.1. The Tenses

##### 4.1.1. First and Second Conjugations

###### 4.1.1.1. Group A (present)

###### 4.1.1.1.1. Present Tense

The verb "dormir" 'sleep' has the following forms in the present indicative:

je dors	/dòr/	nous dormons	/dòrmõ/
tu dors	/dòr/	vous dormez	/dòrmé/
il dort	/dòr/	ils dorment	/dòrm/

The plural forms have as their stem: /dòrm/, whereas the singular forms do not show the final stem consonant: /dòr/. Since we should like to derive all forms from a single underlying stem, the absence of the consonant in the singular forms could be easily explained if it were the case that the final stem consonant was followed by another consonant. Under these circumstances the stem consonant would be deleted by the truncation rule.

In those styles where liaison occurs between the verb and the following word (e.g., "il dort\_aujourd'hui" 'he is sleeping today') the following forms are noted:

/dòrz/	/dòrmõz/
/dòrz/	/dòrméz/
/dòrt/	/dòrm(e)t/

In the case of the singular forms we shall consider the

liaison consonant to be a person marker, so that 1 sg = S, 2 sg = S, and 3 sg = t.<sup>4</sup> The addition of a person marker produces a bi-morphemic structure: #verb stem + person marker#

#dòrm+S#  
#dòrm+S#  
#dòrm+t#

The m is then deleted by the truncation rule.

Since the final stem consonant is found throughout the plural, the 'plural' person markers must begin with a vowel, thus protecting the final stem consonant from truncation. That the person markers have a vowel as their initial segment is clear in the case of the first and second plurals, where the person markers are ONS and ES respectively. (The vowels are tense since they receive the stress.)<sup>5</sup>

#dòrm+ONS#  
#dòrm+ES#

The third plural person marker must also begin with a vowel if the final stem consonant is not to be truncated. This vowel shows up as schwa in the output of particular styles.<sup>6</sup> Since the vowel is always found in post-tonic position, it will have to be lax in the underlying representation. Let us for the moment indicate it directly as schwa. Later we shall determine the exact underlying representation.

#dòrm+et#

In the first conjugation (e.g., "former" 'form') the final stem consonant appears throughout the paradigm.<sup>7</sup>

il forme /fòrm(e)/  
nous formons /fòrmō(z)/  
ils forment /fòrm(e)(t)/

This suggests that the stem terminates in a lax vowel: fòrma, and it is this vowel which protects the final stem consonant throughout the singular. The vowel is truncated in the plural forms where it is always followed by another vowel.

#fòrma+ONS#      #fòrma+et#  
#fòrm +ONS#      #fòrm +et#

Since all first conjugation verbs have an a before the person marker, in the lexicon this a need not be expressly indicated as a segment of the stem providing that the morphological class of the stem is known. It is this morphological information which is represented at the phonological level by the segment a. Therefore, this vowel will be considered as a separate constituent (i.e., the conjugation marker).<sup>3</sup> We shall refer to this conjugation marker as the thematic vowel. In the present tense, then, the finite verb forms (for at least the first conjugation) have the following structure:

# stem + thematic + person #  
#fòrm+a+t#  
#fòrm+a+ONS#  
#fòrm+a+et#

Since one should like to postulate the same structure for all present tense forms, one could suppose that the second conjugation verbs of the type "dormir" also have a



thematic vowel. A comparison of other paradigmatic members leads one to postulate lax i as the thematic vowel.<sup>9</sup>

#dòrm+i+t#  
 #dòrm+i+ONS#  
 #dòrm+i+et#

The presence of a thematic vowel in the singular presents a difficulty, since the thematic vowel should prevent the final stem consonant from being truncated. However, we have already established that post-tonic non-low (<- comp>) vowels are deleted.<sup>10</sup> We can incorporate this already existent rule into the system if we adopt the following order:<sup>11</sup>

- 1) stress placement (6)
- 2) post-tonic vowel deletion (18)
- 3) truncation (15)

We illustrate by contrasting the present tense of "dormir" and "former".

	"dort"	"dormons"	"forme"	"formons"
	#dòrm+i+t#	#dòrm+i+ONS#	#fòrm+a+t#	#fòrm+a+ONS#
1)	#dòrm+i+t#	#dòrm+i+ONS#	#fòrm+a+t#	#fòrm+a+ONS#
2)	#dòrm +t#	---	---	---
3)	#dòr +t#	#dòrm +ONS#	---	#fòrm +ONS#

In the second conjugation, in addition to the verbs of the type "dormir", there is a subclass of verbs which have "-iss" in certain forms (e.g., "finir").

il	finit	/f <u>ini</u> (t)/
nous	finissons	/f <u>inis</u> õ(z)/
ils	finissent	/f <u>inis</u> (e)(t)/

These forms exhibit the thematic vowel throughout. The s can be considered an infix which occurs with this particular subclass and which is truncated when followed by a consonant segment.

#fIn+1+s+t#  
#fIn+1+s+ONS#  
#fIn+1+s+et#

The thematic i has to be made tense if it is to become stressed in certain of the forms. Yet the corresponding forms of "dormir" (where the thematic vowel is also i) must not have a tense thematic vowel if stress is to be placed on the stem in the singular and third plural. (Recall that stress is placed on the last tense vowel; if there is no tense vowel then stress is placed on the left-most vowel.)

#dòrm+1+t#  
#dòrm+1+ONS#  
#dòrm+1+et#

Comparing these two sub-classes of verbs it is seen that for the "finir" type the thematic vowel is always followed by a consonantal segment (+s), which suggests that the consonant might be a significant part of the environment for thematic vowel tensing. Yet, the singular forms of "dormir" also exhibit a consonant after the thematic vowel. For these forms the consonant is the final segment of the word, whereas for forms of the type "finir" the consonant after the thematic vowel is not the final segment but is in all cases followed by one or more additional segments. Therefore, we shall require a rule which makes the thematic vowel tense whenever it is followed by at least two segments of which the first is consonantal. This rule must precede the rule for stress placement since in the singular and third plural of "finir" stress is placed on the tense thematic vowel.

Rule for thematic vowel tensing

V -----> <+ tense> in the env. + \_\_\_ + <+ cons> < >

We contrast "finir" with "dormir".

- 1) thematic vowel tensing (5)
- 2) stress placement (6)
- 3) post-tonic vowel deletion (18)
- 4) truncation (15)

	"finit"	"finissons"	"dort"	"dormons"
	#fIn+i+s+t#	#fIn+i+s+ONS#	#dòrm+i+t#	#dòrm+i+ONS#
1)	#fIn+I+s+t#	#fIn+I+s+ONS#	---	---
2)	#fIn+I+s+t#	#fIn+I+s+ONS#	#dòrm+i+t#	#dòrm+i+ONS#
3)	---	---	#dòrm +t#	---
4)	#fIn+I +t#	---	#dòr +t#	#dòrm +ONS#

(Third conjugation verbs and "irregular" verbs are discussed elsewhere in the chapter.)

4.1.1.1.2. Imperfect Tense

je dormais	/dòrmè(z)/	nous dormions	/dòrmyõ(z)/
tu dormais	/dòrmè(z)/	vous dormiez	/dòrmyé(z)/
il dormait	/dòrmè(t)/	ils dormaient	/dòrmè(t)/

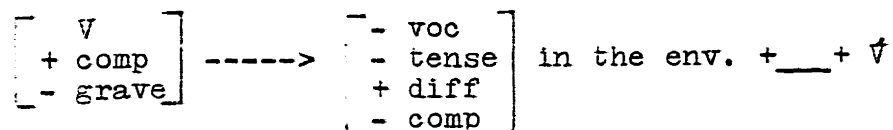
In the imperfect the vowel of the tense marker is stressed throughout the singular and in the third plural. If the vowel is to receive stress it must be tense. We shall therefore assign è as the imperfect marker.

#dòrm+i+è+t#  
 #fIn+i+s+è+ONS#  
 #fòrm+a+è+et#

However, the vowel of the imperfect becomes /y/ in the first and second persons plural (i.e., whenever the following vowel is stressed). Furthermore, the "imperfect" vowel must become /y/ before truncation applies, otherwise the vowel would be truncated. (This internal morphological behavior

corroborates the observation concerning truncation, i.e.,  
 that glides are not truncated whereas vowels are.)

Rule for yod-formation



( $\bar{E} > y$  before a stressed vowel)

The verb forms will have the following structure:

# stem + thematic + tense + person # . We illustrate with  
 the derivations of "dormait" and "dormions".

- 1) thematic vowel tensing (5)
- 2) stress placement (6)
- 3) yod-formation (9)
- 4) post-tonic vowel deletion (18)
- 5) truncation (15)

	"dormait"	"dormions"
	#dòrm+i+ $\bar{E}$ +t#	#dòrm+i+ $\bar{E}$ +ONS#
1)	---	---
2)	#dòrm+i+ $\bar{E}$ +t#	#dòrm+i+ $\bar{E}$ +ONS#
3)	---	#dòrm+i+y+ONS#
4)	---	---
5)	#dòrm + $\bar{E}$ +t#	#dòrm +y+ONS#

4.1.1.1.3. Present Subjunctive

je dorme	/dòrm(e)/	nous dormions	/dòrmyõ(z)/
tu dormes	/dòrm(e)/	vous dormiez	/dòrmyé(z)/
il dorme	/dòrm(e)/	ils dorment	/dòrm(e)(t)/

In the singular all present subjunctive forms retain  
 the final stem consonant. The mark of the subjunctive must  
 therefore be a vowel. This vowel will have to be lax so that  
 it will not receive stress. In addition, it must be compact  
 (low); otherwise it would be deleted by the rule for post-

tonic vowel deletion and there would be no vowel to protect the final stem consonant from truncation.

The first and second plural forms of the subjunctive are homophonous with the corresponding forms of the imperfect. The vowel of the subjunctive cannot be a for if this vowel were to become /y/ before a stressed vowel, the thematic a of first conjugation forms would also become /y/ in the present tense. Clearly, then, the subjunctive vowel is not the same vowel as the first conjugation thematic vowel even though both ultimately show up as schwa in the output of certain forms. However, as we have already stated, the subjunctive vowel must be a low vowel, otherwise it would be deleted by the rule for post-tonic vowel deletion. The subjunctive could be represented then by either lax è or ò. A rule is needed which converts the vowel to /y/ in the first and second plural. There is already a rule which changes È to /y/ under the same conditions (in the imperfect). If we represent the subjunctive as è we can generalize the yod-formation rule (the difference between è and È lies in the tenseness feature) and allow either low front unrounded vowel to become /y/ when followed by a stressed vowel.<sup>12</sup> (The rule as presented in the preceding section is stated so that it will handle both vowels.) Those è which do not become /y/ will have to be converted to schwa. Since these vowels are in post-tonic position they will automatically become schwa by the rule for schwa conversion (Chapter II).

We contrast the 3 sg present with the subjunctive and the 1 pl subjunctive with the imperfect.

- 1) thematic vowel tensing (5)
- 2) stress placement (6)
- 3) yod-formation (9)
- 4) post-tonic vowel deletion (18)
- 5) truncation (15)
- 6) schwa conversion (25)

	"forme"(pres)	"forme"(subj)	"formions"(subj)	"formions"(imp)
	#fòrm+a+t#	#fòrm+a+è+t#	#fòrm+a+è+ONS#	#fòrm+a+E+ONS#
1)	---	---	---	---
2)	#fòrm+a+t#	#fòrm+a+è+t#	#fòrm+a+è+ONS#	#fòrm+a+E+ONS#
3)	---	---	#fòrm+a+y+ONS#	#fòrm+a+y+ONS#
4)	---	---	---	---
5)	---	#fòrm +è+t#	#fòrm +y+ONS#	#fòrm +y+ONS#
6)	---	#fòrm +a+t#	---	---

#### 4.1.1.1.4. Present participle

"dormant"	/dòrmā(t)/
"finissant"	/finisā(t)/
"formant"	/fòrmā(t)/

The present participle is always stressed on the vowel of the "participle" morpheme. We shall therefore set up Ant as the underlying representation of the present participle.<sup>13</sup> No new rules are needed to derive the output forms. The three forms cited above will then have the following representations.

#dòrm+i+Ant#
#fin+i+s+Ant#
#fòrm+a+Ant#

#### 4.1.1.2. Group B (future)

##### 4.1.1.2.1. The Infinitive

"dormir"	/dòrmir/
"finir"	/finir/
"former"	/fòrmé/

The second conjugation forms show that the thematic vowel is stressed and that the infinitive marker must be r. "Dormir" would appear then to have the following underlying representation: #dòrm+i+r#. In order for the thematic vowel to receive the stress it must be made tense. There already exists a tensing rule (i.e., the rule for thematic vowel tensing), which is needed in order to account for the tense thematic vowel found in second conjugation verbs of the type "finir" ("finit, finissent", etc.). The rule states that the thematic vowel becomes tense whenever it is followed by two segments of which the first is consonantal. It would be desirable to utilize this same rule for the thematic vowel tensing which takes place in infinitives. However, in the form #dòrm+i+r#, the thematic vowel is not followed by two segments. If the representation were #dòrm+i+r<sup>e</sup># then the necessary conditions would be present to cause the thematic vowel to become tense. The tense I would then be stressed; the final vowel (which is non-compact) would be deleted by the rule for post-tonic vowel deletion. If we represent the <sup>infinitive</sup> by r<sup>e</sup>, then no new rules are needed to account for the forms (at least in the second conjugation).<sup>14</sup>

The verb "finir" differed from "dormir" in that an s was infix between the thematic vowel and the tense marker. This infix s is restricted to the present, imperfect, present subjunctive, and present participle (Group A). It does

not appear in the other tenses. Therefore, while the representation for the third singular of the present subjunctive is #fIn+i+s+è+t# , the representation for the infinitive is #fIn+i+ré# . Its derivation is identical to that of "dormir".

The underlying representation for "former" must accordingly be: #fòrm+a+ré# . The thematic vowel becomes tense and receives the stress, yielding: #fòrm+A+ré# . The final vowel is deleted by the rule for post-tonic vowel deletion: #fòrm+A+r# . It remains to convert A+r to /é/.

(First, however, we must note certain nouns and adjectives of the type: "étranger : étrangère" /étrāžé : étrāžèr(e)/ 'stranger'; "premier : première" /premyé : premyèr(e)/ 'first', etc. For the latter pair the underlying representation for the masculine is #prēm=èr# and for the feminine #prēm=èr+a# . Stress is placed on the suffix and since the vowel is lax front unrounded it undergoes diphthongization (22), yielding: #prēm=yèr# and #prēm=yèr+a# . To account for the masculine form a rule is needed which converts è to é and deletes the r whenever the two segments èr immediately precede # .<sup>15</sup>

Rule for é-conversion

$$\begin{array}{c}
 \bar{V} \\
 \left[ \begin{array}{l} + \text{ comp} \\ - \text{ grave} \\ - \text{ round} \end{array} \right] \quad r \neq \quad \text{-----} \quad \left[ \begin{array}{l} 1 \\ - \text{ comp} \end{array} \right] \quad \emptyset \quad 3 \\
 \quad \quad \quad 1 \quad \quad \quad 2 \quad 3 \\
 (\text{èr\#} > \text{é\#})
 \end{array}$$

In the form #fòrm+A+r# the thematic vowel is tense and



will therefore remain /a/. However, if the vowel were to become lax it would undergo vowel fronting and become  $\underline{e}$ : #fòrm+ $\underline{e}$ +r#. The rule for  $\acute{e}$ -formation would produce the correct final form: #fòrm+ $\acute{e}$ #. A rule is needed which makes the thematic vowel lax. What are the conditions for a tense thematic vowel to become lax? First, the thematic vowel must be non-high (<- diff>) (cf. "finir, dormir" which are always tense); second, the thematic vowel must be followed by a single consonantal segment.<sup>16</sup>

Rule for thematic vowel laxing

$\left[ \begin{array}{c} \text{V} \\ - \text{diff} \end{array} \right]$  -----> <- tense> in the env. +\_\_\_+  $\left[ + \text{cons} \right]^1$

We give the derivations of "dormir" and "former". (The rules for yod-formation and schwa-formation are omitted since they are not relevant to this example.)

- 1) thematic vowel tensing (5)
- 2) stress placement (6)
- 3) post-tonic vowel deletion (18)
- 4) thematic vowel laxing (8)
- 5) truncation (15)
- 6) vowel fronting (23)
- 7)  $\acute{e}$ -conversion (35)

	"dormir"	"former"
	#dòrm+i+ré#	#fòrm+a+ré#
1)	#dòrm+I+ré#	#fòrm+A+ré#
2)	#dòrm+I+ré#	#fòrm+A+ré#
3)	#dòrm+ <u>I</u> +r #	#fòrm+ <u>A</u> +r #
4)	---	#fòrm+ <u>a</u> +r #
5)	---	---
6)	---	#fòrm+ $\underline{e}$ +r #
7)	---	#fòrm+ $\underline{e}$ #

4.1.1.2.2. The Future Tense

je dormirai	/dòrmiré/	nous dormirons	/dòrmirô(z)/
tu dormirás	/dòrmira/	vous dormirez	/dòrmiré(z)/
il dormira	/dòrmira/	ils dormiront	/dòrmirô(t)/

In all these forms the thematic vowel appears before the r but the forms exhibit different vowels after the r. The first and second plurals show the characteristic vowel of their person markers. However, what is the origin of the vowel found in the other forms? The second and third singulars suggest that the future marker is rA; the vowel must be tense since it is stressed in these forms and does not undergo vowel shift. We shall illustrate with the third singular. The underlying representation is #dòrm+i+rA+t#. Since the thematic vowel is followed by two segments of which the first is consonantal, the vowel will become tense: #dòrm+i+rA+t#. Stress is placed on the last tense vowel: #dòrm+i+rA+t#. The absence of the final consonant in liaison is due to the preceding central vowel (i.e., rule for person marker deletion (34): #dòrm+i+rA ≠. The second singular is similarly derived from an underlying: #dòrm+i+rA+S#.

The underlying representation for the first plural is #dòrm+i+rA+ONS#. The thematic vowel becomes tense and stress is placed on the last tense vowel (i.e., the person marker): #dòrm+i+rA+ONS#. The truncation rule deletes the A: #dòrm+i+r+ONS#. The second plural is similarly derived.

If the first singular is represented as #dòrm+i+rA+S#,

it would have a derivation identical to that of the second singular. Yet one observes that although the final forms of the first and second singulars are usually identical in most tenses they are different in the future. This difference can be accounted for only if the two forms do not have the same underlying representations, and accordingly the difference can only be in the person marker; the stem, thematic vowel, and tense marker remain constant throughout. Originally, we postulated a single person marker S (which was neither /s/ nor /z/ but the features common to both save voicing). The fact that only /z/ occurs in the phonetic output (i.e., when liaison takes place) is predictable since continuants are always voiced under these conditions. Therefore, we shall make use of the voicing feature to differentiate the first and second singular forms. The first singular will be represented by z and the second singular by s. The fact that s shows up as /z/ in liaison is still automatically handled by the rule which voices continuants in the liaison environment and this rule then will account for the homophony of the two forms under such circumstances.

