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On a Morphologically Governed Vowel Alternation in French*

1. Introduction

In studying the vowels of French one discovers a state of affairs which is doubtless quite common in other languages of the world. Some vowel alternations are of great regularity, and the factors conditioning them are clearly defined in phonological terms, that is, in terms of phonological feature matrices and boundaries. A certain number of additional alternations are to be found, however, which are rather more limited in scope. Some appear only among a small class of irregular verbs; others occur only in words related by derivational morphology. The factors governing them cannot be defined in purely phonological terms. Such is the case with the alternations $\varepsilon \sim a, \alpha \sim \mathfrak{I}$ that are encountered in pairs like *formel* 'formal'/*formalisme* 'formalism', *professeur* 'professor'/*professoral* 'professorial'. The rule which accounts for these, which we will call Learned Backing, will be examined in detail in this article. We will see that the operation of Learned Backing is governed by the morphological characteristics of a word. In particular, we will show that the derivational suffixes (and roots) of French divide into two complementary sets, and that membership in these sets determines whether or not a morpheme undergoes Learned Backing or provides the context for it. The membership of these sets is not predictable in phonological terms, and we will show that a morphological feature must be posited in order to differentiate between them.

2. Review of the French Vowel System

This study is based on a view of French phonology which is rather different from the one propounded by Schane in *French Phonology and Morphology,* the first treatment of the French sound system within the framework of generative phonology. Our intellectual debt to Schane's book is enormous, and it is with regret that we recognize the impossibility of doing justice to his analysis in the context of this article by presenting a systematic explanation of our differences and an exposition of the arguments which have led us to adopt the analysis advocated below. A detailed discussion of Schane's analysis will be given in Dell (forthcoming).

Before getting into a discussion of the morphophonemic rule of Learned Backing which is the center of our attention in this article, we will give a brief review of the assumptions about the phonology of vowels in French which provide the backdrop for our analysis.

(1) The system of underlying vowels which must be posited in order to account for the facts of French phonology is essentially the same as the system of oral vowels traditionally accepted in analyses in the "phonemic" vein, i.e. /i, e, ɛ, ü, ö, œ, u, o, ɔ, a, ə/.

(2) French has a fairly limited number of phonological rules of any generality. Those involving vowels are notably Nasalization,[1] Gliding,[2] Vowel Harmony,[3] Closed Syllable Adjustment,[4] Round Vowel Raising,[5] and the various rules of

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[1] French has no underlying nasal vowels. The nasal vowels appearing in *bain* [bɛ̃] 'bath', *fin* [fɛ̃] 'thin, fine', *parfum* [parfɛ̃] ([parfœ̃] for some speakers) 'perfume', *bon* [bɔ̃] 'good' are derived from underlying oral vowels preceding a nasal consonant: /bɛn/, /fin/, /parfüm/, /bɔn/. Cf., for example, Schane (1968, 45–50).

[2] Cf. Morin (1971, 108–162), Dell (1972).

[3] Cf. Morin (1971, 98), Selkirk (1972, 358 ff.), Dell (1973, 214–217).

[4] See below.

[5] The rule of Round Vowel Raising rewrites all round vowels as nonlow in word-final position, cf. Schane (1968, 50–51). It accounts for the absence of any low round vowels (i.e. œ and ɔ) at the end of words, and for alternations such as *salope* [salɔp] 'bastard, fem.'~*salaud* [salo] 'bastard, masc.', *dégueulasse* [degœlas] 'disgusting (in slang)'~*dégueu* [degö] short form of *dégueulasse* (cf. also *dégueule* [degœl] 'he throws up (in slang)'). It is this rule and not some generalization of Closed Syllable Adjustment (cf. below) that is responsible for such alternations as *veulent* [vœl] 'they want'~*veut* [vö] 'he wants', *peuvent* [pœv] 'they can'~*peut* [pö] 'she can', if one assumes that the verbal roots have the underlying forms /vœl/, /pœv/. Round Vowel Raising must also apply to round vowels preceding the consonant *z* immediately followed by a morpheme boundary or a word boundary, so as to account for the nonoccurrence of low round vowels in that context, as in *cause* [koz] 'he chats', *causer* [koze] 'to chat', *causerie* [kozri] 'talk'. The rule will then also account for the vowel alternation found in the agentive suffix *-eur,* which is *-eur* [œr] in the masculine and *-euse* [öz] in the feminine. Notice that the rule must specify the presence of a boundary following *z,* since [ɔ] can occur in front of a morpheme-internal *z,* as in *Joseph, Cosette, Lozère* (proper names), *losange* 'diamond (geom.)', *sosie* '(someone's) double', *mosaïque* 'mosaic', *philosophe* 'philosopher', *cosaque* 'cossack'.

For those speakers who pronounce schwa as [œ], the rule of Round Vowel Raising will have to precede the late *ə → œ* rule, since schwa can be pronounced [œ] even at the end of a word or before a morpheme-final *z: reste là* 'stay here' [rɛstœla], *peser* 'to weigh' [pœze].

schwa deletion.[6,7] Most of the alternations not accounted for by these rules, such as those found with *meurt* [mœr] 'she dies' ~ *mourez* [mure] 'you pl. die', *doivent* [dwav] 'they owe, must' ~ *devez* [dəve] 'you pl. owe, must', *homme* [ɔm] 'man' ~ *humain* [ümɛ̃] 'human', are of marginal nature and must be handled by resorting to suppletion devices or to "minor" rules, i.e. rules which only operate in a limited set of exceptional forms, which are listed in the lexicon as being susceptible to them.[8]

(3) The word stress rule applying in French assigns stress to the rightmost syllable of a word, unless this syllable contains a schwa, in which case stress falls on the penultimate syllable. The rule may be formulated as $V \rightarrow [+ \text{stress}] /$ ___ $C_0(\text{ə}C_0)\#$. Except for a few very late rules dealing mainly with vowel length, the position of word stress plays only a marginal role as a conditioning factor for vowel alternations. Those few rules whose structural description must refer to the feature [stress] are minor rules, like those needed to account for the alternations found in *meurt* ~ *mourez, doivent* ~ *devez*.

These assumptions differ greatly from some of the conclusions reached in Schane (1968). Schane proposed that the underlying vowel system of French had no front rounded vowels, but that it did have a systematic contrast between tense and lax vowels.[9] He argued that the operation of many rules in "nonlearned" forms depended crucially on the prior assignment of word stress by an early stress rule, and that the stress rule itself took into consideration the distinctions between tense and lax vowels and between inflectional and derivational affixes. A detailed discussion of our reasons for rejecting these claims will be given elsewhere.[10] In Schane's analysis various alternations which we can demonstrate are entirely marginal are taken as reflecting the operation of very general rules. This is done at the cost of considering as exceptional many nonalternating morphemes, whose phonological behavior is the rule in the most productive areas of the morphology of modern French. It is done at the cost of generating as possible and normal in modern French various alternations which in fact are never found to occur.[11]

As an illustration of our assumptions (1) and (2), let us examine the behavior of the

[6] Cf. Dell (1973, 221–260) and Vergnaud (1975).

[7] To these should be added the rule inserting a yod between ε or *wa* and a following vowel (cf. fn. 16 below) and the rule(s) which account for the adjustment in vowel backness in the [wañ] ~ [wɛ̃] alternations one finds in e.g. *poing* [pwɛ̃] 'fist' ~ *poignée* [pwañe] 'fistful', *joins* [jwɛ̃] 'you (sg.) bring together' ~ *joignez* [jwañe] 'you pl. bring together'.