In the first singular of the future the verb "dormir" will then have the following representation: #d<sup>h</sup>orm+i+rA+z#. Thematic vowel tensing and stress placement are straightforward, yielding: #d<sup>h</sup>orm+I+rA+z#. It is necessary to convert A+z# to /é/. We shall do this in two steps: first, A+z# will become A+i#, then the combination A+i will be

converted to /é/.<sup>17</sup>

Rule for i-conversion

z ----->  $\begin{bmatrix} - \text{ cons} \\ + \text{ voc} \\ - \text{ strid} \end{bmatrix}$  in the env.  $\begin{bmatrix} V \\ + \text{ grave} \\ - \text{ round} \end{bmatrix}$  + \_\_\_ #

(z > lax i in final position whenever it follows a central vowel)

Rule for vowel attraction

$\begin{bmatrix} V \\ + \text{ tense} \\ + \text{ grave} \\ - \text{ round} \end{bmatrix}$  1 +  $\begin{bmatrix} V \\ - \text{ tense} \\ + \text{ diff} \\ - \text{ round} \end{bmatrix}$  2 ----->  $\begin{bmatrix} i \\ - \text{ comp} \\ - \text{ grave} \end{bmatrix}$  3  $\emptyset \emptyset$

(A+i > /é/)

The third person form is unique in that it shows a nasalized stressed vowel in the output: /dòrmir $\bar{\text{o}}$ (t)/. The nasalization of the vowel must be due to a following nasal consonant. This nasal consonant can only be part of the person marker; this means that the third plural ending is composed of three segments: some vowel followed by a nasal consonant followed by t. We can therefore represent the future as #dòrm+i+rA+Vnt#. What is the nature of the vowel? It has to be lax since it does not receive the stress. Furthermore, it must convert preceding A to a back rounded vowel which is then nasalized. There is already a rule (required in the future of the first singular) which converts A to /é/ whenever the vowel following A is lax and high (diffuse), i.e., i. However, there is another lax high

vowel in the system, namely i. Just as the front lax high vowel raises and fronts A, one could expect that the back lax high vowel should raise and back A (i.e., Au > /ó/). Both types of vowel attraction could then be accounted for by a single assimilation rule.

Rule for vowel attraction (revised)

$$\begin{array}{c} \left[ \begin{array}{c} V \\ + \text{ tense} \\ + \text{ grave} \\ - \text{ round} \end{array} \right] \\ 1 \end{array} + \begin{array}{c} \left[ \begin{array}{c} V \\ - \text{ tense} \\ + \text{ diff} \\ @ \text{ round} \end{array} \right] \\ 2 \end{array} \longrightarrow \begin{array}{c} \left[ \begin{array}{c} \downarrow \\ - \text{ comp} \\ @ \text{ grave} \\ @ \text{ round} \end{array} \right] \emptyset \emptyset \\ 3 \end{array}$$

If we adopt this analysis the underlying representation of "dormiront" is: #d<sup>h</sup>orm+i+rA+unt#. The thematic vowel becomes tense and stress is placed on the last tense vowel: #d<sup>h</sup>orm+I+rA+unt#. The rule for vowel attraction yields: #d<sup>h</sup>orm+I+ró+nt#. The stressed vowel then undergoes nasalization: #d<sup>h</sup>orm+I+rõ+t#.

Why is there no nasalization in the third plural forms of other tenses? We shall illustrate with the third plural present "dorment". The underlying representation is now #d<sup>h</sup>orm+i+unt#. The thematic vowel does not become tense as it is not followed by a consonantal segment; stress is placed on the stem vowel: #d<sup>h</sup>orm+i+unt#. The lax i is deleted by post-tonic vowel deletion: #d<sup>h</sup>orm +unt#. The u is not deleted, even though it is non-low (non-compact), since the rule for post-tonic vowel deletion (18) permits no more than one consonant to follow the vowel; i.e., the

vowel is not deleted whenever it is followed by two consonants. The nasal consonant and the final t serve to protect the lax u. If we place a condition on the nasalization rule, namely, that a post-tonic vowel cannot be nasalized, we can account for the absence of nasalization. (Recall that in the form "dormiront", A+unt > Ó+nt so that the nasal consonant immediately followed the tonic vowel.) This condition is not imposed uniquely for nasalization. Several of the vowel changes (diphthongization, fronting, raising) can apply only to vowels which are not in post-tonic position. This environmental restriction is needed then for a block of rules.

Since the u of unt has been neither deleted nor nasalized it will be converted to schwa by the rule for schwa conversion (25); all post-tonic vowels merge to schwa: #dòrm +ent#. It is still necessary to delete the nasal consonant. Elsewhere in the grammar there is needed a rule which deletes the first of two consonants in word final position.<sup>18</sup> We shall make use of this rule to delete the n of the third person ending.

Rule for pre-final consonant deletion

$\left[ \begin{array}{l} + \text{ cons} \\ - \text{ voc} \end{array} \right] \text{-----} \rightarrow \emptyset \text{ in the env. } \underline{\quad} \text{ C } \#$

The first conjugation verbs all have schwa before the r, e.g., "formera" /fòrmera/. This schwa results from rules which have already been established. As an example,

the third singular has the following representation:

$\#f\grave{o}r\text{m}+a+rA+t\#$  . The thematic vowel is followed by two segments of which the first is consonantal. Therefore, the vowel becomes tense:  $\#f\grave{o}r\text{m}+A+rA+t\#$  . Stress is placed on the last tense vowel:  $\#f\grave{o}r\text{m}+A+r\underline{A}+t\#$  . Since the thematic vowel is non-high (non-diffuse) and followed by a single consonantal segment the thematic vowel becomes lax:

$\#f\grave{o}r\text{m}+a+r\underline{A}+t\#$  . (This rule was needed in the infinitive:  $f\grave{o}r\text{m}+A+r > f\grave{o}r\text{m}+a+r > f\grave{o}r\text{m}+\underline{e}+r > f\grave{o}r\text{m}+e$  .) A pre-tonic lax vowel undergoes pre-tonic adjustment (21):  $\#f\grave{o}r\text{m}+E+r\underline{A}+t\#$  . Pre-tonic tense  $\underline{E}$  becomes schwa (25):  $\#f\grave{o}r\text{m}+e+r\underline{A}+t\#$  . Since the final  $\underline{t}$  follows a central vowel it is deleted by the rule for singular person marker deletion (34):

$\#f\grave{o}r\text{m}+e+r\underline{A} \#$  .

We illustrate the derivations of the various future forms. The third plural future is also contrasted with the third plural present.

1) thematic vowel tensing (5)					
2) stress placement (6)					
3) post-tonic vowel deletion (18)					
4) thematic vowel laxing (8)					
5) truncation (15)					
6) i-conversion (16)					
7) vowel attraction (17)					
8) pre-tonic vowel adjustment (20)					
9) schwa conversion (25)					
10) nasalization (27)					
11) pre-final consonant deletion (34)					
12) singular person marker deletion (34)					
	"formera"	"dormlrai"	"finlront"	"finlssent"	
1)	#förmta+rA+l#	#dörm+I+rA+z#	#fIn+I+rA+unt#	#fIn+I+s+unt#	
2)	#förm+A+rA+t#	#dörm+I+rA+z#	#fIn+I+rA+unt#	#fIn+I+s+unt#	
3)	#förm+A+rA+t#	#dörm+I+rA+z#	#fIn+I+rA+unt#	#fIn+I+s+unt#	
4)	---	---	---	---	
5)	#förmta+rA+t#	---	---	---	
6)	---	#dörm+I+rA+l#	---	---	
7)	---	#dörm+I+rA#	#fIn+I+rö+nt#	---	
8)	#förm+e+rA+l#	---	---	---	
9)	#förm+e+rA+t#	---	#fIn+I+rö+nt#	#fIn+I+s+ent#	
10)	---	---	---	---	
11)	---	---	#fIn+I+rö+nt#	#fIn+I+s+ent#	
12)	#förm+e+rA#	---	---	---	



4.1.1.2.3. The Conditional

je dormirais	/dòrmirè(z)/	nous dormirions	/dòrmiryô(z)/
tu dormirais	/dòrmirè(z)/	vous dormiriez	/dòrmiryé(z)/
il dormirait	/dòrmirè(t)/	ils dormiraient	/dòrmirè(t)/

Morphologically the conditional resembles the future up to the r and the imperfect after the r. To show this resemblance we shall represent the conditional by two morphemes: that of the future and that of the imperfect.<sup>19</sup>

#dòrm+i+rA+E+t#  
 #dòrm+i+rA+E+ONS#  
 #dòrm+i+rA+E+unt#

The derivations are straightforward and require little explanation: è becomes /y/ when followed by a stressed vowel and the A of rA in all cases is truncated by the following <- cons> segment.

4.1.1.3. Group C (past)

4.1.1.3.1. The preterite tense (passé simple)

je dormis	/dòrmì(z)/	nous dormîmes	/dòrmim(e)(z)/
tu dormis	/dòrmì(z)/	vous dormîtes	/dòrmît(e)(z)/
il dormit	/dòrmì(t)/	ils dormirent	/dòrmir(e)(t)/

The preterite forms are characteristically stressed on the thematic vowel and show special person markers for the first and second plurals.<sup>20</sup> The only output form which has an overt tense marker is the third plural "dormirent" where r appears to be the marker of the preterite. If this marker were to appear in the underlying representation of the other five forms, it would have to become deleted somewhere in the derivation. One notes further that all the person endings,

except for the third plural, begin with a consonant (viz., z, s, t, mes, tes) and it must be this consonant which causes the preceding tense marker to be truncated. Yet, we have shown (Chapter III) that liquids are never truncated. Hence the underlying representation of the tense marker for the preterite must not be r but rather a true consonant (i.e., a segment which is <+ cons, - voc>); this consonant becomes r only in the third plural (where it is intervocalic).

In terms of distinctive features r has the following phonological representation:

$$\left[ \begin{array}{l} + \text{ cons} \\ + \text{ voc} \\ + \text{ cont} \\ - \text{ comp} \\ - \text{ grave} \\ - \text{ strid} \end{array} \right]$$

If this segment is converted into a true consonant (i.e., if it is made <- voc>), it will have all the features of a dental sibilant; (the stridency must also be changed).

$$\left[ \begin{array}{l} + \text{ cons} \\ - \text{ voc} \\ + \text{ cont} \\ - \text{ comp} \\ - \text{ grave} \\ + \text{ strid} \end{array} \right]$$

Therefore, we shall represent the preterite morpheme by the segment ʒ and allow this segment to become r whenever it is intervocalic. (Further structural evidence for a dental consonant will become apparent after we have presented the other Group C tenses.)<sup>21</sup>

Rule for rhotacism

S ----->  $\left[ \begin{array}{l} + \text{ voc} \\ - \text{ strid} \end{array} \right]$  in the env. V + \_\_\_ + V

Postulating S as the morpheme of the preterite causes some difficulty, for we have already utilized s (the voiceless sibilant) as the infix marker for certain second conjugation verbs (type "finir"). According to the above rule this infix s should rhotacize whenever it is found intervocalically (e.g., /finis(e), finisõ/, etc.). To resolve this difficulty let us say that the infix marker for second conjugation verbs is not s but rather ss and that a geminate sibilant does not rhotacize. The ss would then be simplified by the rule for degemination (33), which was developed in Chapter III. The degemination rule must of course follow the rule for rhotacism.<sup>22</sup>

However, setting up ss creates another problem. In the present singular (e.g., #fIn+i+ss+t#) only one s would be deleted by the truncation rule, yielding: #fIn+I+s +t#. We would therefore need a rule (after truncation) which deletes the first of two consonants in word final position. We already have such a rule in the grammar, for we encountered a similar situation when we dealt with the third plural marker unt#. The same rule (i.e., pre-final consonant deletion) which deletes the n of unt# will cause the s of #fIn+I+s +t# to be deleted also.

Having established that the preterite is S, it is easy

to account for the presence of a tense thematic vowel since the vowel will have acquired its tenseness by the rule for thematic vowel tensing. We illustrate with the derivations of the third person forms.

- 1) thematic vowel tensing (5)
- 2) stress placement (6)
- 3) rhotacism (11)
- 4) truncation (15)
- 5) schwa conversion (25)
- 6) pre-final consonant deletion (34)

	"dormit"	"dormirent"
	#dòrm+i+S+t#	#dòrm+i+S+unt#
1)	#dòrm+I+S+t#	#dòrm+I+S+unt#
2)	#dòrm+ <u>I</u> +S+t#	#dòrm+ <u>I</u> +S+unt#
3)	---	#dòrm+ <u>I</u> +r+unt#
4)	#dòrm+ <u>I</u> +t#	---
5)	---	#dòrm+ <u>I</u> +r+ent#
6)	---	#dòrm+ <u>I</u> +r+e t#

Another characteristic of the preterite, which we noted, is the "special" set of person endings in the first and second plurals (i.e., "-mes, -tes"). Are these endings at all related to those which are found in the other tenses (i.e., "-ons, -ez")? If the first plural marker were OmS instead of ONS (i.e., we specify exactly which nasal consonant occurs), there could be a rule which metathesizes the first and second segments; it would also be necessary to make the resultant vowel lax and low so it would be neither stressed nor deleted. From the ending OmS one would then derive mòS. Since the vowel has become a post-tonic lax low vowel it will not be deleted but will be converted to schwa by existing rules.

Can the metathesis be extended to the second plural marker? This maneuver of course requires that the underlying representation of the second plural be composed of at least three segments and that the second segment be t: viz., ɛ̇tS.<sup>23</sup> To obtain the preterite form one would again metathesize the first and second segments and make the resultant vowel lax and low so that it, too, would neither receive stress nor undergo post-tonic vowel deletion (i.e., ɛ̇tS > tèS).

Rule for metathesis

$$\begin{array}{ccccccc}
 7 & C & + & \left[ \begin{array}{c} V \\ - \text{diff} \\ - \text{comp} \end{array} \right] & C & C & \# \text{ -----} & 1 & 2 & 3 & 5 & \left[ \begin{array}{c} 4 \\ - \text{tense} \\ + \text{comp} \end{array} \right] & 6 & 7 \\
 1 & 2 & 3 & & 4 & & & 5 & 6 & 7 & & & & \\
 \text{(Oms} & > & \text{mòS, } & \text{ɛ̇tS} & > & \text{tèS)}
 \end{array}$$

The metathesis rule can take place only when the person ending is preceded by a single consonant (position 2 in the structural formula). In the other tenses which we have so far examined metathesis will not occur since the person marker is immediately preceded by a vowel (the thematic vowel in the case of the present tense, the various tense marker vowels for the other tenses of Group A). Similarly, if the second conjugation infix ss is present metathesis will not take place, for the structural description requires a single consonant. This provides an additional motivation for postulating the two segment ss as the infix.

Since in the other tenses the endings Oms and ɛ̇tS do

not metathesize, these endings will then be subjected to previously established rules. Thus, in the first plural the vowel will become nasalized and low (by the nasalization rules). In the case of the second plural the t will have to be deleted. This deletion does not require a new rule since the t is the first of two consonants in word final position; it will accordingly be deleted by the pre-final consonant deletion rule which was required elsewhere. The segments in final position (i.e., S) will be retained or truncated depending on whether or not liaison is made.

We illustrate the rules so far developed by contrasting the first and second plurals of the present and preterite of the verbs "dormir" and "finir".

- 1) metathesis (4)
- 2) thematic vowel tensing (5)
- 3) stress placement (6)
- 4) rhotacism (11)
- 5) truncation (15)
- 5) schwa conversion (25)
- 7) nasalization, degemination (27, 33)
- 3) pre-final consonant deletion (34)

	"dormons"	"dormimes"	"finissez"	"finîtes"
	#dòrm+i+OmS#	#dòrm+i+S+OmS#	#fIn+i+ss+ÉtS#	#fIn+i+S+ÉtS#
1)	---	#dòrm+i+S+mòS#	---	#fIn+i+S+tèS#
2)	---	#dòrm+I+S+mòS#	#fIn+I+ss+ÉtS#	#fIn+I+S+tèS#
3)	#dòrm+i+OmS#	#dòrm+I+S+mòS#	#fIn+I+ss+ÉtS#	#fIn+I+S+tèS#
4)	---	---	---	---
5)	#dòrm +OmS#	#dòrm+I +mòS#	---	#fIn+I +tèS#
5)	---	#dòrm+I +meS#	---	#fIn+I +tèS#
7)	#dòrm +õ S#	---	#fIn+I+s +ÉtS#	---
3)	---	---	#fIn+I+s +É S#	

First conjugation verbs have the following forms in the preterite:

je formai	/fòrmé/	nous formâmes	/fòrmam(e)(z)/
tu formas	/fòrma/	vous formâtes	/fòrmat(e)(z)/
il forma	/fòrma/	ils formèrent	/fòrmèr(e)(t)/

The presence of a stressed tense /a/ in four of the forms results from the application of the rule for thematic vowel tensing. However, the first singular and third plural exhibit different vowels. The underlying representation for the third plural must be #fòrm+a+S+unt#. The thematic vowel becomes tense and accordingly receives the stress: #fòrm+A+S+unt#. The thematic vowel, which is non-diffuse, is followed by a single consonantal segment. It is in this environment that the rule for thematic vowel laxing (8) applies: #fòrm+a+S+unt#. (It is to be recalled that the rule for thematic vowel laxing was originally postulated to handle the Group B forms (e.g., fòrm+A+ré > fòrm+A+ré > fòrm+a+r > fòrm+è+r > fòrm+é).) The thematic vowel does not become lax in the other persons of the preterite since in those forms the thematic vowel is always followed by two consonants (i.e., the preterite marker s plus one of the person markers z, s, r, mòS, tèS); thematic vowels do not become lax in a strong syllable. In the above third plural derivation since the preterite s is intervocalic it will be rhotacized: #fòrm+a+r+unt#. The lax stressed vowel will become fronted: #fòrm+è+r+unt#. The remainder of the derivation is straightforward.

The rule for thematic vowel laxing was originally formulated to handle the infinitives, futures, and conditionals

(Group B), in order to account for the vowel shifts observable in these tenses. The characteristic r of these forms is always found in intervocalic position. Similarly, the third plural preterite is the only preterite form where the s appears in intervocalic position. Thus, it is seen that final thematic vowel quality is intimately tied with the intervocalic position of the following consonantal segment. What originally appeared to be an "irregularity" for the third plural forms is seen as a "regularity" in terms of the underlying structural representation.

The first singular "formai" has the following representation: #f`orm+a+S+z# . The rules for thematic vowel tensing and stress placement operate: #f`orm+A+S+z# . Since the S is followed by a consonant it is truncated: #f`orm+A+z# . The result of the previous rule is the combination A+z which is what was found in the first singular of the future and it was this environment which changed z to lax i (i.e., the rule for i-conversion (16)) #f`orm+A+i# . Vowel attraction then applies, yielding: #f`orm+E# . Here is another instance where a set of rules formulated for a particular verb tense provides a solution to a "disparate" form observable elsewhere in the system. In the first singular preterite of the other conjugations (e.g., "dormis, finis") the z is not converted to lax i since the preceding vowel is not A. We contrast "formai" and "finis" in the preterite and "finis" in the present (since it is homophonous with the preterite).



- 1) metathesis (4)
- 2) thematic vowel tensing (5)
- 3) stress placement (6)
- 4) rhotacism (11)
- 5) truncation (15)
- 6) i-conversion (16)
- 7) vowel attraction (17)
- 8) pre-final consonant deletion (34)

	"formai"	"finis" (pret)	"finis" (pres)
	#fòrm+a+S+z#	#fIn+i+S+z#	#fIn+i+ss+z#
1)	---	---	---
2)	#fòrm+A+S+z#	#fIn+I+S+z#	#fIn+I+ss+z#
3)	#fòrm+A+S+z#	#fIn+I+S+z#	#fIn+I+ss+z#
4)	---	---	---
5)	#fòrm+A +z#	#fIn+I +z#	#fIn+I+s +z#
6)	#fòrm+A +i#	---	---
7)	#fòrm+A #	---	---
8)	---	---	#fIn+I +z#

#### 4.1.1.3.2. The past subjunctive

je dormisse /dòrmis(e)/    nous dormissions /dòrmisyõ(z)/  
 tu dormisses /dòrmis(e)/    vous dormissiez /dòrmisyẽ(z)/  
 il dormît /dòrmî(t)/    ils dormissent /dòrmis(e)(t)/

Just as the conditional shows morphological features of the future and the imperfect, the past subjunctive resembles both the preterite and the subjunctive (except in the third singular). Therefore, we shall represent this tense as ss+è; in the third singular it will be represented simply as ss:<sup>24</sup>

je dormisse            #dòrm+i+ss+è+z#  
 nous dormissions    #dòrm+i+ss+è+OmS#  
 il dormît            #dòrm+i+ss+t#

The first part of the tense marker must be ss since the marker appears in intervocalic position and is not rhotacized.

Additional motivation for the necessity of postulating ss can be found by comparing the derivations of the third singular preterite and past subjunctive in the first conjugation;

the preterite does not have a liaison consonant whereas the past subjunctive does: "forma" /fòrma/ : "formât" /fòrma(t)/.

We cite the relevant rules.

- 1) thematic vowel tensing (5)
- 2) stress placement (6)
- 3) truncation (15)
- 4) person marker deletion (34)
- 5) pre-final consonant deletion (34)

	"forma"	"formât"
	#fòrm+a+S+t#	#fòrm+a+ss+t#
1)	#fòrm+A+S+t#	#fòrm+A+ss+t#
2)	#fòrm+A+S+t#	#fòrm+A+ss+t#
3)	#fòrm+A +t#	#fòrm+A+ss+t#
4)	#fòrm+A #	#fòrm+A+ss +t#
5)	---	---
		#fòrm+A +t#

The truncation rule deletes the tense marker in the preterite but only the second s in the past subjunctive. The s which remains in the past subjunctive protects the following consonant from being deleted by the rule for person marker deletion (i.e., the person marker is deleted when preceded by a central vowel). The s is ultimately deleted since it is in pre-final position. Not only does this example illustrate the necessity of recognizing a two segment marker for the past subjunctive, but it also provides further motivation for a pre-final consonant deletion rule which occurs after truncation.

#### 4.1.1.3.3. The past participle

dormi	/dòrmi/
fini	/fini/
formé	/fòrmé/

In these past participle forms the thematic vowel is

stressed. To receive stress it must have become tense by the rule for thematic vowel tensing, which means that in the underlying representation the thematic vowel will have to be followed by at least two segments of which the first is consonantal. Hence, the marker of the past participle is composed of two segments. What is the nature of the initial consonantal segment? An examination of other past participle forms reveals that they terminate in t, e.g., "fait" (cf. feminine "faite"), "écrit, peint, cuit", etc. Let us assume therefore that the past participle has an underlying t everywhere as its first segment and (analogous to the infinitive) the second segment is a non-low (<- comp>) vowel. (Further structural motivation for a final past participle vowel will be found in the section on "irregular" verbs.) The above forms then have the following representations:

#dòrm+i+té#  
#fIn+i+té#  
#fòrm+a+té#

The t of the past participle will have to be deleted. So far we have found three types of consonant deletion: truncation, where the consonant is followed by a juncture plus another consonantal segment; pre-final consonant deletion, where the consonant is the first of two consonants in a final cluster; and phrase final consonant deletion, where the consonant is the final segment of the phrase. Since the past participle t does not fit any of these environments we cannot make use of one of these existing rules to explain

its deletion.

In Chapter III we showed that the underlying representation for "h aspiré" had to be a velar non-strident fricative. We attributed the deletion of this segment to its non-strident character. (Those fricatives which appear in the phonetic output are all strident.) The following rule was required.

Rule for deletion of non-strident fricative

$$\left[ \begin{array}{l} + \text{ cons} \\ - \text{ voc} \\ + \text{ cont} \\ - \text{ strid} \end{array} \right] \text{ -----} \rightarrow \emptyset$$

Although the t of the past participle is non-strident it is not a continuant. However, if its continuant feature were to be changed it would be converted to a non-strident fricative (i.e., θ) and would then be deleted by the above rule.<sup>25</sup>

Rule for lenition

$$t \text{ -----} \rightarrow \langle + \text{ cont} \rangle \text{ in the env. } + \check{V} + \text{ \_\_\_\_\_\_ } \check{V} \#$$

The past participle vowel would be subsequently deleted by the rule for post-tonic vowel deletion.

The past participle of first conjugation verbs (e.g., /fòrmé/) is homophonous with the infinitive, for both forms show a thematic vowel which has undergone vowel shift. At some point in the derivation the thematic vowel had to be made tense if it was to receive stress: #fòrm+A+té# . Yet, it can only undergo vowel fronting (i.e., a > è) on condition that it is lax, which means it must subsequently

be subjected to the rule for thematic vowel laxing. This rule applies to a non-diffuse thematic vowel whenever it is followed by a single consonantal segment. Since the past participle morpheme té provides such an environment the preceding thematic vowel will become lax, yielding: #fòrm+a+t<sup>é</sup>#. After the rules for lenition, post-tonic vowel deletion, and vowel fronting, one obtains: #fòrm+è+θ #. The infinitive at this stage of the derivation would be: #fòrm+è+r #. We already have a rule which converts èr to é. If we extend this rule to include èθ we could account for the homophony of the infinitive and past participle forms. Since r and θ have the same features except for vocality it is relatively easy to generalize the rule.

Rule for é-conversion (revised)

$$\begin{array}{c}
 \text{è} \quad \left[ \begin{array}{l} + \text{ cons} \\ + \text{ cont} \\ - \text{ strid} \end{array} \right] \quad (+C) \quad \text{-----} \quad \left[ \begin{array}{l} - \\ - \text{ comp} \end{array} \right] \quad \emptyset \quad 3 \quad 4 \\
 \text{1} \quad \quad \quad 2 \quad \quad \quad 34
 \end{array}$$

We illustrate these rules with the derivations of the past participles of the first and second conjugations. We shall also contrast the first conjugation past participle with the homophonous infinitive.

- 1) thematic vowel tensing (5)
- 2) stress placement (6)
- 3) thematic vowel laxing (8)
- 4) lenition (12)
- 5) post-tonic vowel deletion (18)
- 6) vowel fronting (23)
- 7) é-conversion (35)
- 8) deletion of non-strident fricative (38)

	"fini"	"formé"	"former"
	#fIn+i+té#	#fòrm+a+té#	#fòrm+a+ré#
1)	#fIn+I+té#	#fòrm+A+té#	#fòrm+A+ré#
2)	#fIn+I+té#	#fòrm+A+té#	#fòrm+A+ré#
3)	---	#fòrm+a+té#	#fòrm+a+ré#
4)	#fIn+I+é#	#fòrm+a+é#	---
5)	#fIn+I+é #	#fòrm+a+é #	#fòrm+a+r #
6)	---	#fòrm+é+é #	#fòrm+é+r #
7)	---	#fòrm+é #	#fòrm+é #
8)	#fIn+I #	---	---

#### 4.1.1.4. Summary

Verbs have the following structure:

# stem + thematic + tense(s) + (person) # . All forms exhibit at least one tense marker (except the present tense which is unmarked); however, the past subjunctive (except in the third singular) and the conditional show two tense markers. The present participle, infinitive, and past participle of course do not have person markers.

We have shown that the tenses have the following underlying representations:

Group A:

- present  
 è present subjunctive  
 É imperfect  
 Ant present participle

Group B:

rA	future
rA+E	conditional
ré	infinitive

Group C:

S	preterite
ss(+è)	past subjunctive
té	past participle

It can now be seen how the tense markers within each of the three sub-groups serve to define phonologically the sub-group. The tense markers in Group A have a vowel (or nothing) as their first segment, those of Group B a liquid, and those of Group C a consonant. In fact, additional structure can be imposed on these segments. The vowels of Group A are all compact and unrounded; the initial liquid of Group B is uniquely r; and the initial consonant segment of Group C is a dental. It is the nature of the initial segment which accounts for the similarity of phonological processes observable within each of the sub-groups. Thus, the non-grave vowel tense markers (è and È) (Group A) become /y/ when immediately followed by a stressed vowel. The single consonant segments (S and t) of Group C undergo rhotacism or lenition whenever they are in intervocalic position. Furthermore, the nature of the initial segment of the tense marker affects the preceding thematic vowel: The thematic vowel is deleted whenever the following tense marker begins with a vowel (Group A). It will become tense before two segments of which the first is <+ cons> (Groups B and C) and if it is

<- diff> it will subsequently become lax whenever it is followed by a single <+ cons> segment.

There are six person endings with the following underlying representations:

Singular:

z	first
s	second
t	third

Plural:

OmS	first
EtS	second
unt	third

Each of the singulars is represented by a single consonant segment; the plurals all have a vowel as their first segment. It is this basic consonant/vowel dichotomy which plays such a decisive role in the derivation of forms, causing a preceding consonant or vowel to be appropriately truncated. The person markers themselves may undergo change: z becomes i whenever it is preceded by a. This i, as well as the u of unt, combines with a preceding A. The first and second plural endings metathesize their first two segments whenever there is a preceding single consonant (i.e., in the preterite); elsewhere, the first and second plural markers bear the stress due to their initial tense vowels. The u of the third plural which combines with a preceding A is nasalized by the following n. Elsewhere the u becomes schwa. The n itself is later deleted since it is in pre-final consonant position.



#### 4.1.2. Third conjugation verbs

Within the third conjugation there are two subclasses: those verbs which have infinitives in "-re" and those with infinitives in "-oir". We shall deal with the latter first.

##### 4.1.2.1. Third conjugation (type "-oir")

In Chapter II we established that "oi" /wa/ has its origin in a lax front unrounded mid vowel (i.e., é). We shall therefore establish é as the thematic vowel. The verb "mouvoir" /muvwar/ 'move' has the following representation in the infinitive: #mòv+é+ré#. The rules for thematic vowel tensing (5) and stress placement (6) yield:

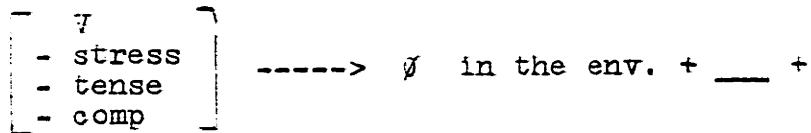
#mòv+É+ré#. The thematic vowel is before a single consonantal segment; since it is non-high (<- diff>) it will undergo thematic vowel laxing (8): #mòv+é+ré#. The final post-tonic vowel is deleted: #mòv+é+r #. The vowel shift rules (20, 22, 24, 36) will cause the stressed vowel to become /wa/ and the pre-tonic stem vowel to become /u/: #muv+wa+r#.

The present tense offers no special problems. The third singular, for example, "il meut" /mø(t)/ has the following underlying representation: #mòv+é+t#. The thematic vowel does not become tense since it is not followed by two segments; stress is therefore placed on the stem vowel: #mòv+é+t#. The thematic vowel is then deleted by the rule for post-tonic vowel deletion (18) (the vowel

is non-low): #mòv +t# . The v is truncated for it is followed by a consonant: #mò +t# ; and the stressed lax stem vowel undergoes vowel fronting (23) and phonetic adjustment (41): #mò +t# . The imperfect, present subjunctive, and present participle are derived analogously to the forms of the other conjugations and require no additional rules.

The output of the future does not show a thematic vowel, e.g., "il mouvra" /muvra/. Therefore, the thematic vowel will have to be deleted in this form. The underlying representation is #mòv+é+rA+t# . Thematic vowel tensing and stress placement yield: #mòv+é+rA+t# . The thematic vowel becomes lax for it is followed by a single segment: #mòv+é+rA+t# . Since the thematic vowel is lax unrounded and in pre-tonic position it should become schwa (cf. the first conjugation "formera" which at this stage of the derivation would be #fòrm+a+rA+t# ).<sup>26</sup> Yet there is no schwa in the output. We shall therefore need a rule which deletes a lax mid unstressed thematic vowel.<sup>27</sup>

Rule for thematic vowel deletion



We contrast the futures in all three conjugations. The significant rules are:

- 1) thematic vowel tensing (5)
- 2) stress placement (6)
- 3) thematic vowel laxing (8)
- 4) thematic vowel deletion (18)
- 5) vowel shifts (20, 22, 23, 24, 36)

	"formera"	"dormira"	"mouvra"
	#fòrm+a+rA+t#	#dòrm+i+rA+t#	#mòv+é+rA+t#
1)	#fòrm+A+rA+t#	#dòrm+I+rA+t#	#mòv+É+rA+t#
2)	#fòrm+A+r <u>A</u> +t#	#dòrm+I+r <u>A</u> +t#	#mòv+É+r <u>A</u> +t#
3)	#fòrm+a+r <u>A</u> +t#	---	#mòv+é+r <u>A</u> +t#
4)	---	---	#mòv +r <u>A</u> +t#
5)	---	---	#muv +r <u>A</u> +t#

One notes that the rule for thematic vowel tensing applies to all three thematic vowels. Thematic vowel laxing affects only the non-high (<- diff>) vowels (hence, "dormira" retains its tense thematic vowel). The rule for thematic vowel deletion applies only to lax non-low (<- comp>) vowels (thus "dormira" and "formera" retain their vowels). We contrast the above futures with their infinitives:

	"former"	"dormir"	"mouvoir"
	#fòrm+a+ré#	#dòrm+i+ré#	#mòv+é+ré#
1)	#fòrm+A+ré#	#dòrm+I+ré#	#mòv+É+ré#
2)	#fòrm+A+r <u>é</u> #	#dòrm+I+r <u>é</u> #	#mòv+É+r <u>é</u> #
3)	#fòrm+a+r <u>é</u> #	---	#mòv+é+r <u>é</u> #
4)	---	---	---
5)	#fòrm+ <u>é</u> #	#dòrm+I+r #	#muv+wa+r#

Due to vowel tensing all thematic vowels receive the stress. The non-high vowels become lax and undergo vowel shift. Thematic vowel deletion does not apply to "mouvoir" as its thematic vowel is now stressed.

The verb "mouvoir" shows 'abbreviated' forms (to be discussed elsewhere) in the tenses of Group C: e.g., "je mus, je musse, mu". Therefore, we shall cite the Group C

forms of the verb "vouloir" 'want'.

je voulais	/vul <u>ʔ</u> (z)/
je voulaisse	/vul <u>ʔ</u> s(e)/
voulu	/vul <u>ʔ</u> /

Comparing the above with the corresponding forms of the first two conjugations (e.g., "formai, formasse, formé; dormis, dormisse, dormi") one observes that the vowel /ʔ/ of the third conjugation forms corresponds to the thematic vowel of the other forms. This correspondence suggests of course that the thematic vowel is ʔ; yet we have shown that for the other tenses the thematic vowel is lax é. Therefore, a rule is needed which converts é to ʔ in Group C forms. The environment for such a change can be stated exclusively in phonological terms, since all Group C tense markers begin with a true consonant; (those of Group B begin with a liquid and those of Group A with a vowel). This rule precedes the rule for thematic vowel laxing. Once ʔ has become tense it will not subsequently become lax as the rule for thematic vowel laxing does not apply to high vowels.<sup>28</sup>

Rule for third conjugation thematic vowel adjustment

$$\begin{bmatrix} \text{V} \\ - \text{diff} \\ - \text{comp} \end{bmatrix} \text{-----} \begin{bmatrix} + \text{diff} \\ + \text{round} \end{bmatrix} \text{ in the env. } + \text{---} + \begin{bmatrix} + \text{cons} \\ - \text{voc} \end{bmatrix}$$

(thematic é > ʔ before a consonant)

Two verbs "mourir" 'die' and "courir" 'run' are identical (except for their infinitives) to the third conjugation type "-oir".<sup>29</sup> Thus, these two verbs show thematic vowel

deletion in the future and conditional (e.g., "il courra, il courrait") and /ʉ/ throughout Group C: "je courus, je courusse, couru"). The infinitives then are the anomalous forms. "Mourir" and "courir" are the only two third conjugation verbs which have stems terminating in r; it is this r which causes the thematic vowel é to be raised to /i/. This rule occurs after stress has been placed but before vowel laxing, for thematic i never becomes lax.

Rule for thematic raising

$$\left[ \begin{array}{c} V \\ + \text{ stress} \\ - \text{ comp} \end{array} \right] \text{-----} > <+ \text{ diff} > \text{ in the env. } r + \text{ \_\_\_\_ } +$$

(thematic é > i whenever it is stressed and follows r)

We illustrate with derivations of the third singular preterite, future, and the infinitive of "courir"; we contrast the latter with the infinitive of "vouloir".