[8] See Lightner (1968) on the notion of minor rules in phonology.

[9] Cf. also Schane (1972).

[10] In Dell (forthcoming).

[11] We agree basically with the criticisms presented in Walker (1975, 893–895), although we think that they give only a very sketchy outline of the difficulties that one runs into when one pursues the implications of Schane's proposals for facts other than those cited in his book.

vowels in the verbal stems belonging to the "first conjugation". The verbal stems of French must be marked in the lexicon as belonging to one of a number of conjugational classes. The so-called "first conjugation" contains all and only those verbs which take the ending -*er* (phonetically [e]) in the infinitive,[12] e.g. *graver* 'to carve out, to engrave', *centraliser* 'to centralize'. All the relevant data are summarized in Table 1, where we have given a series of verbs, each of which illustrates one of the various possibilities of vocalic behavior. For each verb we give the infinitive and the third person singular present, both in their written form and in phonetic transcription. At the left of each verb, we have placed the vowel which we believe underlies the vowel(s) in the last syllable of the verbal stem in question.[13]

Table 1

/i/ *citer cite* 'to quote' [site] [sit]	/ü/ *sucer suce* 'to suck' [süse] [süs]	/u/ *trouver trouve* 'to find' [truve] [truv]
/e/ *céder cède* 'to yield, [sede] [sɛd] cede'	/ö/ *ameuter ameute* 'to [amöte] [amöt] collect into a riotous crowd'	/o/ *frôler frôle* 'to touch [frole] [frol] lightly, to brush'
/ɛ/ *mêler mêle* 'to mix' [mɛle] [mɛl]	/œ/ *pleurer pleure* 'to cry, [plœre] [plœr] weep'	/ɔ/ *voler vole* 'to fly' [vɔle] [vɔl]
	/ə/ *mener mène* 'to lead' [məne] [mɛn]	/a/ *parler parle* 'to talk' [parle] [parl]

[12] Except for *aller* 'to go'. While everyone agrees on the defining characteristics and membership of the "first conjugation", which contains the bulk of French verbs, there is no such consensus about the number of conjugational classes necessary to accommodate the conjugation patterns of the remaining verbs. For the sake of convenience, we will group into a "second conjugation" all and only those verbs in which tense and mood endings beginning in a vowel are preceded by the augment -*iss*- ([is]), and will lump all the remaining verbs of French into a "third conjugation". Thus *finir* 'to finish' (2nd pl. indic. pres. *finissez*) belongs to the second conjugation, while *prendre* 'to take', *devoir* 'to owe; must', *dormir* 'to sleep' belong to the third conjugation.

[13] It is necessary to give some details about the phonetic representations we will be making use of throughout this article. In order to avoid undue complication in these representations, we will not note the effects of certain processes, such as vowel harmony or the lengthening of stressed vowels before the "lengthening consonants" [v,z,ž,r]. These rules apply quite late in the grammar and are irrelevant to our main concerns here. So, for example, the pronunciation of the root *vis*- will always be written as [viz], whether in *viser* [vize] or *vise* [viz], though strictly speaking this last form should be written [vi:z]. Similarly, for *mêler*, Table 1 gives only the pronunciation [mɛle], whereas there is also another pronunciation, [mele], derived by the operation of the rule of Vowel Harmony. (See fn. 3.) Furthermore, we will not note the differences between ɛ~ɛ: and a~a:; *mettre* 'to put' and *maître* 'master' will both be written [mɛtr], while *patte* 'paw, foot' and *pâte* 'batter, paste' will both be written [pat], the symbol [a] being chosen for typographical convenience. The opposition between [ɛ] and [ɛ:] no longer exists in Paris, except for a few individuals with conservative speech; however, the distinction between [a] and [a:] is still quite alive in the speech of many Parisians of the younger generation, though from speaker to speaker it is subject to fluctuations which call for a detailed sociolinguistic study. Cf. for example Reichstein (1960). Finally, as far as [ə] is concerned, see below. Word stress will not be marked. Its position is always predictable, according to the rule given at the beginning of assumption (3).

The only vowels of Table 1 which exhibit any alternations and thus a phonetic form at variance with the underlying one are /e/ and /ə/. We agree with Schane (1968, 35) that there is a rule of "Closed Syllable Adjustment" which converts /e/ to [ɛ] in a closed syllable (the [ɛ] of *cède* deriving from /e/), and we think furthermore that it should be generalized so as to rewrite /ə/ as [ɛ] as well, in the same context. This latter modification allows us to account for the [e] ~ [ɛ] alternations and the [ə] ~ [ɛ] alternations found in *mener/mène* and other similar verbs with a single rule, for both alternations occur in exactly the same range of contexts. Since it is by no means an easy matter to formally define the notion "closed syllable", at the intermediate level at which Closed Syllable Adjustment (CSA) must apply, and since it would involve going into many details irrelevant to the purpose of this article, we will content ourselves with the informal characterization of CSA given below in (4). (We refer the interested reader to Dell (1973, 198–217) and to Basbøll (1975), where this rule is discussed at length.)

(4) *CSA*
$$\begin{Bmatrix} e \\ ə \end{Bmatrix} \rightarrow ɛ \; / \text{ in closed syllables}$$

This rule allows no exceptions.[14] Though our examples were drawn from the verbal conjugation, many others can be found which show that CSA is also at work in the area of derivational morphology, e.g. *hôtel* [otɛl] 'hotel', *hôtelier* [otəlje] 'hotel keeper', *Genève* [žənɛv] 'Geneva', *genevois* [žənəvwa] 'Genevan', *insertion* [ɛ̃sɛrsjɔ̃] 'insertion', *insérer* [ɛ̃sere] 'to insert', *complète* [kɔ̃plɛt] 'complete (fem.)', *compléter* [kɔ̃plete] 'to complete', etc.[15]

Up to this point, then, we have reached the following conclusion: that the only alternations undergone by vowels occurring in inflected first conjugation stems are those governed by CSA and the other phonological rules mentioned in assumption (2).[16] This conclusion is not without interest, for the first conjugation is the only productive conjugational class in French. It contains the overwhelming majority of the verbs in the language, and is the only one to which new items can be added,[17] be they foreign

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[14] Cf. Dell (1973, 219).

[15] Note that Closed Syllable Adjustment, which converts an underlying /ə/ into [ɛ], must apply before Word Stress. The derivation of *hôtel* is then /otəl/ → /otɛl/ → [otɛ́l]. Given that the stress rule is formulated as V → [+stress] / ___ C₀(əC₀)#, the opposite ordering of stress and CSA would yield /otəl/ → /ótəl/ → *[ótɛl].

[16] Certain other rules could be added to the list in assumption (2): for example, the insertion of yod at the end of verbs ending in [ɛ] and [wa] (graphically *ai* and *oi*) before an ending beginning with a vowel, e.g. *il balaie* [balɛ] 'he sweeps', *nous balayons* [balɛyɔ̃] 'we sweep', *il aboie* [abwa] 'he barks', *nous aboyons* [abwayɔ̃] 'we bark'. Notice that, like the other rules referred to in the text so far, this one applies in derivational morphology, too: *balai* [balɛ] 'broom', *balayette* [balɛyɛt] 'little broom', *soie* [swa] 'silk', *soyeux* [swayö] 'silky, silk-like'.