- 1) third conjugation thematic vowel adjustment (2)
- 2) thematic vowel tensing (5)
- 3) stress placement (6)
- 4) thematic vowel raising (7)
- 5) thematic vowel laxing (8)
- 6) post-tonic vowel deletion (18)
- 7) truncation (15)
- 8) thematic vowel deletion (18)
- 9) vowel shifts (20, 22, 23, 24, 36)

	"courut"	"courra"	"courir"	"vouloir"
	#kÓr+é+S+t#	#kÓr+é+rA+t#	#kÓr+é+ré#	#vòl+é+ré#
1)	#kÓr+u+S+t#	---	---	---
2)	#kÓr+U+S+t#	#kÓr+É+rA+t#	#kÓr+É+ré#	#vòl+É+ré#
3)	#kÓr+U+S+t#	#kÓr+É+rA+t#	#kÓr+É+ré#	#vòl+É+ré#
4)	---	---	#kÓr+I+ré#	---
5)	---	#kÓr+é+rA+t#	---	#vòl+é+ré#
6)	---	---	#kÓr+I+r #	#vòl+é+r #
7)	#kÓr+U +t#	---	---	---
8)	---	#kÓr +rA+t#	---	---
9)	#kur+ʉ +t#	#kur +rA+t#	#kur+I+r #	#vul+wa+r#

4.1.2.2. Third conjugation (type "-re")

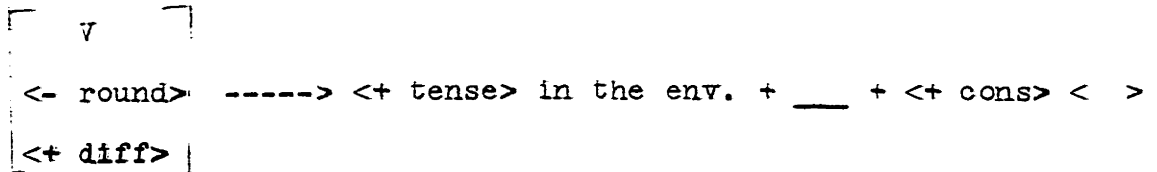
This group of verbs is the only one which does not show a thematic vowel in the infinitive, e.g., "vendre" /vādr(e)/ 'sell'. The form is of course stressed on the stem vowel. The output might lead one to conclude that there is no thematic vowel and that the underlying representation for the infinitive is: #vand+ré# . However, this representation is not possible for then the stem final d would be truncated by the following <+ cons> segment (i.e., consonants are truncated before liquids). Furthermore, a vowel which must have its origin as the thematic vowel does appear in the Group C forms (e.g., "tu vendis, tu vendisses, vendu"). Finally, we should like the three conjugations to exhibit the same structure. Therefore, we shall assume that all the forms of the paradigm have a thematic vowel. The infinitive is then represented as: #vand+V+ré# . The thematic vowel (whatever it is) prevents the d from being truncated. However, this vowel (unlike the other thematic vowels) must not become tense by the rule for thematic vowel tensing, if stress is to be placed on the stem vowel. The thematic vowel would then be in post-tonic position and could be deleted by the rule for post-tonic vowel deletion.

The thematic vowel for the third conjugation (type "-re") cannot be i, é, è, or a since these are markers for the second conjugation, third conjugation (type "-oir"), present subjunctive, and first conjugation respectively. Further-

more, post-tonic è and a are never deleted, for compact (low) vowels remain in post-tonic position.

One of the back rounded vowels (u, ó, ò) must therefore be the marker for these third conjugation forms. The vowel ò can be excluded for as we have just observed post-tonic low vowels are not deleted. Although u does appear in the past participle this vowel cannot be utilized for the infinitive since the past participle form shows that u is stressed and accordingly must have been tense (i.e., diffuse (high) vowels always undergo thematic vowel tensing). The thematic vowel for "-re" verbs then can only be lax ó.<sup>30</sup> Consequently, the rule for thematic vowel tensing will have to be revised to apply only to i, é, a, u (i.e., unrounded vowels and high vowels).<sup>31</sup>

Rule for thematic vowel tensing (revised)



(An unrounded or high thematic vowel becomes tense whenever it is followed by two segments of which the first is consonantal)

The infinitive "vendre" then has the following representation: #vand+ó+ré# . Since the thematic vowel is neither unrounded nor high it does not become tense; stress is placed on the stem vowel: #vand+ó+ré# . The lax non-low thematic vowel will now be subjected to post-tonic vowel deletion, yielding: #vand +ré# . The d of the stem should

then undergo the truncation rule. Yet we require the presence of the thematic vowel precisely so that the final stem consonant will not be truncated. It appears then that the rule for post-tonic vowel deletion should follow truncation. Yet we originally set up the order: post-tonic vowel deletion, truncation, in order to handle forms of the type "il dort" where the final stem consonant must be deleted, e.g.,  
#dòrm+i+t# > #dòrm +t# > #dòr +t# . If we adopt the order: truncation, post-tonic vowel deletion (the ordering required for third conjugation infinitives) the final stem consonant would also be retained in the form "il dort"; the m would not be truncated as long as the thematic vowel is present. One would then obtain the incorrect #dòrm +t# . However, there is no real problem here, for the m is now in pre-final consonant position. Since there already exists a rule (34) which deletes consonants in this environment, the m accordingly will be deleted. Therefore, we may adopt the new order: truncation, post-tonic vowel deletion. We illustrate by contrasting the second singular and plural of the present with the infinitive.<sup>32</sup>



- 1) thematic vowel tensing (5)
- 2) stress placement (6)
- 3) truncation (15)
- 4) post-tonic vowel deletion (18)
- 5) nasalization, schwa conversion (21, 25)
- 6) pre-final consonant deletion (34)

	"vends"	"vendez"	"vendre"
	#vand+ó+s#	#vand+ó+ÉtS#	#vand+ó+ré#
1)	---	---	---
2)	#v <u>and</u> +ó+s#	#v <u>and</u> +ó+ÉtS#	#v <u>and</u> +ó+ré#
3)	---	#vand +ÉtS#	---
4)	#v <u>and</u> +s#	---	#v <u>and</u> +ré#
5)	#v <u>ã</u> d +s#	#v <u>ã</u> d +ÉtS#	#v <u>ã</u> d +re#
6)	#v <u>ã</u> +s#	#v <u>ã</u> d +É S#	---

When we first discussed infinitives we postulated the two segment morpheme ré in order that the rule for thematic vowel tensing would operate. However, when one considers "-re" type verbs a final vowel (schwa) actually appears in the output of certain styles, e.g., /vãdre/, thus confirming the original two segment representation. In the first, second, and third (type "-oir") conjugations the final é of ré was deleted due to its post-tonic position. Similarly, this vowel would be deleted in the "-re" forms. Therefore, the present solution is not adequate.

The third conjugation (type "-re") are the only verbs which do not show a thematic vowel in the final form of the infinitive. One can attribute the presence of a final infinitive vowel to the absence of a thematic vowel; or viewed conversely one could say that the presence of a stressed thematic vowel in the infinitive (first, second, and third (type "-oir")) presupposes the absence of a final infinitive

vowel.<sup>33</sup> Rather than to represent the infinitive vowel by é we shall let the <sup>infinitive</sup> marker be è (i.e., the vowel is low). Low vowels are not deleted by the rule for post-tonic vowel deletion. Therefore, the final infinitive vowel will be retained in all forms and a later rule will be required which deletes this vowel whenever the preceding vowel is a thematic vowel.<sup>34</sup>

Rule for infinitive vowel deletion

V -----> Ø in the env. +V̄ + r \_\_\_ #

We contrast "mouvoir" with "vivre" 'live'.

- 1) thematic vowel tensing (5)
- 2) stress placement (6)
- 3) thematic vowel laxing (8)
- 4) truncation (15)
- 5) post-tonic vowel deletion (18)
- 6) infinitive vowel deletion (18)
- 7) vowel shifts (20, 22, 24)

	"mouvoir"	"vivre"
	#mòv+é+rè#	#vIv+ó+rè#
1)	#mòv+é+rè#	---
2)	#mòv+è+rè#	#vIv+ó+rè#
3)	#mòv+é+rè#	---
4)	---	---
5)	---	#vIv +rè#
6)	#mòv+é+r #	---
7)	#muv+wà+r#	#vIv +re#

The thematic vowel of "-re" verbs becomes /i/ in the preterite and past subjunctive whereas it is /ɥ/ in the past participle, e.g., "vendis, vendisses, vendu". The "-oir" verbs exhibited /ɥ/ throughout Group C, e.g., "voulus, voulusses, voulu". The rule for third conjugation thematic vowel adjustment (2) handled these forms. The rule stated

that é (a mid vowel) became u whenever it was followed by a consonant. The thematic vowel for "-re" verbs is ó which is also a mid vowel; (i.e., all third conjugation forms have a mid vowel as a thematic vowel and it is this vowel which is changed in the Group C forms).

If one were to subject the "-re" verbs to the rule for third conjugation thematic vowel adjustment one would obtain the forms: "\*vendus, \*vendusses, vendu". The preterite and past subjunctive need to have the u changed to i. In the underlying representations the thematic vowel will be followed by a continuant in the preterite (+S) and the past subjunctive (+ss) but by a stop in the past participle (+t). Therefore, we shall consider the following continuant to be the environment which converts u to i.<sup>35</sup> (This behavior of "-re" thematic vowels provides further evidence for postulating š as the preterite marker.)

What prevents the u of "voulus, voulusses" from becoming i? If one examines those preterite and past subjunctive forms which show an u after the final stem consonant, e.g., "volut, fallut, valut, mourut, courut, molut", one sees that in all cases the stem consonant terminates in a liquid and it is this liquid which keeps u from becoming i in the preterite and past subjunctive.<sup>36</sup> This observation is corroborated by a comparison of the verbs "coudre" 'sew' and "moudre" 'mill'. These verbs are conjugated identically except in the preterite and past subjunctive where the former

is "cousis, cousisses", while the latter has the forms "moulus, moulusses".

Consequently, the following statement can be made about both types of third conjugation verbs. The thematic vowel is a mid vowel (either é or ó). In the Group C forms (i.e., those tense markers which have a true consonant as their first segment) the thematic vowel becomes high and rounded; this vowel in turn becomes unrounded providing that the stem does not terminate in a liquid and that the following consonantal segment is a continuant.<sup>37</sup>

Rule for third conjugation thematic vowel adjustment  
(revised)

$$V \text{ -----} \left\{ \begin{array}{l} \left[ \begin{array}{l} + \text{ diff} \\ + \text{ round} \end{array} \right] \text{ in the env. } + \left[ \begin{array}{l} - \text{ diff} \\ - \text{ comp} \end{array} \right] + \langle - \text{ voc} \rangle \\ \langle - \text{ round} \rangle \text{ in the env. } \langle - \text{ voc} \rangle + \text{ --- } + \left[ \begin{array}{l} - \text{ voc} \\ + \text{ cont} \end{array} \right] \end{array} \right\}$$

We give the derivations of "cousit, cousu" and "moulut, moulu".

- 1) third conjugation thematic vowel adjustment (2)
- 2) thematic vowel tensing (5)
- 3) stress placement (6)
- 4) lenition (12)
- 5) truncation (15)
- 6) post-tonic vowel deletion (18)
- 7) vowel shifts (20, 24)
- 8) deletion of non-strident fricative (38)

	"cousit"	"cousu"	"moulut"	"moulu"
	#kÓz+ó+S+t#	#kÓz+ó+té#	#mÓl+ó+S+t#	#mÓl+ó+té#
1)	#kÓz+u+S+t#	#kÓz+u+té#	#mÓl+u+S+t#	#mÓl+u+té#
	#kÓz+i+S+t#	---	---	---
2)	#kÓz+I+S+t#	#kÓz+U+té#	#mÓl+U+S+t#	#mÓl+U+té#
3)	#kÓz+ <u>I</u> +S+t#	#kÓz+ <u>U</u> +té#	#mÓl+ <u>U</u> +S+t#	#mÓl+ <u>U</u> +té#
4)	---	#kÓz+ <u>U</u> +éé#	---	#mÓl+ <u>U</u> +éé#
5)	#kÓz+ <u>I</u> +t#	---	#mÓl+ <u>U</u> +t#	---
6)	---	#kÓz+ <u>U</u> +é #	---	#mÓl+ <u>U</u> +é #
7)	#kuz+ <u>I</u> +t#	#kuz+ <u>U</u> +é #	#mul+ <u>U</u> +t#	#mul+ <u>U</u> +é #
8)	---	#kuz+ <u>U</u> #	---	#mul+ <u>U</u> #

#### 4.2. Irregular Verbs

In addition to the three "regular" conjugations there are verbs which deviate in one way or another from some of the general tendencies which we have noted.<sup>38</sup> However, even these verbs follow the generalizations throughout most of their conjugation and it is only individual tenses or persons which show anomalous behavior.<sup>39</sup> These traditionally "irregular" forms can be accounted for in various ways within our analysis. 1) The forms in question may undergo certain rules which do not affect the "regular" verbs. 2) Conversely, the "irregularity" may be due to the failure of a form to undergo a particular rule. 3) Often a form can be handled if an additional restriction is placed on the environment of an existent rule. 4) An irregularity may result from a form

not having a thematic vowel or an overt tense marker.

5) A form may show a stem alternant in one or more tenses.

We have already given an example of forms which undergo a special rule. The infinitives "mourir" and "courir" have as underlying representations #mòr+é+rè# and #kUr+é+rè# . The stressed thematic vowel is raised to i whenever the stem terminates in r (rule for thematic vowel raising (7)).<sup>40</sup>

We also have had examples of forms which do not undergo particular rules. Whereas vowel alternation takes place in "meurt, mourons", alternation does not occur in the forms "pleure, pleurons". (Chapter II.) Hence, first conjugation verbs are an exception to the rule for pre-tonic vowel adjustment (20).

In the preterite we observed the forms: "vendit, voulut, courus"; i.e., the vowel remains u whenever the stem terminates in a liquid. By imposing this additional restriction on the rule which converts u to i we were able to account for these forms.<sup>41</sup>

We have not discussed the fourth type of "irregular" behavior--absence of a thematic vowel. Of interest here is that some of the most anomalous appearing forms can be accounted for without the necessity of postulating additional rules. The remainder of this section will be devoted to this phenomenon since it provides a structural basis for a plethora of "irregularities" and further justification for many of the rules which we have postulated.

As an initial example of the absence of a thematic vowel we shall consider the verbs "vivre" 'live' and "écrire" 'write'. These verbs are identical throughout their Group A forms:

il vit	il écrit
nous vivons	nous écrivons
ils vivent	ils écrivent
il vive	il écrive
nous vivions	nous écrivions, etc.

The underlying stems must accordingly be: vIv and ÉkrIv. However, the Group B forms differ ("écrire" has lost its final stem consonant).

vivre	écrire
il vivra	il écrira
nous vivrions	nous écririons

Since the verbs are third conjugation (type "-re") the thematic vowel is ó. We shall say that "écrire" is irregular to the extent that it does not have a thematic vowel in the Group B forms (i.e., whenever the tense marker begins with a liquid).<sup>42</sup> The derivations of these two forms follow.

Only relevant rules are indicated.

- 1) stress placement (6)
- 2) truncation (15)
- 3) post-tonic vowel deletion (18)
- 4) schwa conversion (25)

	"vivre"	"écrire"
	‡vIv+ó+re#	‡ÉkrIv+re#
1)	‡vIv+ó+re#	‡ÉkrIv+re#
2)	---	‡ÉkrI +re#
3)	‡vIv +re#	---
4)	‡vIv +re#	‡ÉkrI +re#

It is the presence of a thematic vowel which of course

protects the stem consonant from being truncated in the case of "vivre" and the absence of a thematic vowel which accounts for truncation in "écrire". (Recall that consonants are truncated before liquids.) Other verbs which do not have a thematic vowel in their Group B forms are "dire, lire, faire, plaie, boire, clore, confire, cuire".<sup>43</sup>

Many verbs do not have a thematic vowel in the past participle. We contrast "fini" with "écrit".

- 1) thematic vowel tensing (5)
- 2) stress placement (6)
- 3) lenition (12)
- 4) truncation (15)
- 5) post-tonic vowel deletion (18)
- 6) deletion of non-strident fricative (38)

	"fini"	"écrit"
	#fIn+i+té#	#EkrIv+té#
1)	#fIn+I+té#	---
2)	#fIn+I+té#	#EkrIv+té#
3)	#fIn+I+θé#	---
4)	---	#EkrI +té#
5)	#fIn+I+θ #	#EkrI +t #
6)	#fIn+I #	---

Absence of a thematic vowel keeps the past participle t from being lenited and hence it is never deleted; also the deletion of the stem final consonant is easily accounted for if no thematic vowel is present. Other verbs without a thematic vowel in the past participle are "mort, dit, médit, maudit, fait, trait, confit, cuit, frit".

Absence of a thematic vowel also explains the tense vowel (i.e., failure to undergo vowel shift) in the past participle "mort". The stem vowel becomes tense whenever it



is in a strong syllable (i.e., followed by two consonantal segments). We contrast the third singular present "meurt" with the past participle "mort".

- 1) tensing of stem vowel (5)
- 2) stress placement (6)
- 3) truncation (15)
- 4) post-tonic vowel deletion (18)
- 5) vowel shifts (23)

	"meurt"	"mort"
	#mòr+é+t#	#mòr+té#
1)	---	#mòr+té#
2)	#mòr+é+t#	#mòr+té#
3)	---	---
4)	#mòr +t#	#mòr+t #
5)	#mœr +t#	---

Since there is no thematic vowel in the past participle the stem vowel will be in strong position and will become tense; hence it will not subsequently undergo vowel shift. The stem final r is not truncated since it is a liquid.

We have shown that "dire" and "écrire" do not have thematic vowels in the past participle: "dit, écrit". In the other Group C forms (preterite and past subjunctive), these two verbs are different, e.g., "il écrivit, il dit". "Écrivit" characteristically exhibits after the stem consonant the raised thematic vowel of the third conjugation; "dit" of course shows a more "abbreviated" form. These "abbreviated" forms are easily accounted for if no thematic vowel is present in the underlying representation. We cite the derivations of the third singular preterite of both verbs.

- 1) third conjugation thematic vowel adjustment (2)
- 2) thematic vowel tensing (5)
- 3) stress placement (6)
- 4) truncation (15)

	"écrivit"	"dit"
	#ÉkrIv+ó+S+t#	#dIz+S+t#
1)	#ÉkrIv+i+S+t#	---
2)	#ÉkrIv+I+S+t#	---
3)	#ÉkrIv+I+S+t#	#dIz+S+t#
4)	#ÉkrIv+ <u>I</u> +t#	#d <u>I</u> +t#

The verbs "lire" 'read' and "dire" 'say' are identical throughout Groups A and B:

il lit	il dit
nous lisons	nous disons
ils lisaient	ils disaient
il lira	il dira
nous lirions	nous dirions, etc.

However, they differ in the second plural present: "vous lisez, vous dites". The ending tèš appeared for all verbs in the preterite; it resulted from the metathesis of an underlying ÉtS. The metathesis took place whenever the ending was preceded by a single consonant. We shall show that if no thematic vowel is present in the second plural present, the anomalous "dites" will then result automatically from those rules previously established.

- 1) metathesis (4)
- 2) stress placement (6)
- 3) truncation (15)
- 4) schwa conversion (25)
- 5) pre-final consonant deletion (34)

	"lisez"	"dites"
	#lIz+ó+ÉtS#	#dIz+ÉtS#
1)	---	#dIz+tèS#
2)	#lIz+ó+ÉtS#	#dIz+tèS#
3)	#lIz +ÉtS#	#dI +tèS#
4)	---	#dI +teS#
5)	#lIz +É S#	---

If there is no thematic vowel the ending ÉtS will be preceded by a single consonant (i.e., the final stem consonant) and the first two segments of the ending will be metathesized; the final stem consonant is later truncated by the metathesized consonant segment. Other verbs without a thematic vowel in the second plural present are "faites" and "êtes".<sup>44</sup>

The present "vous dites" is homophonous with the preterite "vous dîtes". We have already shown that there is no thematic vowel in the Group C forms of "dire". Therefore, the second plural preterite must be represented as:  
#dIz+S+ÉtS# .

In the preterite the first two segments of the person ending metathesize; the metathesis takes place only if the ending is preceded by a single consonant. (It is to be recalled that the infix ss did not cause metathesis; viz., "finissez"; hence there had to be imposed the stipulation that only one consonant could precede the person marker.) However, in the form #dIz+S+ÉtS# , the ending is not pre-

ceded by a single consonant and therefore it will not undergo metathesis; yet, metathesis always occurs in the preterite. If truncation were to precede metathesis one would obtain #dI +S+ÉtS# ; the ending would be preceded by a single consonant and metathesis would then take place: #dI +S+tèS# . However, it is still necessary to delete the preterite S but unfortunately the rule for truncation has already been applied. No matter which order of rules is adopted the wrong result is obtained.

However, if we modify the constituent structure of the verbs so that the primary constituent division is between the person marker and everything which precedes it, we can account for all the forms without modifying any of the rules. The constituent structure for finite forms becomes: ((# stem + thematic + tense(s)) + person #) and for non-finite forms: ((# stem + thematic + tense) #).<sup>45</sup> The rules are applied twice (in a cycle), first to the innermost constituents.<sup>46</sup> We contrast the homophonous forms "dites" and "dîtes".

- 1) metathesis (4)
- 2) stress placement (6)
- 3) truncation (15)
- 4) remove innermost parentheses

	"dites"	"dites"
	((#dIz)+ÉtS#)	((#dIz+S)+ÉtS#)
1)	---	---
2)	---	---
3)	---	((#dI +S)+ÉtS#)
4)	( #dIz +ÉtS#)	( #dI +S +ÉtS#)
1)	( #dIz +tèS#)	( #dI +S +tèS#)
2)	( #dIz +tèS#)	( #dI +S +tèS#)
3)	( #dI +tèS#)	( #dI +tèS#)
4)	#dI +tèS#	#dI +tèS#

A number of verbs show "abbreviated" stems in type C.

We cite the third singular preterite.

prit	"prendre"	dut	"devoir"
nit	"mettre"	nut	"mouvoir"
assit	"asseoir"	plut	"plaître"
sursit	"surseoir"	plut	"pleuvoir"
acquit	"acquérir"	connut	"connaître"
		lut	"lire"
		crut	"croire"
		crût	"croître"
		reçut	"recevoir"
		sut	"savoir"
		put	"pouvoir"
		pourvut	"pourvoir"

The absence of a final stem consonant is easily accounted for if no thematic vowel is present, since the consonant would be truncated by the following S of the preterite.

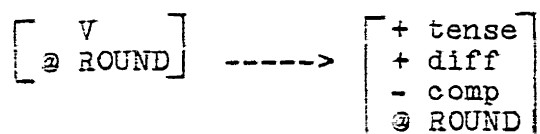
The representations for "prit" and "dut" would then be:

((#prÈn+S)+t#) and ((#dév+S)+t#). However, if these forms

have no thematic vowel then the high vowel which they exhibit can only be derived from the stem vowel. This raising of the stem vowel is an idiosyncratic property of these particular verbs and such stems must be accordingly marked

for vowel raising in the lexicon. In addition we must note whether the vowel becomes (high) rounded or (high) unrounded. We shall call this lexical feature <ROUND>. Then for the Group C forms "prendre" will be marked <- ROUND>, whereas "devoir" will be marked <+ ROUND>. <sup>47</sup>

Rule for stem vowel raising



We cite the derivations of "prit" and "dut".

- 1) stem vowel raising (3)
- 2) stress placement (6)
- 3) truncation (15)
- 4) remove inner parentheses

	"prit"		"dut"
	((#prɛn+S)+t#)		((#dév+S)+t#)
1)	((#prɪn+S)+t#)		((#dUv+S)+t#)
2)	---		---
3)	((#prɪ +S)+t#)		((#dU +S)+t#)
4)	( #prɪ +S +t#)		( #dU +S +t#)
1)	---		---
2)	( #prɪ̄ +S +t#)		( #dŪ +S +t#)
3)	( #prɪ̄ +t#)		( #dŪ +t#)
4)	#prɪ̄ +t#		#dŪ +t#

Two verbs ("venir" and "tenir") have a nasalized vowel in the preterite and past subjunctive, e.g., "il vint, il tint". These verbs undergo stem vowel raising. However, they differ from the other "abbreviated" stems in that the final stem consonant is not truncated. The preceding raised stem vowel will then be nasalized and lowered. Therefore, in addition to being marked for the lexical feature <- ROUND>, "venir" and "tenir" will have to be marked as

exceptions to the truncation rule. We contrast the preterites of "prendre" and "venir" as both verbs have stems terminating in a nasal.

- 1) stem vowel raising (3)
- 2) stress placement (6)
- 3) truncation (15)
- 4) nasalization (21, 27)
- 5) remove innermost parentheses

	"prit"	"vint"
	((#prɛ̃n+S)+t#)	((#vɛ̃n+S)+t#)
1)	((#prɪn+S)+t#)	((#vɪn+S)+t#)
2)	---	---
3)	((#prɪ+S)+t#)	exception
4)	---	---
5)	(#prɪ+S+t#)	(#vɪn+S+t#)
1)	---	---
2)	(#prɪ̃+S+t#)	(#vɪ̃n+S+t#)
3)	(#prɪ̃+t#)	(#vɪ̃n+t#)
4)	---	(#vɛ̃̃+t#)
5)	#prɪ̃+t#	#vɛ̃̃+t#

Most of the verbs which have "abbreviated" stems in the preterite and past subjunctive also show "abbreviated" stems in the past participle.<sup>48</sup>

pris	du
mis	pu
assis	mu
acquis	plu, etc.

Analogous to the finite forms of Group C these past participles would not have a thematic vowel, e.g., #prɛ̃n+té#, #dé̃v+té#. The forms are of course marked for vowel raising (either <+ ROUND> or <- ROUND>). The stem consonant would be truncated by the following t: #prɪ+té#, #dU+té#. However, according to the present rules this t should remain in the output (cf. "écrit" #ɛ̃krɪv+té#). Yet one observes

that the forms with the i vowel have no t whereas the forms with the e vowel are always followed by s (cf. the feminine "prise"). The s can only be derived from the past participle t.

In derivational morphology there occur forms of the type: "démocrate, démocratie" /démòkrat(e)/ : /démòkrasi/, "imitateur, imitation" /imitatœr/ : /imitasyõ/, In these forms t becomes a continuant whenever it is intervocalic and followed by a high front unrounded vowel.<sup>49</sup> The following rule will therefore be required:

Rule for assibilation

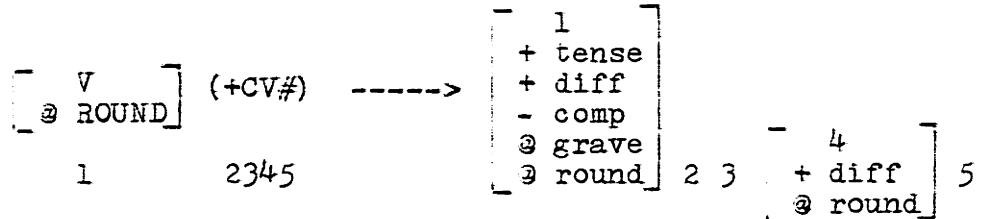
$$t \text{ -----} > \begin{bmatrix} + \text{ cont} \\ + \text{ strid} \end{bmatrix} \text{ in the env. } V \text{ --- } \begin{bmatrix} V \\ + \text{ diff} \\ - \text{ round} \end{bmatrix}$$

If the past participle vowel were i instead of e then the preceding t would become a continuant. Yet it cannot be i in its underlying representation for then the t of "fait" would also be converted to s. However, as we have already noted, the s is found only in those past participles which have a diffuse (high) stem vowel that is the result of stem vowel raising. Therefore, if we permit the rule for stem vowel raising (3) to apply to the past participle vowel as well as to the stem vowel, then the past participle e will be raised to i: #prEn+té# > #prIn+ti#. In the first cycle the final stem consonant will be truncated: #prI +ti#. In the second cycle the t will be in the appropriate environment for assibilation to take place: #prI +si#. The final



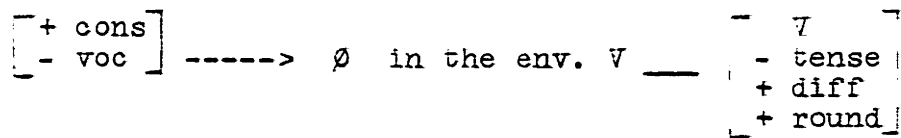
i will be subsequently deleted by the rule for post-tonic vowel deletion: #prI +s # .<sup>50</sup>

Rule for stem vowel raising (revised)



The rule for stem vowel raising is an alpha-rule. Just as #prEn+té# is converted to #prIn+ti# , similarly #dèv+té# will become #dÜv+tu# . In the first cycle the stem final v will be truncated by the following consonant: #dU +tu# . The t will have to be deleted since the past participles with a rounded raised stem vowel do not exhibit a consonant segment after the vowel. Let us for the moment adopt an ad hoc rule whereby an intervocalic consonant is deleted whenever it is followed by a lax high rounded vowel.<sup>51</sup>

Rule for intervocalic consonant deletion



Can this rule be justified on other grounds? Let us consider the present plural forms of "savoir" and "avoir".

savons	avons
savez	avez
savent	ont

As usual we shall say that the anomalous "ont" does not have a thematic vowel, i.e., #Av+unt# . If one could delete the

final stem consonant, one would obtain #A +unt# , which then becomes "ont" by existing rules (compare the future "form-  
ront" #f<sup>h</sup>orm+a+rA+unt# ). Yet, consonants are not normally deleted before vowels. However, if the rule for intervocalic consonant deletion is adopted one can account for the consonant truncation of "ont" (as well as "font").

The complete derivations of "savent" and "ont" follow. We have omitted the first cycle.

- 1) stress placement (6)
- 2) intervocalic consonant deletion (13)
- 3) truncation (15)
- 4) vowel attraction (17)
- 5) nasalization (21, 27)
- 6) schwa conversion (25)
- 7) pre-final consonant deletion (34)

	"savent"	"ont"
	#sAV+é+unt#	#AV+unt#
1)	#s <u>A</u> V+é+unt#	# <u>A</u> V+unt#
2)	---	# <u>A</u> +unt#
3)	#s <u>A</u> V +unt#	---
4)	---	# <u>o</u> + nt#
5)	---	# <u>o</u> + t#
6)	#s <u>A</u> V +ent#	---
7)	#s <u>A</u> V +e t#	---

The derivation of "ont" is particularly instructive. The rule for intervocalic consonant deletion was originally formulated to handle those "abbreviated" past participles having a rounded raised stem vowel. The fact that this same rule can account for an entirely different phenomenon (i.e., the anomalous "ont") can only lend support to the necessity for such a rule. The derivation of "ont" from an underlying #AV+unt# is of further interest. Not only does

the u of unt delete the preceding stem consonant, but it also subsequently combines with the stem vowel to produce ó. Thus, it is seen that the vowel of unt performs two essentially different tasks. These two phenomena provide further structural evidence for lax u as the vowel of the third plural ending.

We have shown that for the "abbreviated" past participles with a raised stem vowel the past participle vowel takes on the diffuseness and roundness of the raised stem vowel. If the past participle vowel is i it converts the preceding t to s; if it is u it causes the preceding t to be deleted. We illustrate the derivations of the past participles of the verbs "finir", "dire", "lire", and "prendre". "Finir" has a thematic vowel; the other three verbs do not. "Lire" and "prendre" (but not "dire") undergo stem vowel raising. "Lire" is marked <+ ROUND>, whereas "prendre" is marked <- ROUND>. <sup>52</sup>

- 1) stem vowel raising (3)
- 2) thematic vowel tensing (5)
- 3) stress placement (6)
- 4) lenition (12)
- 5) assibilation (12)
- 6) intervocalic consonant deletion (13)
- 7) truncation (15)
- 3) post-tonic vowel deletion (18)
- 9) deletion of non-strident fricative (38)
- 10) remove inner parentheses

	"fini"	"dit"	"lu"	"pris"
	((#fIn+i+té) #)	((#dIz+té) #)	((#lIz+té) #)	((#prān+té) #)
1)	---	---	((#lUz+tu) #)	((#prIn+ti) #)
2)	((#fIn+I+té) #)	---	---	---
3-6)	---	---	---	---
7)	---	((#dI +té) #)	((#lU +tu) #)	((#prI +ti) #)
3-9)	---	---	---	---
10)	( #fIn+I+té #)	( #dI +té #)	( #lU +tu #)	( #prI +ti #)
1)	---	---	---	---
2)	---	---	---	---
3)	( #fIn+ <u>I</u> +té #)	( #d <u>I</u> +té #)	( #l <u>U</u> +tu #)	( #pr <u>I</u> +ti #)
4)	( #fIn+ <u>I</u> + <u>é</u> #)	---	---	---
5)	---	---	---	( #pr <u>I</u> +s <u>i</u> #)
6)	---	---	( #l <u>U</u> + u #)	---
7)	---	---	---	---
3)	( #fIn+ <u>I</u> + <u>é</u> #)	( #d <u>I</u> +t #)	( #l <u>U</u> #)	( #pr <u>I</u> +s #)
3)	( #fIn+ <u>I</u> #)	---	---	---
10)	#fIn+ <u>I</u> #	#d <u>I</u> +t #	#l <u>U</u> #	#pr <u>I</u> +s #

In this section we have shown that a large number of so-called "irregular" verbs result from the absence of a thematic vowel. By contrasting phonologically similar stems we have demonstrated how a set of rules applied to forms with thematic vowels produces one type of output, while the same rules applied to forms without thematic vowels produce an entirely different output. The thematic vowel is of course a vocalic segment; the tense marker (in Groups B and J where most of the irregularities occur) begins with a consonantal segment. Whenever the thematic vowel is absent,

this vocalic-consonantal sequence is broken and the rules accordingly have different consequences. The functional importance of the truncation rule is evident.

There are other "irregularities". However, we shall not treat these in detail since they do not form so interesting a sub-system as do the forms without thematic vowels. For example, a form may show two different thematic vowels, e.g., "vêtir" where the thematic vowel is i everywhere except in the past participle ("vêtu") where it is é or é (both would yield the same result here). Some verbs lack the past participle morpheme and the past participle is represented by the bare stem, e.g., "clos, ri"; similarly, one verb has no infinitive marker in the infinitive: e.g., "fiche". There are verbs which undergo rules which we have not dealt with here. Thus, verbs whose stems terminate in a dental develop a d or t (depending on the voicing of the dental) before the r of Group B forms, e.g., "coudre, moudre, connaître, voudra, faudra, vaudra", etc. (This rule for dental stop conversion can be found in Appendix A (30).)

The thematic vowels of second conjugation verbs whose stems terminate in a stop plus liquid (e.g., "ouvrir, offrir") undergo the rule for supporting vowel insertion in the present because of the cluster. The vowel will then be reduced to schwa, e.g., "ouvre, offre". The same phenomenon occurs with those second conjugation stems that develop a palatal i (which ultimately becomes /y/): e.g., "défaillir; défaille".

---

The "offrir" type verbs also have irregular past participles: e.g., "offert". These can be accounted for by a special rule once it is recognized that the forms in addition do not have a thematic vowel in the past participle, e.g., #Ofr+té# . The final post-vocalic sequence of consonant plus liquid plus consonant plus vowel undergoes a type of metathesis whereby the final vowel is inserted between the consonant and liquid: e.g., #Ofér+t# . (This rule is stated in Appendix A (4).) These past participle forms provide further evidence that the past participle vowel must be mid front.

"Tenir" and "venir" are third conjugation verbs (i.e., the stem vowel is raised in the preterite and past subjunctive). In the infinitive of these two verbs the thematic vowel é is raised to i. This same phenomenon has already been noted for the verbs "mourir" and "courir". Therefore, the rule for thematic vowel raising (7) must be revised to allow raising to take place after both r and n.

"Voir" is peculiar in that it has a truncated stem vowel throughout Groups B and C (wherever the thematic vowel is stressed), e.g., #vé+é+rè# > #v +é+rè# > #v +é+r # > #v +w+r # .<sup>53</sup> However, the behavior of its thematic vowel is "regular" in the preterite and past participle; "vit, vu" is no different from "vendit, vendu". "Croire", on the other hand, does not show stem vowel deletion: #kré+ó+rè# > #kré +rè# > #krwa +re# . We have already shown that in Group C "croire" undergoes stem vowel raising, e.g., "il

crut, cru".

A few verbs show stem alternants in certain tenses: "faire" and "savoir" in the subjunctive have respectively the forms "fass-" and "sach-"; "pouvoir" has "pour-" in the future and conditional; "vivre" has "véc-" in its Group C forms. The verbs "être", "avoir", and "aller" also exhibit several stem alternants.

In Appendix B can be found a list of the more common "irregular" verbs. For each verb stem we have indicated how we handle the various irregular forms.

#### 4.3. Summary

At the beginning of this chapter we noted that verbs are divided into three principal conjugations. Each conjugation has a characteristic vowel--the thematic vowel--which can be viewed as the phonological representation of the conjugation class. For the first conjugation we have established that the thematic vowel is a. Second conjugation verbs have i as the thematic vowel; in addition, there is a sub-class of forms with the infix ss in Group A tenses. The third conjugation also comprises two sub-classes, those forms which have é as a thematic vowel and those which have ó.

The structure exhibited by the thematic vowels is apparent: a is the only compact (low) thematic vowel and it is of course this feature which distinguishes the first conjugation from the others. Similarly, i is the only diffuse

(high) thematic vowel. Although the third conjugation has two thematic vowels, both of these vowels are mid; it is this mid quality which accounts for the similarities between the "-oir" and "-re" types.

The thematic vowels are lax in the underlying abstract representation. The non-round thematic vowels (i.e., all of them except ó) become tense whenever they are followed by two segments of which the first is consonantal. A thematic vowel can receive stress only if it has been made tense. Subsequently, thematic vowels may undergo vowel raising or laxing so that the various vowel shifts or deletion of vowels may occur. A thematic vowel becomes lax only if it is non-diffuse (non-high) and it is not followed by a consonant cluster. These various processes account for the different vowels (or absence of vowel) observable in the phonetic output.

It is seen that our division into three conjugations according to type of thematic vowel parallels closely the traditional classification based on the infinitive ending since "-er" verbs have a as their thematic vowel, "-ir" have i, "-oir" have é, and "-re" have ó. There are only a few discrepancies between the two types of classification. As we have shown, for example, verbs of the type "venir, mourir", etc. are not second conjugation forms but third conjugation with thematic é; (the thematic vowel is raised to /i/ in the infinitive where it is stressed). However,



by and large, our conjugation classes reflect the traditional division. We think that we have demonstrated sufficient internal structural evidence within our system to justify this traditional observation.