[17] An exception to this generalization is *alunir* 'to land on the moon' (cf. *atterrir* 'to land'), which belongs to the second conjugation. We have not been able to find any such exception in the case of the third conjugation.

borrowings such as *surfer, sprinter, shooter, napalmer, interviewer* or new derived stems such as *ovationner, transistoriser,* etc. We see, then, that only the "productive" (i.e. perfectly general) phonological rules are associated with the productive verb class. All the vowel alternations found in inflected verbal stems which cannot be handled by the aforementioned phonological rules, e.g. *peuvent* [pœv] '(they) can', *pouvez* [puve] '(you) can', are in fact restricted to the nonproductive, far smaller, "third conjugation". (Apart from one isolated case,[18] the stems of the second conjugation do not show any verbal alternations at all.)[19]

Another conclusion suggested by Table 1 is that the underlying vowel system of French should include at least the eleven vowels /i,e,ɛ,ü,ö,œ,u,o,ɔ,a,ə/, since such an eleven-way contrast is found on the surface in the last syllable of the first conjugation stems.[20] Careful examination of the relevant data shows that tables containing identical eleven-way contrasts can be built for second conjugation verbs, nouns, adjectives, etc. We will thus assume that this eleven-vowel system *is* the system of underlying vowels of French. Within the distinctive feature system proposed in Chomsky and Halle (1968) (hereafter SPE), the feature specifications of these vowels are as shown in Table 2:

Table 2

	$\begin{bmatrix} -\text{back} \\ -\text{round} \end{bmatrix}$	$\begin{bmatrix} -\text{back} \\ +\text{round} \end{bmatrix}$	$\begin{bmatrix} +\text{back} \\ -\text{round} \end{bmatrix}$	$\begin{bmatrix} +\text{back} \\ +\text{round} \end{bmatrix}$
[+high, −low]	i	ü		u
[−high, −low]	e	ö	ə	o
[−high, +low]	ɛ	œ	a	ɔ

The feature specifications of all the vowels except /ə/ are straightforward, since they are simply a translation into the SPE framework of the phonetic values that the corresponding symbols have in the IPA notation. The feature characterization of /ə/ is not so straightforward, however. We know that in order for the schwa deletion rules to be able to refer unambiguously to the right vowel, schwa must be distinct from all the other nonhigh vowels. Its feature specification must furthermore be such as to allow as natural as possible a characterization of the class of segments which are inputs to CSA. The most plausible candidate for /ə/ would therefore be a [+back, −low, −high, −round] vowel. This would allow us to rewrite CSA as follows:

[18] The [ai]/[ɛ] alternation found in *haïr: il hait* [ɛ] 'he hates', *ils haïssent* [ais].

[19] Of course, the fact that some vowel alternations are found only in a small minority of verbs which all belong to the nonproductive third conjugation, and are never found in verbs of the first and second conjugations, cannot in itself be taken as proof that these vowel alternations are only of a marginal character, to be accounted for by minor rules and suppletion devices. Indeed, our intention here is not to argue that assumptions (1)–(3) are to be preferred to alternative ones such as Schane's. Rather we wish only to illustrate concretely our conceptions of what the overall patterns of the French vowels are, so as to enable the reader to see the special alternations to be discussed later in the proper perspective.

[20] We leave aside the nasal vowels, which we assume are to be derived from underlying nonnasal ones. Cf. fn. 1.

(5) *CSA*

$$\begin{bmatrix} -\text{high} \\ -\text{low} \\ -\text{round} \end{bmatrix} \rightarrow \begin{bmatrix} -\text{back} \\ +\text{low} \end{bmatrix} / \text{ in closed syllables}$$

However, in the varieties of Parisian French with which we are familiar (and these are apparently the most common), /ə/ is not realized phonetically as a [+back, −low, −high, −round] vowel. Those /ə/ which are not deleted, or converted into [ɛ] by CSA, show up as [œ], i.e. a low front rounded vowel identical in all respects with the surface reflexes of /œ/, e.g. the vowel in *neuf* [nœf] 'nine'. As for the dialects where the schwas immune to CSA and the schwa deletion rules appear as some sort of "central vowel" distinct from [œ] and [ö], the reports found in the literature are too vague or hesitant to be useful. For the purposes of this article we will assume the characterization of underlying /ə/ as given in Table 2, and assume the existence of some rule(s) which will give the vowel its proper phonetic realization in the cases not governed by deletion or CSA.

3. The Rule of Learned Backing and the Feature [Learned]

3.1. The Morphemes Providing the Context

This section will be devoted to a detailed examination of the vocalic alternations [œ] ~ [ɔ] and [ɛ] ~ [a] that are found, for example, with the pairs *heure* [œr] 'hour' ~ *horaire* [ɔrɛr] 'hourly' and *mer* [mɛr] 'sea' ~ *marin* [marɛ̃] 'seaman'. We argue that /œ/ and /ɛ/, respectively, underlie these phonetic alternants, and that these underlying vowels undergo a change only in words with a so-called "learned" suffix. We argue for the existence of a morphological feature [±L] (for learned) which serves to divide the suffixes and roots of French into two classes. The rule of Backing which we claim derives [ɔ] from /œ/ and [a] from /ɛ/ is sensitive to this morphological feature, and as such is not a strictly phonological rule.

Consider first Table 3, containing examples in which [œ] alternates with [ɔ]:

Table 3

A [œ]	B [œ]	C [ɔ]
fleur 'flower'	fleurette 'small flower'	floral 'floral'
seul 'alone'	seulement 'only'	solitude 'solitude'
peuple 'people'	peuplade 'tribe'	populaire 'popular'[21]
meurtre 'murder'	meurtrier 'murderer'	
veuf 'widower'	veuvage 'widowhood'	
heure 'hour'		horaire 'hourly, schedule'
choeur 'choir'		choral 'choral'
terreur 'terror'		terroriser 'terrorize'

[21] For a discussion of the appearance of the vowel [ü] (written *u*) in *populaire*, cf. Appendix B.

Columns B and C contain words formed by adding derivational suffixes onto the words of column A, which all have [œ] as their last full vowel.[22] The data of Table 3 illustrate the fact that, when considered from the point of view of the [œ] ~ [ɔ] alternation, the derivational suffixes of French can be divided into two complementary sets, which we will call "nonlearned" and "learned".[23] When a nonlearned suffix is added onto a derivational base[24] whose last full vowel is [œ], this vowel still shows up as [œ] in the derived word, as exemplified in column B: *fleur* [flœr] ~ *fleurette* [flœrɛt]. If, on the other hand, the added suffix is a learned one, the last full vowel of the derivational base may switch to [ɔ], as exemplified in column C: *fleur* ~ *floral* [flɔral]. (Because of accidental or systematic gaps in the derivational morphology, not all of the derivational bases allow for the full range of combinations displayed by the first three examples of Table 3. Some bases, such as *meurtre, veuf,* are not found in combination with learned suffixes, whereas others, such as *heure, choeur, terreur,* are not found in combination with nonlearned suffixes. Thus the columns B and C have been left blank for these combinations.)

Since a close examination of the phonological makeup of the derivational suffixes has not revealed any set of features which would allow one to distinguish between the two classes of suffixes on purely phonological grounds, we propose that a diacritic feature provide the necessary distinctions. All the suffixes belonging to the nonlearned class will be marked [−L] in the lexicon, whereas all the others will be marked [+L]. The rule accounting for the observed alternations will be sensitive to the feature [±L]. In section 4 we argue against the alternatives to this morphological feature solution.

Below in (6) we give a first approximation of the rule which we posit in order to account for the alternations under review.