We have furthermore shown that a large number of "irregularities" can be characterized by the absence of a thematic vowel. This idea is particularly attractive since no new rules have to be added to the grammar to produce the anomalous forms. Of even greater interest is the fact that this notion permits us to offer an explanation for the concept "irregularity", for we have been able to account for different types of "irregular" forms which exhibit no external relation to one another.

NOTES

1 Theoretically, there are 45 possible forms. However, certain verbs are defective and do not occur in particular tenses or persons. This defectiveness is a peculiarity of individual stems and one therefore has to note in the lexicon those persons or tenses for which the stem does not exhibit forms.

Most verbs also have three imperative forms. In almost all cases these are identical to the corresponding present tense forms (except for "être, avoir, savoir, vouloir" where the stems are those of the present subjunctive). Therefore, we shall omit the imperatives from the analysis, since they do not demonstrate characteristics not found elsewhere in the paradigm. Also we shall not be concerned with the compound tenses as the component parts can be described in terms of simple tenses.

2 In addition to the similar traits observable in the vertical plane there are also similarities in the horizontal dimension. We shall treat both types after we have exposed the underlying system of tense markers and person markers.

3 The "partir" type verbs are sometimes included in the third conjugation since these "-ir" types are not productive (Grevisse, Grammaire Larousse). The third conjugation then becomes a pot pourri of various sub-types; all the "irregular"

verbs are included here. In Bloomfield's analysis there is one "regular" conjugation (i.e., the first). All other verbs are considered "irregular"; these include about a dozen classes plus some odd stems which do not conveniently fit into any of these classes. Trager has three conjugations with two sub-classes in the second and third. Thus, our classification is the same as his. Hall also has three conjugations: The first is of course composed of verbs with infinitives in "-er"; the second conjugation includes forms with an infinitive in "-ir" but not those which insert "-iss"; the third conjugation contains everything else. Within each of these major divisions there is also an intricate system of minor groupings based on cross classification in order to account for the similarities in different conjugations. De Félice classifies the verbs according to two criteria: 1) the past participle ending; 2) whether or not the past participle has the same number of syllables as the stem. He has a total of nine groups, some of these in turn having sub-classes. He is unable to show any inter-relation among the groups and is forced to repeat similar statements.

4 It is immaterial at this point whether the first and second singular markers are represented by s or z, since in liaison continuants are always voiced. Therefore, we shall represent both person markers by S, an archiphoneme (i.e., S has only the features which s and z share; hence it is not

marked for voicing (tenseness)).

5 Recall that nasalized vowels are derived from an oral vowel plus nasal consonant. For the first person plural marker we represent the nasal consonant as an archiphoneme since it is not relevant at this point whether it is actually /m/ or /n/. Also, the vowel may be either ò or ó as nasalized vowels are always lowered (Chapter II). Similarly, the final consonantal segment of both person markers is represented by the archiphoneme ʒ; the voicing in liaison is predictable (see note 4).

6 See Chapter III for those styles which exhibit schwas in the final form. In Chapter II we showed the necessity for underlying post-tonic lax vowels (which become schwa) in order to account for the non-nasalization of vowels (e.g., "bonne" #b<sup>h</sup>ɔ̃n+a#). Also lax and tense vowels alternate in derivation: e.g., "feuille, foliation", both containing the underlying fòlia. In Chapter III we required post-tonic lax vowels for the correct operation of the truncation rule, particularly in the case of "feminine" adjectives.

7 For a given stem and tense we shall often cite only three verb forms: 3 sg, 1 pl, and 3 pl. The first and second singular in most cases follow the same rules as the third singular; the second plural is similar to the first plural. Liaison consonants and final schwa are parenthe-

sized; their presence or absence is stylistically determined and need not concern us here (see Chapter III).

As we noted in Chapter III, whenever the verb is the final constituent of a verb group the singular person marker is deleted if there is a tense A or lax a (schwa) (e.g., "il forme") immediately before the marker (rule for person marker deletion). We shall not always refer to this rule, it being assumed that one obligatorily applies the rule at the end of the derivation if we have not done so.

8 In the lexicon all verb stems are marked for conjugation (e.g., fòrm <l conj>). The conjugation marker a is then added to those stems marked for <l conj>.

9 In the forms "dormira, dormirait, dormir, dormit, dormisse, dormi" the /i/ vowel occurs. Similarly for the first conjugation one clearly finds an /a/ in the forms "forma, formasse". Therefore, we postulate lax a for first conjugation verbs and lax i for second conjugation forms. The thematic vowels must be lax in the present tense so that stress is appropriately placed within the word. In the forms cited above the thematic vowels are tense. This change of tenseness in the thematic vowel will be discussed when we treat the particular verb forms involved.

10 In order to derive "feuille" from an underlying #fòlia# (Chapter II) we required a rule which deletes post-tonic

non-compact (non-low) vowels.

11 The parenthesized numbers after the name of each rule refer to the location of that rule in the final list of ordered rules. This list is given in Appendix A. The formalized rules developed in this chapter and in previous chapters can be found there.

12 One can regard this rule as an explanation for the homophony of most first and second plural subjunctive and imperfect forms. We have already shown (Chapter II) the inter-relation between  $\grave{e}$  and  $\grave{E}$ . The similarity between  $\grave{e}$  and  $\grave{E}$  is then further corroborated by this unique behavior (i.e., becoming /y/) observable in the verb conjugation.

13 Whenever the present participle functions as an adjective, it agrees with the noun which it modifies and accordingly the morpheme or morphemes which indicate feminine gender and/or plural number are attached to the "present participle" morpheme.

14 The vowel after the  $\underline{r}$  may appear to be an ad hoc device which renders operative the rule for thematic vowel tensing. Additional motivation for postulating a vowel will be found when we consider verbs of the type "vendre, croire", etc., where a final schwa may appear in certain styles.

15 This is a transformational rule (as all phonological

rules are). It states that the first constituent (i.e., e) becomes non-low (<- comp>), that the second constituent (i.e., r) is deleted and that the third constituent (i.e., #) remains unchanged. In the case of adjectives and nouns the rule should allow for an optional (+C) before the #, in order to account for plurals of the type "étrangers, premiers", etc. Monosyllabic adjectives do not undergo this rule: e.g., "cher, fier, clair", etc.

16 For the first conjugation infinitives the thematic vowel is originally lax, becomes tense, then becomes lax again. Why is this switching necessary? Initially it must be made tense if stress is to be placed on the thematic vowel; however, this vowel will shift only if it is lax. Therefore, it must be made lax in particular environments. This switching is not a unique phenomenon of first conjugation infinitives. The tensing and laxing rules will subsequently play an important role in the derivation of other tenses and conjugations.

The rules for thematic vowel tensing and laxing are somewhat similar (i.e., they change the tenseness of the thematic vowel). Tensing requires that there be at least two segments after the vowel; the first segment must be <+ cons>, the second may be anything. The rule for laxing applies only to non-diffuse thematic vowels. This rule also requires a consonantal segment after the vowel. However, the second

segment may not be <+ cons>. Therefore, laxing (unlike tensing) does not take place before a consonant cluster. This constraint on the laxing rule is necessary for the preterite forms (to be discussed in the next section), which always exhibit unshifted vowels.

17 One could of course have a rule which would directly convert Az# to é#. The intermediate Ai is motivated since elsewhere there will be a rule (to be developed shortly) which converts Au to ó. The Ai > /é/ conversion and the Au > /ó/ conversion can then be generalized by a single alpha-type rule.

Changing z to i is a relatively simple matter. In terms of distinctive features z is <+ cons, - voc, + cont, - tense, + diff, - grave, - round, + strid>; i is <- cons, + voc, + cont, - tense, + diff, - grave, - round, - strid>. Therefore, it is necessary to change only the consonantal, vocalic, and stridency features. It is for this reason that we have chosen to represent the first singular by z and the second singular by s (rather than the other way around), since z and i agree in tenseness. The change of a continuant consonant to a lax high vowel appears to have taken place in Italian: viz., Latin "vadis", French "vas", Spanish "vas", Italian "vai"; Latin "nos", French "nous", Spanish "nos", Italian "noi". (Meyer-Lübke, pp. 495-496; Elcock, p. 52).

The rules for i-conversion and vowel attraction will



also permit us to account for the presence or absence of a liaison consonant in the first and second singular present of the first conjugation (cf. "tu aimes\_á chanter" 'you like to sing', "j'aime á chanter" 'I like to sing'; the liaison in the second singular is archaic). The first person never has a liaison consonant. The underlying representation for the first person is: #am+a+z#. Since the z is preceded by a central vowel it becomes i: #am+a+i#. The combination a + i does not become é as the rule for vowel attraction requires that the central vowel be tense. The i is then subsequently deleted due to its post-tonic position: #am+a # > #em+e #. In the second person the final s would of course remain throughout. This analysis can also be extended to the subjunctive provided that the rules for i-conversion and vowel attraction follow the rule which converts the subjunctive marker to schwa. If this analysis is adopted the rule for person marker deletion (34) is restricted to the third person (i.e., before t).

18 The rule for pre-final consonant deletion is by no means restricted to the third plural marker. Such a rule is independently justified elsewhere in the phonology to account for forms such as "respect" /respè/. A comparison with the derived "respectable" /respèctabl(e)/ shows that the representation for "respect" must be #rÈspÈkt#. The k is deleted by pre-final consonant deletion and the t by the

rule for final consonant deletion. In #rEspEkt=Abl# the k is not in the environment before C# and hence is not deleted. The plural "respects" is represented as #rEspEkt+S#. The t is deleted by the truncation rule: #rEstEk +S#. The k is now in pre-final position and will be deleted by the pre-final consonant deletion rule. The s of course becomes deleted by the rule for final consonant deletion. This example shows the relative order of the three types of deletion rules.

19 Historically, the future and conditional were originally periphrastic tenses based on the infinitive plus the auxiliary verb "avoir", e.g., "former+ai, dormir+as, vendre+a", etc., with absence of "av-" in the dissyllabic forms of the auxiliary verb, e.g., "finir+ez, finir+ait", etc. However, the two components of the future and conditional never had the syntactic independence of the forms found in the earlier stages of other Romance languages. (Elcock, pp. 106-107.)

20 The preterite (as well as the past subjunctive which is treated in the next section) does not usually occur in spoken French, except in certain oratorical styles or in the recitation of text. However, since the forms can be spoken they must be included in the morphological and phonological description. Furthermore, the phonological processes observable in the preterite provide additional evidence and motivation for particular phonological rules.

21 Depending on the particular dialect, the phonetic manifestation of r may be a dental trill, a uvular trill, a velar continuant, or a pharyngeal continuant (Grammont, 1961, pp. 66-68). However, at this higher level of analysis we shall consider r to be a non-grave continuant, its features being very similar to those of the sibilants. The particular phonetic realization of r can be accounted for by phonetic adjustment rules. The claim that r at this higher level is a continuant does not arise solely from a desire to relate r as closely as possible to the sibilants, for there are other structural reasons for this assertion. We have already noted that vowels are lengthened before /v, z, ʒ, r/, i.e., before voiced continuants.

It is rhotacism which is responsible for the r that appears in the third plural preterite. This rhotacism is not restricted, however, only to the preterite. It shows up in derivational forms, e.g., "acquérir, acquisition" and in the agentive suffix: "chanteur, chanteuse" 'singer (m), singer (f)'. However, the latter pair cannot be related by our rule as it is presently set up. We have chosen to represent the preterite morpheme as S. Whenever this becomes r it is of course voiced. The voicing of intervocalic r is predictable.

22 One could suppose, for example, that s is the "infix" morpheme and z the "preterite" morpheme and that only z

rhotacizes. However, we shall show elsewhere in this section and in the next one that it is imperative to represent the infix by two segments in order to account for structural regularities observable in the language.

23 Historically, -oms and -ets were both stages in the development of the first and second plural endings. (Brunot, p. 80; Grevisse, p. 572.)

24 The anomalous third singular is due to the absence of a subjunctive marker (è) after the past subjunctive marker (ss). Therefore, the rules which develop the sequence: stem + thematic + tense(s) + person, would have to be formulated so that the è would not be introduced in the third singular. One could alternatively postulate both markers and then have a special rule which would delete è in the environment +ss+ \_\_\_ +t#. However, this rule is just another way of restating that è does not occur in the third singular of the past subjunctive. Furthermore, this rule would not yield correct results without extensive remodification, since +ss is also the infix morpheme of certain second conjugation verbs where the è of the present subjunctive is retained in the above environment, e.g., "il finisse" #fIn+i+ss+è+t# .

25 Other structural motivations for a final past participle vowel will be considered in the section on "irregular" verbs.

From a historical point of view the past participles underwent this same development. The intervocalic t was lenited to ð (or d); the lenited segment and post-tonic vowel were later dropped. (Pope, p. 385.)

26 That lax é should become schwa in pre-tonic position was seen in Chapter II where we observed the alternation "doivent : devons" with an underlying stem dév. The verb system corroborates the observation made in Chapter II that lax é > /wa/, lax è > /yè/ rather than the other way around. If the converse situation were adopted then the third conjugation would have to have è as its thematic vowel. Yet this is not feasible since è is not deleted in post-tonic position; furthermore, as we have shown, it is the mark of the subjunctive. When we consider the "-re" verbs we shall adduce additional structural reasons for a mid vowel in the third conjugation.

27 The rule for thematic vowel deletion is similar to the rule for post-tonic vowel deletion since both require that the deleted vowel be lax and non-low; the difference in the two rules is that the former applies in pre-tonic as well as post-tonic position. We can combine these into a single vowel deletion rule with two environments:

$$\begin{array}{l} \text{--- } v \\ \text{--- tense} \\ \text{--- comp} \end{array} \left[ \begin{array}{l} \\ \\ \\ \end{array} \right] \text{ -----> } \emptyset \text{ in the env. } \left\{ \begin{array}{l} \check{v}c_0 \text{ --- } c_0^1 \\ + \text{ --- } \ddagger \end{array} \right\}$$

28 The rule for thematic vowel adjustment will also cause the thematic vowel to become u in the present singular forms where the vowel is followed by a consonant (i.e., "il veut"): #vòl+é+t# > #vòl+u+t# . However, this change will cause no difficulty. Since the vowel is still non-low and post-tonic it will be deleted.

29 "Mourir" also has an irregular past participle: "mort". This irregularity will be discussed in the section on "irregular" verbs. "Courir", on the other hand, has a regular past participle: "couru".

30 Both classes of third conjugation verbs show similarities in their thematic vowels. The "-oir" type has é as the thematic vowel; the "-re" type has ó. The thematic vowels in both types are mid. It is the mid quality of the thematic vowel which will account for many of the structural similarities observable between "-oir" and "-re" verbs.

31 The rule for thematic vowel tensing is to be read: A vowel which is either <- round> or <+ diff> becomes <+ tense>, etc. All vowels except ó and ò are subjected to this rule whenever the environmental conditions are met. Since è and ò do not occur as thematic vowels (i.e., these vowels would never appear in the appropriate environment) the rule applies innocuously to them.

32 According to our rules as presently stated, in the derivation of the infinitive the final infinitive vowel should

be deleted by the rule for post-tonic vowel deletion; subsequently the final stem consonant would be in pre-final position and would also be truncated. This difficulty is resolved elsewhere in this section.

33 The difference between "voir" 'see' and "croire" 'believe' is therefore attributable to the presence or absence of a thematic vowel: "voir" being v-oi-r (like "devoir" dev-oi-r); "croire" being croi-re (like "vendre" vend-re). A detailed analysis of these two forms is given in the section on "irregular" verbs.

34 The rule for infinitive vowel deletion can be combined with the rules for post-tonic vowel deletion and thematic vowel deletion (see note 27).

Rule for vowel deletion

$$V \text{ -----} \rightarrow \emptyset \text{ in the env. } \left\{ \begin{array}{l} \{ \overset{1}{\vee} c_0 \text{ --- } c_0^1 \} \\ + \text{ --- } + \end{array} \right\} \text{ in the env. } \left[ \begin{array}{l} - \text{ tense} \\ - \text{ comp} \\ \text{---} \end{array} \right]$$

$$\left\{ \begin{array}{l} + \overset{1}{\vee} + r \text{ --- } \neq \end{array} \right.$$

The three environments of the rule are ordered with respect to one another. Thus, thematic vowel deletion has to occur before the deletion of the infinitive vowel.

35 One might suppose that for Group C forms we could have changed all mid thematic vowels to i and then change i to u in the past participle. However, once the forms become i they would merge with original i of the second conjugation (e.g., "dormir, finir"). The latter never become u in the

past participle. This difficulty is of course obviated with the ordering:  $\acute{e}, \acute{o} > u > i$ .

36 We do not include here the Group C forms such as "but, crut, dut, sut", etc. These are based on "abbreviated" stems; the forms which we are presently considering show "full" stems in the output. The "abbreviated" forms are discussed in the section on "irregular" verbs.

37 The rule for third conjugation vowel adjustment is to be read: A vowel becomes high and rounded (y) whenever it is a mid thematic vowel preceding a consonant; a vowel becomes unrounded (i) whenever it is a thematic vowel preceded by a non-liquid and followed by a continuant consonant. The second part of the rule applies vacuously to all other thematic vowels.

38 The Bescherelle lists about 80 "irregular" verbs. An "irregular" verb is one which cannot be conjugated in all its forms on the models of the three regular conjugations. In this section we do not intend to treat every "irregular" verb of French, although we shall offer explanations for many of the forms. We are primarily interested in those verbs where the irregularities give information regarding the underlying phonological system and we shall examine in particular those instances where the rules which were originally formulated for problems encountered elsewhere in the phonology



serve to explain an "irregular" form. In Appendix B we have listed the more common "irregular" verbs and have indicated how we treat the various irregular forms.

39 In the lexicon one would need to note which persons or tenses are irregular. If a complete tense or group of tenses is irregular in the same way, one would then note this generality and there would be no need to indicate separately that every person of the tense was irregular. Note that the vowel shifts (apophony) are not "irregularities". These vowel shifts result automatically from the tense/lax distinction developed in Chapter II.

40 All other verbs are not an exception to the rule for thematic vowel raising. The other verbs simply do not fulfill the structural description and therefore the rule cannot possibly apply to them. A form is an exception to a rule only if it satisfies the structural description but does not undergo the rule. If a form is an exception to a rule it must of course be so marked in the lexicon.

41 If the environment of a rule is modified to handle forms which could not be handled previously, then the previous "exceptions" cease to be exceptions; the forms result automatically from the application of the rules. Within the present scheme a particular form is "irregular" only if its anomalous behavior (e.g., failure to undergo a rule, no the-

matic vowel, etc.) needs to be noted in the lexicon; i.e., "irregularities" are idiosyncratic properties of the stem morpheme.

42 One does not need to state that ÉkrIV has no thematic vowel throughout the future, conditional, and the infinitive. Since the most general type statement is desirable, one would prefer to say that ÉkrIV has no thematic vowel when the following tense marker begins with a segment which is <+ cons, +voc>. Hence, the environments in which a thematic vowel does not appear can often be phonologically defined.

43 The underlying stems for the verbs cited in this chapter will be found in Appendix B.

44 "Redites" also occurs without the thematic vowel, although other compounds with "dire" retain the thematic vowel: "vous contredisez, médisez", etc. It is interesting to note that children very often can be heard to say "disez" and "faisez", thus regularizing the forms. The "regularized" forms also occur in substandard speech (Bauche, pp. 114-115). In this case to regularize a form would be to provide it with a thematic vowel, since we have already shown that "regular" verbs always have a thematic vowel in all persons and tenses.

45 We showed in Chapter III that when one set of forms required the rule order A, B while other forms necessitated

the order B, A, that all forms could be accounted for by allowing the rules to be applied cyclically (i.e., from smaller to larger constituents). Here we require the order A, B, A (i.e., rule A (truncation) must be applied more than once). If a cycle is adopted the repeated application of rules becomes possible.

With the constituent structure ((# stem + thematic + tense(s)) + person#) one is able to characterize within each group of tenses the relation between the finite and the non-finite forms. They are identical in structure, except for the person marker in the finite forms, and it is this person marker which constitutes a separate constituent.

46 A cycle allows one to account for the third plural preterite "dirent"; i.e., ((#dIz+S)+unt#). Note that the stem final consonant must be deleted (cycle 1) if the preterite s is to be in intervocalic position so that it will be rhotacized (cycle 2).

47 The verbs which undergo stem vowel raising have to be so indicated in the lexicon, since there is no way to predict this phenomenon simply by examining the phonological segments of the stem. In actuality very few verbs will have to be marked for stem vowel raising. This phenomenon affects only third conjugation forms ("-re" or "-oir" verbs). Therefore, first and second conjugation verbs will be automatically excluded from stem vowel raising. Within the

third conjugation many verbs have stems terminating in a nasal consonant plus stop (e.g., "vendre") and these verbs never undergo vowel raising either. We are left then with those "-re" verbs whose stems generally terminate in a single consonant (about 25 verbs) and it is this group in which some of the forms show a raised stem vowel. The members of the group must accordingly be marked as to whether or not their stem vowels are raised and if so whether the vowel is rounded or unrounded. The "-oir" verbs also show stem vowel raising. Within this group we can predict however that if the stem ends in y (e.g., "sav-, pouv-", etc.) the form has a raised vowel and that this vowel is always rounded.

The feature ROUND is not a phonological feature (i.e., a property of the segment) but a morphological marker (i.e., a particular fact about the morpheme). This feature is distributed over all segments of the morpheme. We note the feature ROUND in upper case letters so that it will not be confused with the phonological features. The rule for stem vowel raising states that a vowel which is marked for the morphological feature ROUND becomes tense, diffuse, and either round or unround depending on the sign (+ or -) of the morphological feature. The stems which bear the feature ROUND never have a thematic vowel in those Group C forms where vowel raising occurs. Therefore it is not necessary to mark these stems for absence of thematic vowel, since the latter phenomenon is predictable once it is known that the

stem vowel undergoes raising.

48 "Tenir, venir, and faire" show raised stem vowels in the finite forms "il tint, vint, fit" but not in the past participle: "tenu, venu, fait".

49 One notes "démocratique" /démòkratik(e)/ without assibilation; assibilation does not take place before the "-ique" suffix. However, there are other exceptions too, e.g., "sympathie" /sěpati/.

50 The revised rule for stem vowel raising makes the stem vowel and participle vowel (if the past participle is present) identical in quality except for tenseness. One could regard this as a type of vowel harmony.

51 The rule for intervocalic consonant deletion must follow the rule for rhotacism, otherwise the preterite marker would be deleted in the third plural (e.g., #fòrm+a+S+unt#). Once the s becomes r it will not be deleted since the rule requires that the deletable segment be a true consonant.

52 These past participle examples serve to illustrate the intricate inter-relations between various rules and the underlying representations. The past participle morpheme is té: the t occurs in participles of the type "dit"; the é is deleted in post-tonic position. At first we postulated a two segment past participle so that a preceding thematic

vowel would become tense. Additional motivation for the vowel segment is seen now in forms of the type "pris, lu", where the participle vowel is raised in the same manner as the stem vowel. The raised participle vowel affects the preceding consonant which is either assibilated or deleted. Both of these processes are observed elsewhere in the phonological system, the same rules accounting for quite different data. Finally, whenever the past participle is preceded by a thematic vowel the t is lenited and becomes the continuant ɥ. This continuant is then deleted as it is a non-strident fricative.

53 Stem vowels tend not to undergo truncation: (cf. "crie, crier" #krI+a+ré# ).

APPENDIX A

The Phonological Rules

The following is an ordered list of the rules developed in Chapters II-IV.

1. Vocalic redundancy

$$\begin{aligned} <- \text{cons}> \text{ -----} > <+ \text{voc}> \\ \left[ \begin{array}{l} - \text{cons} \\ + \text{comp} \end{array} \right] \text{ -----} > <- \text{diff}> \end{aligned}$$

2. Third conjugation thematic vowel

$$\begin{aligned} V \text{ -----} > \left\{ \begin{array}{l} \left[ \begin{array}{l} + \text{diff} \\ + \text{round} \end{array} \right] \text{ in the env.} + \left[ \begin{array}{l} - \text{diff} \\ - \text{comp} \end{array} \right] + <- \text{voc}> \\ <- \text{round}> \text{ in the env.} <- \text{voc}> + \text{---} + \left[ \begin{array}{l} - \text{voc} \\ + \text{cont} \end{array} \right] \end{array} \right\} \end{aligned}$$

(thematic é, ó > u in Group C; > i in finite C if preceding segment is not a liquid, e.g., vendit, vendu)

3. Stem vowel raising

$$\begin{array}{c} \left[ \begin{array}{l} \text{V} \\ @ \text{ ROUND} \end{array} \right] C_0 (+CV\#) \text{ -----} > \left[ \begin{array}{l} \text{1} \\ + \text{tense} \\ + \text{diff} \\ - \text{comp} \\ @ \text{ round} \end{array} \right] 2 \ 3 \ 4 \left[ \begin{array}{l} \text{5} \\ + \text{diff} \\ @ \text{ round} \end{array} \right] 6 \\ \text{1} \quad \quad \quad 2 \quad 3456 \end{array}$$

(stem vowel > I or U in abbreviated Group C forms, e.g., mit, put)

4. Metathesis

a. first and second persons plural

$$V C + \begin{bmatrix} V \\ - \text{diff} \end{bmatrix} C C \# \text{ -----} \rightarrow \begin{matrix} 1 & 2 & 3 & 5 \\ 4 & & & 6 & 7 \end{matrix} \begin{bmatrix} 4 \\ - \text{tense} \\ + \text{comp} \end{bmatrix}$$

(OmS > m<sup>o</sup>S, ÊtS > t<sup>e</sup>S, when preceded by a single consonant, e.g., formâmes, finîtes, dites)

b. past participle

$$\begin{matrix} <+ \text{cons}> & \begin{bmatrix} - + \text{cons} \\ + \text{voc} \end{bmatrix} & + t \acute{e} \# & \text{ -----} \rightarrow & 1 & 5 & 2 & 3 & 4 & 6 \\ & 1 & & & 2 & & 3 & 4 & 5 & 6 \end{matrix}$$

(Cr + t<sup>e</sup> -----> Cér + t, e.g., ouvert)

5. Vowel tensing (stem and thematic)

$$V \text{ -----} \rightarrow <+ \text{tense}> \text{ in the env. } \left\{ \begin{array}{l} \text{--- } C+C \text{ where } V \text{ is the stem vowel} \\ + \left\{ \begin{array}{l} \begin{bmatrix} - \text{round} \end{bmatrix} \\ \begin{bmatrix} + \text{diff} \end{bmatrix} \end{array} \right\} + <+ \text{cons}> < > \end{array} \right\}$$

(a stem vowel becomes tense before a strong cluster, e.g., mort; thematic a, é, i > tense in Groups B and C, e.g., formasse, fini, vendu)



6. Stress placement (word and verb group)

V -----> <+ stress> in the env.  $\text{--- } C_0 \left( \begin{bmatrix} V \\ - \text{tense} \end{bmatrix} C_0 \right)_0 \#$

$\text{--- } Q$ ) VG, such that Q does not contain a V or have its final segment followed by a #

(Within the word place stress on the first vowel such that no tense vowel follows; within the verb group place stress on the last vowel providing there is no following #.)

7. Thematic vowel raising

$\begin{bmatrix} - \\ V \\ + \text{stress} \\ - \text{comp} \end{bmatrix}$  -----> <+ diff> in the env.  $\left\{ \begin{bmatrix} + \text{cons} \\ + \text{voc} \\ + \text{cont} \end{bmatrix} \right\} + \text{---} + \left\{ \begin{bmatrix} + \text{nasal} \\ + \text{diff} \\ - \text{grave} \end{bmatrix} \right\}$

(thematic  $\hat{e} > i$  when preceded by r or n, e.g., mourir, venir)

3. Thematic vowel laxing

$\begin{bmatrix} - \\ V \\ - \text{diff} \end{bmatrix}$  -----> <- tense> / + --- + <+ cons><sup>i</sup>

(thematic  $\acute{e}$ , a become lax when followed by a single consonantal segment)

9. Yod formation

$\begin{bmatrix} - \\ V \\ + \text{comp} \\ - \text{grave} \end{bmatrix}$  ----->  $\begin{bmatrix} - \text{voc} \\ - \text{tense} \\ + \text{diff} \\ - \text{comp} \end{bmatrix}$  in the env. + --- +  $\nabla$

(tense markers  $\grave{e}$ ,  $\grave{e} > y$  before a stressed vowel, e.g., formions)

10. Palatalization

l -----> <- diff> in the env.  $\left. \begin{array}{l} i \\ +\tilde{e}+ \end{array} \right\}$  , for a small class of verbs)

(l >  $\tilde{l}$  before lax i and in certain subjunctive forms, e.g., feuille, veuille)

11. Rhotacism

S ----->  $\left[ \begin{array}{l} + \text{voc} \\ - \text{strid} \end{array} \right]$  in the env. V + \_\_\_ + V  
(preterite S > r when intervocalic, e.g., formèrent)

12. Lenition and assibilation

t ----->  $\left\{ \begin{array}{l} <+ \text{cont}> \text{ in the env. } + \check{V} + \_ V\# \\ \left[ \begin{array}{l} + \text{cont} \\ + \text{strid} \end{array} \right] \text{ in the env. } V \_ i \end{array} \right\}$

(t >  $\theta$  when preceded by a thematic vowel, e.g., fini < fin+i+ $\theta$ é;  
t > s when followed by a lax i, e.g., pris, démocratie)

13. Intervocalic consonant deletion

$\left[ \begin{array}{l} + \text{cons} \\ - \text{voc} \end{array} \right]$  ----->  $\emptyset$  in the env. V \_\_\_ u

(a consonant is deleted by a following lax u, e.g., pu < pu+tu, font < faz+tunt)

14. Supporting vowel insertion

$\emptyset$  ----->  $\left[ \begin{array}{l} - \text{cons} \\ + \text{voc} \\ + \text{comp} \end{array} \right]$  in the env.  $\left\{ \begin{array}{l} <+ \text{cons}> \left[ \begin{array}{l} + \text{cons} \\ + \text{voc} \end{array} \right] \\ \neq <+ \text{cons}> \_ (+C) \left\{ \begin{array}{l} \# \\ \# \end{array} \right\} \end{array} \right\}$

(a schwa is inserted after a final consonant plus liquid cluster, e.g., table, or in a word with no vowel, e.g., de < #d# )

15. Truncation

$$\begin{bmatrix} @ \text{ cons} \\ -@ \text{ voc} \\ - \text{ stress} \end{bmatrix} \text{ -----} \rightarrow \emptyset \text{ in the env. } \text{---} \left\{ \begin{matrix} + \\ \# \end{matrix} \right\} (\#) <@ \text{ cons}>$$

(consonants are truncated before consonantal segments;  
vowels are truncated before non-consonantal segments)

16. i-conversion

$$z \text{ -----} \rightarrow \begin{bmatrix} - \text{ cons} \\ + \text{ voc} \\ - \text{ strid} \end{bmatrix} \text{ in the env. } \begin{bmatrix} \text{v} \\ + \text{ grave} \\ - \text{ round} \end{bmatrix} + \text{---} \#$$

(first person z > i after a central vowel, e.g., finirai)

17. Vowel attraction

$$\begin{bmatrix} \text{v} \\ + \text{ tense} \\ + \text{ grave} \\ - \text{ round} \end{bmatrix} \quad 1 \quad + \quad \begin{bmatrix} \text{v} \\ - \text{ tense} \\ + \text{ diff} \\ @ \text{ round} \end{bmatrix} \quad 2 \quad \text{-----} \rightarrow \quad \begin{bmatrix} 1 \\ - \text{ comp} \\ @ \text{ grave} \\ @ \text{ round} \end{bmatrix} \quad 3 \quad \emptyset \quad \emptyset$$

(a + i > é, a + u > ó, e.g., finirai, finiront)

18. Vowel deletion

$$r \text{ -----} \rightarrow \emptyset \text{ in the env. } \left\{ \begin{matrix} + \left[ \begin{matrix} - \text{ tense} \\ \text{---} \end{matrix} \right] + \\ \left\{ \begin{matrix} \text{v} \text{c}_o \text{---} \text{c}_o^1 \\ + \text{v} + r \text{---} \# \end{matrix} \right\} \end{matrix} \right\} \text{ in the env. } \left[ \begin{matrix} - \text{ comp} \\ \text{---} \end{matrix} \right]$$

(thematic i, é, ó, any non-low post-tonic vowel and the infinitive vowel when preceded by a thematic vowel are deleted)

19. Redundant vowel features

$$\begin{array}{l} \left[ \begin{array}{l} \bar{v} \\ + \text{ round} \end{array} \right] \text{ -----} \langle + \text{ grave} \rangle \\ \left[ \begin{array}{l} \bar{v} \\ - \text{ comp} \\ - \text{ round} \end{array} \right] \text{ -----} \langle - \text{ grave} \rangle \end{array}$$

20. Pre-tonic vowel adjustment

$$\left[ \begin{array}{l} \bar{v} \\ @ \text{ round} \end{array} \right] \text{ -----} \left[ \begin{array}{l} + \text{ tense} \\ - @ \text{ comp} \\ @ \text{ grave} \end{array} \right] \text{ in the env. } \underline{\quad} C_0 + \bar{v}$$

(é, è, a > È, ò, ó > Ó when pre-tonic, e.g., devons, mourons)

21-24 The next four rules take place in the env.

$$\left[ \begin{array}{l} + \text{ stress} \\ \underline{\quad} \\ \underline{\quad} \dots \bar{v} \end{array} \right] \text{ (i.e., not in post-tonic position).}$$

21. Vowel nasalization

$$\bar{v} \text{ -----} \langle + \text{ nasal} \rangle \text{ in the env. } \underline{\quad} \langle + \text{ nasal} \rangle \left\{ \begin{array}{l} \langle + \text{ cons} \rangle \\ \# \end{array} \right\}$$

(a vowel becomes nasalized when followed by a nasal consonant which is in turn followed by a conscnantal segment or a word boundary, e.g., vendre, bon)

22. Diphthongization

$$\emptyset \text{ -----} \left[ \begin{array}{l} - \text{ voc} \\ - \text{ cons} \\ + \text{ diff} \\ @ \text{ grave} \\ @ \text{ round} \end{array} \right] \text{ in the env. } \underline{\quad} \left[ \begin{array}{l} \bar{v} \\ - \text{ tense} \\ - @ \text{ comp} \\ - \text{ grave} \end{array} \right]$$

(é > wé, è > yè, e.g., doit, vient)

23. Vowel fronting

V -----> <- grave> in the env.  $\left. \begin{array}{l} \boxed{- \text{ tense} } \\ \boxed{+ \text{ diff} } \end{array} \right\}$

(a > è, ò > œ, ó > ø, U > #)

24. Vowel raising

$\left[ \begin{array}{l} \text{V} \\ - \text{ comp} \\ + \text{ grave} \end{array} \right] \text{ -----> } <+ \text{ diff}>$

(ó > u, e.g., courir)

25. Schwa conversion

V -----> e in the env.  $\left( \begin{array}{l} \text{VC}_0 \text{ ---} \\ \left[ \begin{array}{l} + \text{ tense} \\ + \text{ comp} \\ - \text{ grave} \end{array} \right] \text{ in the env. } \left\{ \begin{array}{l} \boxed{- \text{ stress} } \\ \boxed{+ \text{ nasal} } \end{array} \right\} \end{array} \right)$

(post-tonic vowels become schwa; È > e when unstressed or nasalized, e.g., dorme, menons, prends)

26. Phonetic vowel tensing

7 -----> <+ tense> in the env.  $\left\{ \begin{array}{l} \boxed{- \text{ grave} } \\ \boxed{+ \text{ nasal} } \end{array} \right\}$

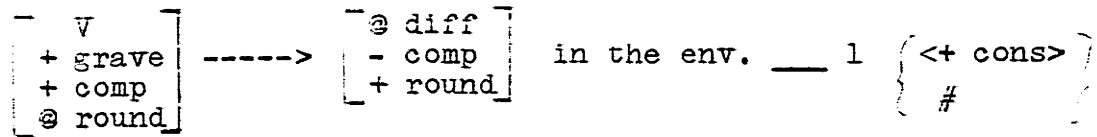
(è, é, œ, ø, and all nasalized vowels become tense)

27. Nasal quality adjustment

$\left[ \begin{array}{l} \text{V} \\ + \text{ nasal} \end{array} \right] \text{ -----> } <+ \text{ comp}>$

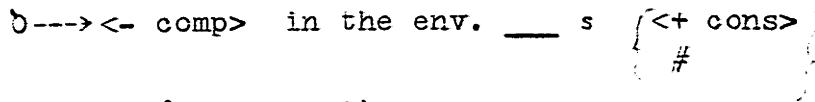
(nasalized vowels are lowered)

28. A1 > Ó, Ø1 > U



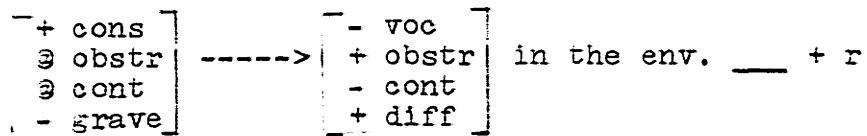
(e.g., valent, vaut; folle, fou)

29. Øs > Ó



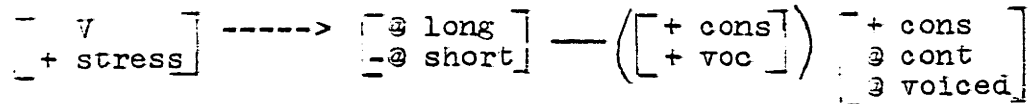
(e.g., côte, costal)