(6) *Learned Backing* (provisional)
$$\begin{bmatrix} +\text{syll} \\ +\text{low} \end{bmatrix} \rightarrow [+\text{back}] \, / \, \underline{\qquad} \, C_0 + \begin{bmatrix} X \\ +L \end{bmatrix}$$

This rule states that a low vowel is rewritten as [+back] when it is the rightmost vowel of a morpheme which is immediately followed within the same word by a morpheme marked [+L]. Assuming, without yet giving any justification, that the underlying representation of *fleur* is simply /flœr/, the underlying representation of *floral* must be as in (7).

(7) $/\text{flœr} + \begin{bmatrix} \text{al} \\ +L \end{bmatrix}/$

[22] We use the term "full vowel" for any vowel that is not [ə].

[23] On the choice of the terms "nonlearned and "learned", see below.

[24] The lexical item *nationaliser* 'to nationalize' is derived by adding the derivational suffix *-is* onto the lexical item *national,* which we call the *derivational base* in this instance. *National* is itself built by adding the derivational suffix *-al* onto the lexical item *nation,* which is the derivational base with respect to the suffix *-al.* In the verb form *nationalisions* 'we were nationalizing', we call the sequence *nationalis-* the inflectional stem, as the sequence *-ions* contains only inflectional suffixes.

The *œ* is rewritten as *ɔ* since the structural description of Learned Backing (hereafter LB) is met. On the other hand, *fleurette* is derived from *fleur* with a nonlearned suffix; its underlying representation is as in (8).[25]

$$(8) \quad /\text{flœr} + \begin{bmatrix} \text{ɛt} \\ -\text{L} \end{bmatrix} + \text{ə}/$$

As a consequence, the *œ* here remains unaffected by the rule LB, for its structural description is not met.

The situation which obtains in the case of the [ɛ] ~ [a] alternation is exactly parallel to the one just described for the [œ] ~ [ɔ] alternation. Some suffixes, when added to a derivational base whose last full vowel is [ɛ], will trigger a switch to [a], while other suffixes will not. Those suffixes which do cause *ɛ* to switch to *a* are precisely those which cause [œ] to switch to [ɔ]. Table 4 below contains a few examples typical of the [ɛ] ~ [a] alternation.

Table 4

A [ɛ]	B [ɛ]	C [a]
vain 'vain'	vainement 'in vain'	vanité 'vanity'
clair 'clear, light'	éclairer 'to light'	clarifier 'clarify'
mer 'sea'	amerrir 'to land on the sea'	marin 'sailor'
aile 'wing'	ailette 'small wing'	
veine 'luck'	veinard 'lucky'	
germain 'member of a Germanic tribe'		germanique 'Germanic'
prolétaire 'proletarian'		prolétarien 'proletarian'

Our rule of LB will handle the alternations of Table 4 and similar ones in the same way it handled those of Table 3. Assuming for the time being that the underlying representation of *vain* [vɛ̃] is simply /vɛn/,[26] the underlying representation of *vanité* will be as in (9):

$$(9) \quad /\text{vɛn} + \begin{bmatrix} \text{ite} \\ +\text{L} \end{bmatrix}/$$

(9) will then be turned into [vanite] by LB.

On the basis of the [œ] ~ [ɔ] and [ɛ] ~ [a] alternations, therefore, it is possible to

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[25] What is written *-ette* is actually a sequence of the diminutive suffix /ɛt/ plus the feminine suffix /ə/. Later on in the derivation, the final schwa is subject to an obligatory deletion rule; cf. fn. 6.

[26] The nasalized vowel in *vain* [vɛ̃] is derived through the operation of the rule of Nasalization; cf. fn. 1.

make an enumeration of what we call the learned suffixes. We have assembled them below, in Table 5. Associated with each suffix in the table is a list of words in which the vowel in the syllable preceding the prefix has undergone LB. In most cases these lists of words are merely representative, not exhaustive.

Table 5: Learned Suffixes

-isme

terrorisme	'terrorism'	(terreur 'terror')
urbanisme	'urbanism'	(urbain 'urban')
naturalisme	'naturalism'	(naturel 'natural')

-iste

choriste	'choir-singer'	(chœur 'choir')
réaliste	'realist'	(réel 'real')
rigoriste	'rigorist'	(rigueur 'severity')

-iser

solidariser	'render jointly responsible'	(solidaire 'jointly responsible')
américaniser	'Americanize'	(américain 'American')
désodoriser	'deodorize'	(odeur 'odor')

-ifier

clarifier	'clarify'	(clair 'clear, light')
panifier	'turn into bread'	(pain 'bread')

-ité[27]

parité	'parity'	(pair 'even')
mondanité	'social event, worldliness'	(mondain 'fashionable, worldly')
supériorité	'superiority'	(supérieur 'superior')

-at

professorat	'professorship'	(professeur 'professor')
notariat	'profession of notary public'	(notaire 'notary public')
odorat	'sense of smell'	(odeur 'odor')

-in

salin	'saline'	(sel 'salt')
marin	'seaman'	(mer 'sea')
bovin	'bovine'	(boeuf 'ox')

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[27] *-ité* is a learned suffix, whereas *-té* is nonlearned.

Table 5:   (Continued)

-ule

granule	'granule	(grain 'grain')
ovule	'ovule'	(oeuf 'egg')

-itude

solitude	'solitude'	(seul 'alone')

-al

choral	'choral'	(choeur 'choir')
équatorial	'equatorial'	(équateur 'equator')
domanial	'public (property)'	(domaine 'estate')

-aire

populaire	'popular'	(peuple 'people')
horaire	'hourly'	(heure 'hour')
honoraire	'honorary'	(honneur 'honor')

-el

charnel	'carnal'	(chair 'flesh')
manuel	'manual'	(main 'hand')
vectoriel	'vectorial'	(vecteur 'vector')

-eux

vaporeux	'vaporous'	(vapeur 'vapor')
liquoreux	'liquor-like'	(liqueur 'liquor')
laborieux	'arduous'	(labeur 'hard work')

-ien

agrarien	'agrarian	(agraire 'agrarian')

-ier[28]

immobilier	'real estate	(immeuble 'building')

-ifère

lanifère	'wool-bearing'	(laine 'wool')
florifère	'flower-bearing	(fleur 'flower')

-oïde

ovoïde	'egg-shaped'	(oeuf 'egg')

[28] The suffix *-ier* we have in mind here is the learned one used in the formation of adjectives which also appears in *régulier* 'regular' (from *règle* 'rule'), *séculier* 'secular' (from *siècle* 'century'). It should be kept carefully distinct from the other *-ier* suffixes which are nonlearned, such as those appearing in *pommier* 'apple-tree' (from *pomme* 'apple'), *prisonnier* 'prisoner' (from *prison* 'prison'), *poudrier* 'powder box' (from *poudre* 'powder').

Table 5: (Continued)

-icide

    parricide   'patricide'   (père 'father')

-(i)fique

    honorifique   'honorific'   (honneur 'honor')

    pacifique   'peaceable'   (paix 'peace')

-at-eur

    amateur   'amateur'   (aimer 'to love')

    novateur   'innovator'   (neuf 'new')

-ique

    germanique   'Germanic'   (germain 'member of a Germanic tribe')

-ibond

    moribond   'moribund'   (meurt '(s)he dies')

When examining the list just given, one should bear in mind that the distinction between "learned" and "nonlearned" suffixes as we define it is set up on purely phonological grounds. For the time being at least, we define the learned suffixes as those which trigger the operation of the phonological rule of Learned Backing. Note also that instead of "learned" and "nonlearned" we could have used the neutral terms "alternating" and "nonalternating" or some such in distinguishing those suffixes which provide the context for Learned Backing from those that do not, but the traditional terms are undoubtedly more perspicuous for students of French and other Romance languages, and so we will continue to use them.[29] These terms should not be taken as dividing words into two distinct levels of vocabulary, which might differ in the styles and circumstances of their usage. One can find many examples of words containing suffixes which are "learnèd" in our sense, and which cannot in any way be considered to be "learnèd words" in present-day French:[30] *cycliste* 'cyclist', *solidité* 'solidity', *locataire* 'tenant', and so on.

3.2. The Morphemes Affected

3.2.1. Not all morphemes may undergo Learned Backing, however, even when the context in (6) is satisfied. In other words, the rule as formulated in (6) is incorrect; it will overapply. So some modification of LB is required. In order to specify the context

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[29] It is not uncommon for languages to have morpheme classes that display rather different phonological properties and whose existence has a historical explanation, as in French. See, for example, Lightner (1972) on Russian and McCawley (1968) on Japanese.

[30] See Dubois (1962), for many examples of everyday words created recently with suffixes which are "learned" in our sense.

of LB more fully, we will take a look at the suffixes and roots which do and do not undergo the rule.

What emerges from this investigation is quite important. It turns out that it is possible to divide morphemes (suffixes and roots) into two classes, depending on whether or not they undergo LB when a [+L] suffix follows directly. Table 6 is composed of the suffixes with low vowels which do undergo LB when they occur immediately before a learned suffix.

Table 6: Alternating Morphemes—Suffixes

-ain
> africain 'African'
> américain 'American'
> humain 'human'

> africaniste 'Africanist'
> américaniser 'Americanize'
> humanité 'humanity'

-el
> immortel 'immortal'
> matériel 'material'
> rationnel 'rational'

> immortalité 'immortality'
> matérialiste 'materialist'
> rationaliser 'rationalize'

-ien
> parisien 'Parisian'
> hégélien 'Hegelian'
> italien 'Italian'

> parisianiser 'Parisianize'
> hégélianisme 'Hegelianism'
> italianiste 'scholar of Italian'

-aire
> ovaire 'ovary'
> volontaire 'voluntary'
> complémentaire 'complementary'
> parlementaire 'parliamentary'
> similaire[31] 'similar'
> solidaire 'jointly responsible'

> ovarien 'ovarian'
> volontariat 'status of an enlisted man'
> complémentarité 'complementarity'
> parlementarisme 'parliamentarism'
> similarité 'similarity'
> solidariser 'render jointly responsible'

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[31] We consider adjectives like *similaire* and *religieux* to be suffixed, even though the roots *simil-* and *relig-* never appear as independent words, for those roots can nevertheless also appear with other suffixes: *similitude* 'resemblance', *religion* 'religion'. We also assume the existence of an adjectival suffix *-aire* in words like *précaire* 'precarious' and *perpendiculaire* 'perpendicular' (cf. *précarité, perpendicularité*), even though there are no other morphologically related words containing the roots *préc-* and *perpendicul-*. We have made a similar decision for the many inbetween cases like *vulgaire* (cf. *vulgarité, vulgariser*) where it is not clear at present whether the same root does appear in other words (that is, it is not clear whether *vulgaire* and *divulguer* 'divulge' should be said to share the same root *vulg-*, in a grammar of modern French). Nothing essential hinges on this choice in the present discussion, where we do not attempt to deal with questions of how words are formed. Viewed from this narrow perspective, the issue is only whether the lexical items *précaire, perpendiculare,* and *vulgaire* are susceptible to the effects of LB because they all contain the same suffix *-aire*, which is marked once and for all as undergoing the rule, or because each of these lexical items is individually marked in the lexicon as undergoing the rule. Our decision to consider them

-ier[32]

singulier 'singular'	singularité 'singularity'
régulier 'regular'	régulariser 'regularize'
particulier 'particular'	particularisme 'particularism'

-eux[33]

nerveux 'nervous'	nervosité 'nervousness'
religieux 'religious'	religiosité 'religiosity'

-eur:1 (adjectives)

intérieur 'interior'	intérioriser 'internalize'
supérieur 'superior'	supériorité 'superiority'

-t-eur:2 (agentive nouns)[34]

recteur 'rector'	rectorat 'rectory'
moteur 'engine'	motoriser 'to mechanize'

-eur:3 (nonagentive nouns)[35]

odeur 'odor'	odorat 'sense of smell'
vapeur 'vapor'	vaporeux 'vaporous'
rigueur 'severity'	rigorisme 'rigorism'
terreur 'terror'	terroriser 'terrorize'
équateur 'equator'	équatorial 'equatorial'

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as containing the suffix *-aire* is partly one of convenience, but is also based on the opinion that the fact that these words ending in *-aire* are indeed adjectives (which is all they could be if they contained the *-aire* suffix) is not a coincidence.

Remarks similar to those made above apply to our decision to think of *antérieur, inférieur*, etc., as containing the adjectival suffix *-eur-1*, and to our decision to think of *odeur, équateur*, etc., as being built with the nominal suffix *-eur-3*.

[32] We assume that this suffix *-ier* has the phonological representation /ɛr/, and that it belongs to a restricted class of morphemes which are marked as susceptible to a minor diphthongization rule, written $\phi \rightarrow$ i / ___ ɛ. This rule accounts for the alternations *matière/matériel, acquiers/acquérir, siècle/séculier, bref/ brièvement*, and also *venez/viennent, tenez/tiennent, papier/paperasse* (these latter forms show that the diphthongization rule must apply after CSA has rewritten the underlying schwa as ɛ). This allows us to account for the [ar] and [jɛr] pronunciations found in *régularité* and *régulière*. (As for the [je] pronunciation found in *régulier*, Selkirk (1972, 343–351) has posited a rule of ER-Conversion which rewrites /ɛr/ as [e] at the end of words not in a liaison context.)

[33] The suffix *-eux* is always pronounced with a nonlow vowel: it appears as [ö] in the masculine (*-eux*), [öz] in the feminine (*-euse*) and [oz] in front of learned suffixes (*-os-*). We assume, however, that its underlying form is /œz/, with a low vowel which turns into [ö] because of the operation of Round Vowel Raising (cf. fn. 5). The latter rule must apply after LB, from which the variant [oz] in *rugosité* (æ → ɔ → o) is derived.

[34] A few agentive nouns in *-eur* without *t*, all of them indicating a rank in an institution, undergo LB: *professeur/professoral, gouverneur/governorat, proviseur/provisorat*.

[35] We have put under this heading a list of miscellaneous abstract nouns, mostly of the feminine gender, whose root cannot appear as an independent word, e.g. *terreur* 'terror', *terrible* 'terrible', *terrifier* 'terrify.'

As for the suffix *-eur* which appears in feminine nouns derived from adjectives (*blancheur* 'whiteness',

Table 7 contains suffixes with low vowels which do not undergo LB when followed by a [+L] suffix.[36]

Table 7: Nonalternating Morphemes—Suffixes

-ier (occupational names)
    ouvrier 'worker'   ouvriérisme 'workerism'

-eur (agentive nouns)
    voyeur 'peeping Tom'   voyeurisme 'voyeurism'
    conteneur 'container'   conteneuriser 'containerize'

-ier (trees)
    rosier 'rose bush'   rosiériste 'rose grower'

-ier (places and containers)
    pépinière 'nursery of trees'   pépiniériste 'nursery gardener'

-et (diminutive)
    trompette 'trumpet'   trompettiste 'trumpetist'
    cornet 'cornet'   cornettiste 'cornetist'

-ais (adjectives)
    japonais 'Japanese'   japonaisifier 'Japanesify'

On the basis of the data presented here and in the previous section, it is possible to make the following important generalization:

> (10) The (low) vowel of a suffix is subject to Learned Backing if and only if it is [+L] itself.