30. Dental stop conversion



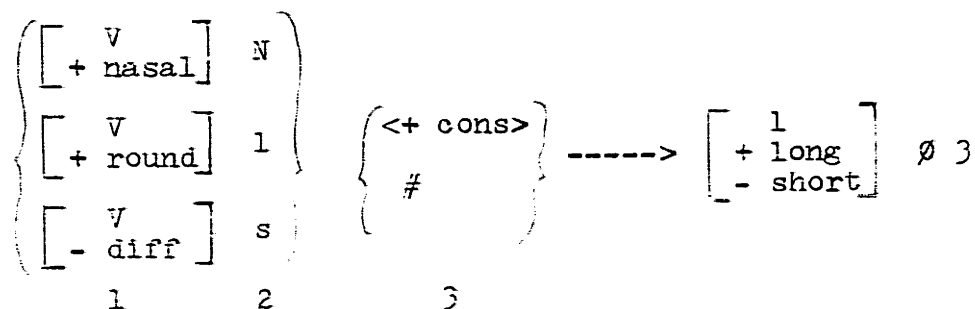
(l, s, z, n, ñ > d before r, e.g., voudra, connaître, coudre, viendra, craindre)

31. Vocalic duration



(a stressed vowel in a closed syllable is short before optional liquid plus voiceless stop, long before optional liquid plus voiced continuant)

32. Vowel lengthening

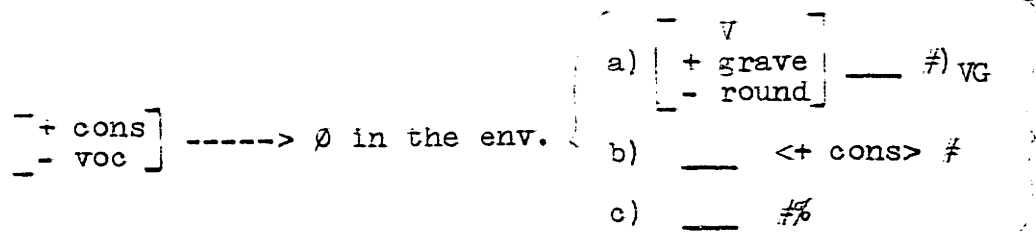


(the deletion of a consonantal segment causes the preceding vowel to be lengthened)

33. Degemination rule

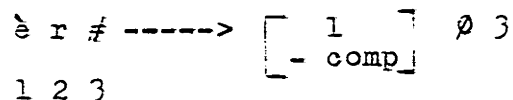
$C_1C_2 \text{-----} \rightarrow C_1$ , where  $C_1$  and  $C_2$  have identical features  
(e.g., finissent)

34. Consonant deletion



(a consonant is deleted: a) if it is a singular person marker following a central vowel; b) whenever it is in pre-final position; c) in phrase final position)

35. é-conversion



(e.g., former, étranger)

36. wa-adjustment

$$\begin{bmatrix} \text{v} \\ - \text{comp} \end{bmatrix} \text{ -----> } \begin{bmatrix} + \text{comp} \\ + \text{grave} \end{bmatrix} \text{ in the env. w } \underline{\quad}$$
 (wé > wa)

37. Glide formation

a. 
$$\begin{bmatrix} + \text{cons} \\ + \text{voc} \\ - \text{diff} \end{bmatrix} \text{ -----> } \begin{bmatrix} - \text{cons} \\ - \text{voc} \\ + \text{diff} \end{bmatrix}$$
 (ĩ > y, e.g., feuille)

b. 
$$\begin{bmatrix} - \text{cons} \\ - \text{stress} \\ + \text{diff} \end{bmatrix} \text{ -----> } \begin{bmatrix} - \text{voc} \\ - \text{tense} \end{bmatrix} \text{ in the env. } \underline{\quad} \begin{bmatrix} - \text{cons} \\ + \text{voc} \end{bmatrix}$$
 (i > y, u > w, ð > # when followed by a vowel, e.g., diable, oui, persuader)

38. Deletion of non-strident fricative

$$\begin{bmatrix} + \text{cons} \\ - \text{voc} \\ + \text{cont} \\ - \text{strid} \end{bmatrix} \text{ -----> } \emptyset$$

(θ, x are deleted, e.g., řini < řIn+i+θ; héros)

39. Liaison voicing

$$\begin{bmatrix} + \text{cons} \\ - \text{voc} \\ @ \text{cont} \end{bmatrix} \text{ -----> } <@ \text{voiced}> \underline{\quad} \#(\#) \text{v}$$

(liaison stops are unvoiced whereas liaison fricatives are voiced)



40. Vocalic duration

a.  $\bar{V}$  ----->  $\begin{bmatrix} - \text{long} \\ - \text{short} \end{bmatrix}$  in the env.  $\_\_ (+C)\#$

(a final vowel is medium in length)

b.  $\begin{bmatrix} \bar{V} \\ - \text{stress} \end{bmatrix}$  ----->  $\begin{bmatrix} - \text{long} \\ + \text{short} \end{bmatrix}$

(an unstressed vowel is short)

41. Phonetic adjustments

a.  $\begin{bmatrix} \bar{V} \\ + \text{stress} \\ - \text{diff} \\ - \text{grave} \\ - \text{round} \end{bmatrix}$  -----> <+ comp> in the env.  $\_\_ C_{\bar{V}}\#$

(é > è in a closed syllable, e.g., espère)

b.  $\begin{bmatrix} \bar{V} \\ - \text{diff} \\ + \text{round} \end{bmatrix}$  -----> <- comp> in the env.  $\left. \begin{matrix} (+C)\# \\ z \end{matrix} \right\}$

(ò > ó, œ > ø when final or before z, e.g., sot, rose, oeufs)

APPENDIX B

Verb Stems

The following is a list of the more common "irregular" verbs with indications on how the various forms are treated within our system. The verbs are alphabetized by infinitive according to the standard orthography. The infinitive is followed by the phonological representation of the stem and the thematic vowel is given in parentheses (a = first conjugation, i = second conjugation, é, ó = third conjugation).

The following abbreviations are used: 1, 2, 3 (first, second, third persons); S, P (singular, plural); A, B, C (Groups A, B, C); prs (present), imp (imperfect), sub (present subjunctive), prp (present participle), imv (imperative); fut (future), inf (infinitive), prt (preterite), pp (past participle). The conditional is like the future and the past subjunctive follows the forms of the preterite. Unless otherwise indicated the imperative is like the present and the present participle like the imperfect. The following symbols are also employed: TV (thematic vowel); SV (stem vowel); SC (final stem consonant); Ø (is deleted), e.g., TV > Ø means no thematic vowel; def (defective), i.e., the form does not exist. Most of our data are taken from Le Nouveau Bescherelle.

absoudre                    Ab=sɔlv                    (ó)

B: absoudra: TV > ø  
prt: def  
pp: absous: TV > ø

acquérir                    Ad=kèz                    (é)

z rhotacizes when followed by <+ voc> :  
acquièrs < Ad=kèz+é+z, acquérons  
A, B unstressed: acquérons: SV > + tense, - comp  
inf: acquérir: TV raising (7)  
C: acquis: <- ROUND>

aller                        ɔl                        (a)  
vA (prs 1, 2, 3S, 3P)  
i (fut)

A, B: TV > ø  
prs: 1S: vais: SV > - tense (vAz > vaz > vèz)  
3P: vont: (vA+unt > vó+ nt)  
sub: aille: SC palatalization (10)

assaillir                    Ad=sAli                    (i)

asseoir                      ɔd=sè                      (é)  
ɔd=sE

<- pre-tonic vowel adjustment>  
prs 3: assois, assieds: SV > - tense  
fut: assoirai, assièrai: SV > - tense  
inf: asseoir: SV > ø  
3: assis: <- ROUND>

avoir                        Av                        (é)

prs: 1, 2, 3S, 3P IV > ø  
ai: Av+z > A +z > A +i > é  
ont: Av+unt > A + unt > ónt  
sub, imv, prp: aie: SV > - tense, SC > ø Av > a > è  
sub 3S: ait: no subjunctive marker  
fut: aurai: SV > ó, SC > ø  
C: eu: <+ ROUND>

battre                    bAt                    (ó)

boire                    bév                    (ó)

<- pre-tonic<sup>V</sup> adjustment >  
A unstressed: buvez: SV > U  
B: boirai: TV > ø  
C: bu: <+ ROUND>

bouillir                bÓli                    (i)

prs S: bous: FV > ø

choir                    šé                    (é)

prs 1, 2P, imp, sub, prt, prp: def  
fut: choirai: <- pre-tonic V adjustment >  
cherrai: SV > + tense  
inf: choir: SV > ø  
pp: chu: <+ ROUND>

clore                    klDz                    (ó)

prs 1, 2P, imp, prt: def  
B: clorai: FV > ø  
pp: clos: no pp ending

conclure                kDn=klU                (ó)

C: conclu: <+ ROUND>

conduire                kDn=dUIz                (ó)

(cf. écrire)

confire                kDn=fIz                (ó)

(cf. écrire)

connaître                kDn=nÉ                (ó)

A, B: connaissons: insert +ss after stem  
connaître: kDnÉss+ó+r > kDnÉss+r > kDnÉst+r > kDnÉ:tr  
C: connu: <+ ROUND>

coudre                    kÓz                    (ó)

3: coudre: kÓz+ó+r > kÓz +r > kÓd +r

courir                    kÓr                    (é)

inf: courir: TV raising: kÓr+É+r > kÓr+I+r

couvrir                    kÓvr                    (i)

prs, sub: couvrir: schwa insertion

pp: couvert: metathesis (4) kÓvr+té > kÓvér+t

craindre                    krañ                    (ó)

<- pre-tonic V adjustment>

<- truncation>

3: craindre: dental C conversion (30)

pp: craint: TV > Ø

croire                    kré                    (ó)

<- pre-tonic V adjustment>

C: cru: <+ ROUND>

croître                    kré                    (ó)

(cf. connaître)

cueillir                    kòli                    (i)

fut: cueillerai: TV > a

cuire                    kUIz                    (ó)

(cf. écrire)

devoir                    dév                    (é)

C: du: <+ ROUND>

dire                   dIz                   (ó)

prs 2P: dites: TV > ø  
3: dirai: TV > ø  
C: dit: TV > ø

écrire                É=krIv               (ó)

3: écrirai: TV > ø  
pp: écrit: TV > ø

envoyer              An=vé               (a)

<- pre-tonic V adjustment>  
fut: enverrai: SV > + tense, TV > ø

être                    ét prs 2, 3S, 2P, imp, prp, inf, pp (ó)  
                      sé sub, imv, fut  
                      fU prt  
                      sVC prs 1S, 2, 3P

prs: TV > ø  
  1S: suis: SV > UI  
  1P: sommes: SV > Ø  
  3P: sont: SV > A  
sub: sois: <- pre-tonic V adjustment >  
          no subjunctive marker  
prt: fus: TV > ø  
pp: été: TV > a

faillir               fAli               (i)

prs 3: faux: TV > ø  
fut: faillirai  
      faudra: TV > ø

faire                 faz               (ó)

prs 2P: faites: TV > ø  
  3P: font: TV > ø, 3V > + tense  
          fas+unt > fAs+unt > fA +unt > fOnt  
sub: fasse: insert +ss after stem  
3: ferai: TV > ø  
prt: fis: <- ROUND>  
pp: fait: TV > ø

falloir	fAI	(é)
3S only (cf. valoir)		
frire	frI	(ó)
prs P, imp, sub, prt: def pp: frit: FV > ø		
fuir	fUI	(i)
3: fuir: SV > ø C: fui: SV > ø		
hafir	IA	(i) +ss
prs 3: hais: IV > ø, SV > - tense IA+ss+ts > xa+ss+ts > xa ts > xè ts > è+ts		
lire	lIz	(ó)
3: lirai: FV > ø C: lu: <+ ROUND>		
luire	lUIz	(ó)
3: luirai: FV > ø pp: lui: SC > ø, no pp ending		
maudre	maI=dIz	(ó)
IV > ø everywhere A: maudissez: insert +ss after stem E, C (cf. dire)		
mettre	mat	(ó)
<- pre-vocalic adjustment> 3: mis: <- ROUND>		
moudre	mól	(ó)
(cf. coudre)		

mourir	mòr	(é)
(cf. courir)		
pp: mort: TV > ø		
mouvoir	mòv	(é)
(cf. devoir)		
naître	nÉ nAk prt	(ó)
A, E insert +ss after stem		
(cf. connaître)		
pp: né: no pp ending		
offrir	òfr	(i)
(cf. couvrir)		
ouvrir	óvr	(i)
(cf. couvrir)		
paître	pÉ	(ó)
J: def		
(cf. connaître)		
paraître	pArÉ	(ó)
(cf. connaître)		
peindre	pañ	(ó)
(cf. craindre)		
plaire	plaz	(ó)
<- pre-tonic V adjustment>		
E: plairai: IV > ø		
J: plu: <+ ROUND>		



pleuvoir	plòv	(é)
3S only <- pre-tonic V adjustment> C: plu: <+ ROUND>		
pourvoir	pór=vé	(é)
<- pre-tonic V adjustment> inf: pourvoir: SV > ø C: pourvu: <+ ROUND>		
pouvoir	pòv	(é)
sub: puisse: SV > ũI, insert +ss after stem fut: pourrai: SC > r C: pu: <+ ROUND>		
prendre	prÈn	(ó)
C: pris: <- ROUND>		
recevoir	rÈ=sév	(é)
(cf. devoir)		
résoudre	rÉ=sòlv	(ó)
(cf. absoudre) C: résolu: SC > ø		
rire	rI	(ó)
C: ris: FV > ø pp: ri: no pp ending		
rompre	rOmp	(ó)
savoir	sAv	(é)
prs S: sais: SV > - tense sub, imv, prp: sache: SC > v fut: SV > Ő, SC > ø C: su: <+ ROUND>		

couffrir                    sÓfr                    (i)

(cf. couvrir)

sulvre                      sUIv                    (ó)

pp: suiv1: FV > i

tenir                        tèn                      (é)

<- truncation>

fut: tiendrai: <- pre-tonic V adjustment>

prt: tins: <- ROUND>

traire                        tra                      (ó)

<- pre-tonic V adjustment>

prt: def

pp: trait: IV > Ø

vaincre                      vÉnk                    (ó)

valoir                        val                      (é)

sub: vaille: palatalization (l0)

venir                         vèn                      (é)

(cf. tenir)

vêtir                         vEst                    (i)

pp: vêtu: FV > é

vivre                         vIv                      (ó)

3: vécu: SV > É, SC > k

FV does not undergo u > i

voir                      vé                      (é)

<- pre-tonic V adjustment>

fut: verrai: SV > + tense

inf: voir: SV > ∅

C: vis, vu: SV > ∅

vouloir                      vòl                      (é)

sub, inv: veuille: palatalization (l0)

BIBLIOGRAPHY

- Armstrong, L.F., *The Phonetics of French*. London, 1959.
- Ayer, C., *Grammaire comparée de la langue française*. 4th ed., Paris, 1885.
- Bauche, H., *Le langage populaire*. Paris, 1951.
- Bloomfield, L., *Language*. New York, 1933.
- , "On Describing Inflection", Festschrift für M. Blakemore Evans, pp. 8-13; Monatshefte für deutschen Unterricht, XXXVII: 4-5, Madison, Wisconsin.
- Brunot, F., *Précis de grammaire historique de la langue française*. Paris, 1887.
- Chomsky, N., "The Logical Basis of Linguistic Theory", Proceedings of the IX International Congress of Linguists, The Hague, 1962.
- Chomsky, N., and M. Halle, *The Sound Pattern of English*. (forthcoming)
- Chomsky, N., and G.A. Miller, "Introduction to the Formal Analysis of Natural Languages", Handbook of Mathematical Psychology, ed. Luce, Bush, and Galanter, 1963.
- Clédat, L., *Dictionnaire étymologique de la langue française*. Paris, 1912.
- Delattre, P., *Principes de phonétique française*. 2nd ed., Middlebury, Vermont, 1951.
- de Félice, Th., *Eléments de grammaire morphologique*. Paris, 1950.
- Elcock, W.D., *The Romance Languages*. New York, 1960.
- Fouché, P., *Traité de prononciation française*. Paris, 1956.
- Grammaire Larousse du XX<sup>e</sup> siècle*. Paris, 1936.
- Grammont, M., *Traité de phonétique*. 6th ed., Paris, 1960.
- , *Traité pratique de prononciation française*. Paris, 1961.
- , *Petit traité de versification française*. 19th ed., Paris, 1962.

Grevisse, M., *Le bon usage*. 3th ed., Gembloux, 1964.

Hall, R.A., Jr., *French. Language Monograph No. 24, Structural Sketches I. Language*, XXIV:3 (1948).

Halle, M., "In Defense of the Number Two", Studies Presented to J. Whatmough, pp. 65-72. The Hague, 1957.

--- , *The Sound Pattern of Russian*. The Hague, 1959.

--- , "On the Role of Simplicity in Linguistic Descriptions", Structure of Language and Its Mathematical Aspects: Proceedings of Symposia in Applied Mathematics, Vol. XII (Providence, R.I., 1961), pp. 89-94.

--- , "Phonology in Generative Grammar", Word, XVIII:1-2 (1962), pp. 54-72.

--- , "A Descriptive Convention for Treating Assimilation and Dissimilation", Quarterly Progress Report, M.I.T., No. 66 (July 1962), pp. 295-296.

Harris, Z.S., *Structural Linguistics*. Chicago, 1960.

Jakobson, R., C.G.M. Fant, and M. Halle, *Preliminaries to Speech Analysis*. Cambridge, Massachusetts, 1961.

Jakobson, R., and M. Halle, *Fundamentals of Language. I: Phonology and Phonetics*. The Hague, 1956.

Jakobson, R., and J. Lotz, "Notes on the French Phonetic Pattern", Word, V (1949). Reprinted in R. Jakobson, *Selected Writings. I: Phonological Studies*. The Hague, 1962, pp. 426-434.

Klein, H.W., *Phonetik und Phonologie des heutigen Französisch*. Munich, 1963.

Körting, G., *Der Formenbau des französischen Verbums in seiner geschichtlichen Entwicklung*. Paderborn, 1893.

Livet, Ch.-L., *La grammaire française et les grammairiens du XVI<sup>e</sup> siècle*. Paris, 1859.

Marouzeau, J., *Du latin au français*. Paris, 1957.

Martinet, A., *La prononciation du français contemporain*. Paris, 1945.

Meyer-Lübke, W., Grammaire des langues romanes. Tome I: Phonétique. Transl. by E. Rabiet. Paris, 1890.

Millet, A., Les grammariens et la phonétique. Paris, 1933.

Nouveau Bescherelle: L'art de conjuguer. Paris, 1959.

Nyrop, Kr., Grammaire historique de la langue française, Vol. I, II. Copenhagen, 1903.

Petit Larousse. 5th ed., Paris, 1961.

Pope, M.K., From Latin to Modern French. Manchester, 1961.

Sholes, G.N., Transformations in French Grammar. Doctoral Dissertation, Indiana University, September 1958.

Trager, G.L., "The Verb Morphology of Spoken French", Language, XX:3 (July-September 1944), pp. 131-141.