Let us review the observations that lead to this conclusion. Remember first that learned suffixes, listed in Table 5, were defined as those which provide a suitable *context* for the operation of LB in the last vowel of the preceding morpheme. Now, Table 6 lists all the suffixes whose vowel can be *input* to LB. It is a fact, as the reader can readily see, that all the suffixes of Table 5 with underlying low vowels are also to be found in Table

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lenteur 'slowness', etc.), it is never followed by any other derivational suffix, except in two cases, *chaleureux* 'warm (person)' and *doucereux* 'sweetish', where it doesn't undergo LB. On these two words, cf. below.

[36] The French vocabulary contains very few words in which a suffix of Table 7 is followed by a learned suffix. In fact, Table 7 contains all the forms we have been able to find. In the case of *-ais*, no form could be found at all. The verb *japonaisifier* is not actually attested, but according to the intuitions of native speakers of French, this is the form which one would obtain if one derived a verb in *-ifier* from *japonais*, not the form **japonasifier* predicted by LB. The lists of Table 7 could easily be extended by adding to them likely new words coined in a similar fashion. For example, the word formed by adding *-isme* on to *cigarette* (*cigare* plus the diminutive suffix *-ette*) would surely be *cigarettisme*, not **cigarattisme*, and so on.

$6.$[37] It is also easy to see that *only* [+L] suffixes can be inputs to LB: all the suffixes of Table 6, except for *-ain* and various *-eur* suffixes which we will discuss directly below, are to be found in Table 5.

The suffix *-ain* and the various *-eur* suffixes were not listed in Table 5 as learned suffixes because, due to certain morphological restrictions, there exists no word in which an occurrence of *-ain* or *-eur* immediately follows a root or suffix susceptible of undergoing LB, and therefore we have no positive evidence that these suffixes are learned (that is, that their presence can trigger LB in the preceding syllable). But, for the same reason, we have no evidence to the contrary either, and thus we can consider them to be [+L], making them compatible with our hypothesis that all suffixes subject to LB are [+L] suffixes.

We can now reformulate our rule of LB (previously given as (6)) as follows:

(11) *Learned Backing (LB)*

$$\begin{bmatrix} +\text{syll} \\ +\text{low} \end{bmatrix} \rightarrow [+\text{back}] / \begin{bmatrix} Y \underline{} C_0 \\ +L \end{bmatrix} + \begin{bmatrix} X \\ +L \end{bmatrix}$$

This revised formulation indicates that it is necessary that a suffix be marked [+L] for there to be Learned Backing in the previous syllable, but that it is not sufficient that this be so. The morphemes whose vowels undergo the rule must themselves be marked in some way. As was shown in establishing the empirical generalization of (10), there is no reason not to put to this purpose the same (ad hoc) feature [±L] which was independently required for distinguishing those suffixes which provide the context for LB from those which do not.

According to our conception of things, then, we consider that in the part of the word-formation component where affixes are listed, each suffix type is assigned the feature [+L] or [−L]. Each token of a suffix will bear this feature in whatever word it is found. So it is not an idiosyncratic fact about the word *naturalisme,* for example, that its suffixes are both [+L], or that the first of its suffixes suffers an alternation between [ɛl] and [al]. The character of these suffixes as [+L] is determined once and for all in the word-formation component. And the appearance of [a] in *naturalisme* (cf. *naturel*) is an automatic consequence of this [+L] character of the suffixes and the formulation we have just given of Learned Backing.

If it were the case that subsequent studies of word formation in French yielded no independent evidence in favor of a partitioning of all the derivational suffixes into two complementary classes [+L] and [−L], our analysis of Learned Backing would in no way be invalidated. It would only mean that the specification of the feature [L] for any

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[37] Table 5 contains seven suffixes with an underlying low vowel, viz. *-at, -al, -aire, -el, -eux, -ien, -ier,* among which *-aire, -el, -eux, -ien, -ier* also appear in Table 6. As for *-at* and *-al,* their vowel is back underlyingly, as it is phonetically, and thus the rule of LB only applies to them vacuously; words like *royalisme* and *finalité* with *-al* preceding a [+L] suffix do not provide any evidence about the application of LB. This is why *-al* and *-at* are not listed in Table 6. Since we have no evidence to the contrary, we will assume that they are subject to LB when followed by a [+L] suffix.

suffix cannot be predicted from other (combinatorial) properties of the suffix, and that this specification must be listed as such in the word-formation component of the grammar (as one must do with conjugational or declensional classes in many languages).

3.2.2. We turn now to an examination of root morphemes. Here again we see that two classes emerge, those that undergo Learned Backing and those that do not. Table 8 is nearly exhaustive. It contains all the roots we know in the language where the presence of a learned suffix in the next syllable causes LB to apply.[38]

Table 8: Alternating Morphemes—Roots

grain 'grain'	granule 'granule'
sel 'salt'	salin 'saline'
mer 'sea'	marin 'seaman'
pair 'even'	parité 'parity'
domaine 'estate'	domanial 'public (property)'
vain 'vain'	vanité 'vanity'
nain 'dwarf'	nanisme 'dwarfing'
	naniser 'cause to become a dwarf'
chair 'flesh'	charnel 'carnal'
paix 'peace'	pacifique[39] 'peaceable'
taisez 'say nothing about'	tacite[39] 'tacit'
laine 'wool'	lanifère 'wool-bearing'
soeur 'sister'	sororal[40] 'sororal'
pain 'bread'	panifier 'turn into bread'
faim 'hunger'	famine 'famine'
clair 'clear, light'	clarifier 'clarify'

[38] Actually, Table 8 does not include pairs exhibiting the LB alternation in which there is also a consonantal alternation that is either not entirely understood or whose status in modern French is a dubious one. Were we to scrape together *all* instances of LB in French, we would have to mention the pairs *chèvre* 'goat'/*caprin* 'goat-like'; *lait* 'milk'/*lactique* 'lactic', *lactation* 'lactation', etc.; *saint* 'saint'/*sanctifier* 'sanctify'; *paissent* 'they feed' (cattle)/*pasteur* 'shepherd'/*pâture* 'pasture'; *naissent* 'they are born'/*natif* 'native of a place'/*natal* 'native (country)'. To this list would also be added the alternating stems *-meuvent/-moteur, -motif/-motion,* and *-traire/-traction,-tracteur,-tractif* which are found in pairs like *émouvoir* 'to affect, to touch'/*émotion* 'emotion'; *promouvoir* 'to promote'/*promoteur* 'originator', *mouvoir* 'to move'/*moteur* (adj.) 'motive'; *distraire* 'to distract'/*distraction* 'absence of mind'.

[39] Notice the alternation between *z* in *apaiser* 'to quiet', *paisible* 'peaceful' and *s* in *pacifier* 'pacify', *pacifique* 'peaceable'. It may be related to that between *k* and *s*, as in *vaincre* [vɛ̃kr(ə)] 'to win'/*invincible* [ɛ̃vɛ̃sibl(ə)] 'invincible', and *prédisons* [prediz5] 'let's predict'/*prédictible* [prediktibl(ə)] 'predictable'/*indicible* [ɛ̃disibl(ə)] 'inexpressible'.

[40] In a synchronic grammar of modern French, *sororal* must be analyzed as /sœr + ɔr + al/ where /ɔr/ is the same augment as the one appearing in *temp-or-el, corp-or-el, frig-or-ifique, sens-or-iel, préfect-or-al, herb-or-iser,* etc.

oeuf 'egg'	ovule 'ovule'
	ovaire 'ovary'
moeurs 'customs'	moral 'moral'
seul 'alone'	solitude 'solitude'
	solitaire 'lonely'
	solo 'solo'
main 'hand'	manuel 'manual'
sain 'healthy'	sanitaire 'sanitary'
père 'father'	parricide[41] 'patricide'
peuple 'people'	populaire 'popular'
	population 'population'
	populiste 'populist'
heure 'hour'	horaire 'schedule; hourly'
fleur 'flower'	floral 'floral'
boeuf 'ox'	bovin 'bovine'
honneur 'honor'	honorifique 'honorific'
immeuble 'building'	immobilier 'real estate'
neuf 'new'	novateur 'innovator'
choeur 'choir'	choriste 'choir singer'
	choral 'choral'
noeud 'knot'	nodule 'nodule'
	nodal 'nodal'

Table 9, on the other hand, includes words containing a [+L] suffix and a root with [ɛ] or [œ] which nevertheless remains [ɛ] or [œ]; it does not pretend to be exhaustive.

Table 9: Nonalternating Morphemes—Roots

aquarelle 'water-color'	aquarelliste 'aquarellist'
pastel 'pastel'	pastelliste 'pastellist'
libelle 'satire'	libelliste 'satirist'
portrait 'portrait'	portraitiste 'portrait-painter'
maquette 'miniature model'	maquettiste 'miniature model maker'
duel 'duel'	duelliste 'duellist'
fantaisie 'imagination'	fantaisiste 'whimsical person'

[41] Alongside the variant [par] which appears in *parricide*, *père* has two others: [patr] (e.g. in *patrilinéaire*) and [pater] (e.g. in *paternel, paternité*), whose vowel [a] may possibly be accounted for by the rule LB. *Mère* and *frère* show alternations which are partially similar: *matricide, fratricide, matrilinéaire, maternel, maternité, fraternel, fraternité*. These *r ~ tr* and *Or ~ Oer* (where O = obstruent) alternations are limited to a few sporadic cases, cf. for example *nourrir ~ nutr-ition, pierre ~ pétr-ifier* and *ouvr-e ~ ouver-t-e, libre ~ libér-er, cadavre ~ cadavér-ique*.

défaite 'defeat' — défaitiste/-isme 'defeatist/ism'
affaires 'business' — affairiste/-isme 'intrusion of business into politics'

écrivain 'writer' — écrivainisme 'dabbling in literary work'
totem 'totem' — totémisme 'totemism'
moderne 'modern' — modernisme 'modernism'
— moderniser 'modernize'

Pasteur 'Pasteur' — pasteuriser 'pasteurize'
monseigneur 'His royal Highness — monseigneuriser 'act like a royal Highness'
maître 'master' — maîtriser 'to master'
expert 'expert' — expertiser 'to estimate'
seigneur 'lord' — seigneurial 'lord-like'
terre 'earth' — terreux 'earthy'
— terrien 'possessing land'

grammaire 'grammar' — grammairien 'grammarian'
Rabelais 'Rabelais' — rabelaisien 'Rabelaisian'
Calais 'Calais' — calaisien 'inhabitant of Calais'
Terre-Neuve 'Newfoundland' — terre-neuvien 'Newfoundlander'
Voltaire 'Voltaire' — voltairien 'Voltairian'
Ukraine 'Ukraine' — ukrainien 'Ukrainian'
Inde 'India' — indien 'Indian'
lamelle 'lamella' — lamellaire 'lamellar'
parcelle 'small fragment' — parcellaire 'divided into small portions'
fer 'iron' — ferreux 'ferrous'
paresse 'laziness' — paresseux 'lazy'
orgueil 'pride' — orgueilleux 'proud'
merveille 'wonder' — merveilleux 'wonderful'
pierre 'stone' — pierreux 'stony'
miel 'honey' — mielleux 'honeyed'
graisse 'grease' — graisseux 'greasy'
peur 'fear' — peureux 'easily frightened'
migraine 'headache' — migraineux 'headachy'
veine 'vein' — veineux 'venous'
haine 'hatred' — haineux 'full of hatred'
glaise 'clay' — glaiseux 'clayey'
glaire 'glair' — glaireux 'glaireous'
fiel 'gall' — fielleux 'bitter'
bonheur 'happiness' — heureux 'happy'
pervers 'perverse' — perversité 'perversity'
univers 'universe' — universel 'universal'

divers 'various'   diversité 'variety'
complexe 'complex'   complexité 'complexity'
perplexe 'perplex'   perplexité 'perplexity'
connexe 'connected'   connexité 'relatedness'
indemne 'without loss'   indemnité 'compensation'

We see, thus, that a class of roots susceptible to Learned Backing must be distinguished from its complement, those roots not susceptible to the rule. It would be entirely in keeping with the revised version we have proposed for Learned Backing to use the feature [±L] to this effect. Roots undergoing the rule will be marked [+L], those not undergoing it will be [−L]. In other words, in the list of root morphemes contained in the word-formation component, some relatively small number of roots will be marked [+L], and all the others [−L].

We say that roots are marked, and not words, because the behavior of a given root in front of a learned (resp. nonlearned) suffix in one word is almost always matched by the same behavior in front of another learned (resp. nonlearned) suffix in another word. Among the roots undergoing Learned Backing are to be found the forms *solitude/ solitaire, choriste/choral, nanisme/naniser, ovule/ovaire, nodule/nodal, populiste/populaire*. Once there is a word *populaire* (from *peuple*), it is of no cost to have *populiste* and, on the contrary, exceptional to have *peupliste*. By marking the root [+L], and by formulating the rule as we have, we encode this fact about related forms directly in the grammar.

But while it is normal for a root to undergo Learned Backing before all learned suffixes once it undergoes the rule before one of them, it must nevertheless be considered exceptional for roots to undergo Learned Backing at all. That is, the alternating roots of Table 8 are exceptional in comparison to those of Table 9. They comprise a small class which will know no expansion. This exceptionality can be made explicit in the following fashion in the word-formation component:

  (i) By (redundantly) marking all root morphemes of French [−L].
 (ii) By individually assigning the feature [+L] to a certain subset of exceptional roots (thus introducing some cost to the lexicon).

The measures (i) and (ii) indicate unequivocally that the roots that undergo Learned Backing are exceptions. The correctness of this approach can be demonstrated, for the prediction is made that new words with learned suffixes formed on roots containing [ɛ] and [œ] will not undergo the rule. Here in Table 10 are a few words that we have made up on our own, and where this prediction is borne out according to the intuitions of native speakers.

Table 10

mitaine 'mitten'	mitainifier 'to make into mittens'
	*mitanifier
gaine 'girdle'	gainiste 'dealer in girdles'
	*ganiste
porcelaine 'porcelain'	porcelainifier 'to make into porcelain'
	*porcelanifier
beurre 'butter'	beurrifier 'to make into butter'
	*borrifier
seuil 'threshold'	seuillaire 'having to do with thresholds'
	*soliaire
couleuvre 'garter snake'	couleuvrin 'garter-snake-like'
	*coulovrin
pieuvre 'octopus'	pieuvrin 'octopus-like'
	piovrin
jeune 'young; youth'	**jeunisme 'youthism'**
	jonisme

There is little doubt that neologisms like these will be immune to LB. The set of [+L] roots is a closed one.

3.2.3. For the sake of completeness, in this short section we begin to assemble a list of the nonlearned suffixes. A suffix is to be considered nonlearned, [−L], if, when it follows a root or suffix that we know is susceptible to LB in morphologically related words, it does not trigger the change. For example, a form like *peuplade* shows that the suffix *-ade* is [−L], since it does not trigger the operation of LB in the root *peuple,* which we know is susceptible to LB because of forms like *populaire, populeux.* The first list, in Table 11, contains words derived by adding a [−L] suffix to a [+L] root. The second, in Table 12, contains words derived by adding a [−L] suffix to a derivational base whose last morpheme is a [+L] suffix with a low vowel.

Table 11: Nonlearned Suffixes—1

-ier

bouvier[42] 'cattleman'	(boeuf 'ox')
grainier 'seedsman'	(grain 'grain')

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[42] *Boeuf* belongs to a set of no more than thirty morphemes (assuming the most liberal standards with regard to morphological relatedness) whose round vowel is low when under stress and is turned into *u* when stressless and in a word not containing a [+L] suffix. (Actually, the change to *u* does not take place in all words satisfying these conditions, cf. *boeuf* ~ *bouvier* 'cattleman' but *boeufferie* 'lumpishness' or *porc* 'pig' ~ *pourceau* 'swine' but *porcelet* 'small pig', *porcherie* 'pig-house'.) Most conspicuous among the roots showing this alternation are the four third conjugation roots *-mouvoir, pouvoir, vouloir,* and *mourir,* and the

-et/ette

    seulet, -ette 'lonesome'   (seul 'alone, only')

    fleurette 'small flower'   (fleur 'flower')

    feuillet 'leaf (of a book)'   (feuille 'leaf')

    clairet 'pale'   (clair 'light, clear')

-ement (adverbs)

    clairement 'clearly'   (clair 'light, clear')

    seulement 'only'   (seul 'alone, only')

    vainement 'vainly'   (vain 'vain')

-ade

    peuplade 'tribe'   (peuple 'people')

-age

    lainage 'woolen article'   (laine 'wool')

    feuillage 'foliage'   (feuille 'leaf')

-on

    fleuron 'flower-shaped ornament'   (fleur 'flower')

-u

    feuillu 'leafy'   (feuille 'leaf')

Table 12: Nonlearned Suffixes—2

-eté

    joyeuseté 'prank'   (joyeux 'joyous')

    gracieuseté 'kindness, favor'   (gracieux 'gracious')

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feminine suffix *-eur*, which shifts to [ur] instead of undergoing LB in *rigoureux, vigoureux, douloureux, langoureux, savoureux,* and lexical items derived from these. Whatever the rule is that is posited to account for these facts, it must be a minor rule. Unstressed *œ* does not usually switch to *u*, nor does stressed *u* usually switch to *œ*.

    A superficially similar alternation appears in the five pairs *jouer* 'to play'/*jeu* 'game', *vouer* 'to dedicate'/ *voeu* 'vow', *avouer* 'to admit'/*aveu* 'confession', *nouer* 'to tie'/*noeud* 'knot', *(é)prouver* 'to prove, (to test)'/ *(é)preuve* 'proof, (test)'. But the parallelism is a spurious one. It has nothing to do with stress (cf. *(il) joue*/ *(un)jeu*), and this time it is the item containing *u* which is morphologically basic, rather than the other way around, for all the items containing a front vowel are in fact deverbal nouns, i.e. *jeu*, for instance, would be [$_N$[$_V$ jou]] at a more abstract level. (Cf. Schane (1968, 44), who established a spurious morphological parallelism between *jouer/jeu* and *saler/sel*; in this case *sel* is not [$_N$[$_V$sal]], rather *saler* is derived from *sel*, and has the structure [$_V$[$_N$sel]].)

-ment
    formellement 'formally'   (formel 'formal')
    nerveusement 'nervously'   (nerveux 'nervous')
    religieusement 'religiously'   (religieux 'religious')
    humainement 'humanely'   (humain 'human, humane')

-esse
    chasseresse[43] 'huntress'   (chasseur 'hunter')

Table 11 is relatively short, and contains by no means the exhaustive set of nonlearned suffix types. All it contains are the nonlearned suffixes which actually appear in existing words with roots susceptible to LB. Table 12, which consists of words in which a [+L] suffix with a low front vowel precedes a [−L] suffix, adds little more. That there are so few examples in Table 12 is a reflection of the restrictions that the derivational morphology of French places on suffix sequences. Many derivational suffixes can be added only onto a derivational base which ends in a root morpheme, and it happens to be the case that most of these suffixes which can be added onto a derivational base ending in a derivational suffix are [+L] suffixes. Hence the paucity of words containing a sequence of two suffixes where the second is [−L], and where furthermore the first is a [+L] suffix with a low front vowel.

4. Alternatives to Learned Backing and the Feature [±L]

4.1. A Boundary Solution?

A perfectly plausible alternative to the solution we are advocating would be one that represented the difference between the two suffix classes by means of different boundary types. According to an analysis of this sort, suffixes of one class would be preceded (or followed) by a boundary of one type, while suffixes of the other class would be preceded (or followed) by a boundary of another type. The rule posited to account for the vowel alternations we have been discussing would be sensitive to this difference in boundary type. Indeed, this approach is proposed in Chomsky and Halle (1968) as a means of distinguishing the "neutral" from the "nonneutral" affixes in English. (Recall that neutral affixes like *-ness* or *-ing* are said to be preceded by a word boundary, "#", while the nonneutral affixes like *-ity, -ic, -al* are preceded by the morpheme boundary "+".) Note that were this sort of approach to be adopted for

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[43] This is a poetic term. The common term for 'hunter, fem.' is the morphologically regular *chasseuse*. There exist no more than a dozen such agentive nouns in *-eur* which have a morphologically irregular feminine in *-eresse* instead of the expected *-euse*, and at least half of them are technical or literary words. Alongside *doucereux* (from *douceur*) and *ingénierie* 'engineering' (from *ingénieur* 'engineer'), they are, to our knowledge, the only lexical items to show a shift from *æ* to schwa. We leave this alternation unexplained, and add that it doesn't fit very felicitously into Schane's system either (cf. Schane (1968, 141, fn. 31)).

French, not only suffixes but also roots would have to be distinguished on the basis of the type of boundary associated with them.

In arguing against this alternative we would first of all like to demonstrate that if there were to be a boundary difference at play it could not be one of # vs. + as found in English. It can be shown that the presence of # in words containing either learned suffixes or nonlearned suffixes would cause a variety of phonological rules to apply to the forms, creating an incorrect output. One such rule is Closed Syllable Adjustment. One of the environments in which CSA converts /e/ and /ə/ into ε is the one shown in (12).

$$(12)\ \begin{Bmatrix} \mathsf{ə} \\ \mathsf{e} \end{Bmatrix} \rightarrow \varepsilon\ /\ \underline{\quad}\ C_1\#$$

Now, were the nonlearned suffixes *-age, -ette, -esse*, for example, preceded by # in their underlying representations, as in /#ažə/, /#ɛt + ə/, and /#ɛsə/, respectively, then any morphemes followed by these suffixes should manifest no [ə] (or deletion of [ə]) or [e] in the presuffix syllable.

Since one does indeed find forms with these vowels in this position, it must be concluded that nonlearned suffixes are not preceded by #. The examples in (13) show this to be so.

(13) métrage [metraž] 'measuring, measurement'
          cf. mètre [mɛtr] 'meter'
      rapiéçage [rapjesaž] 'patchwork'
          cf. (il) rapièce [rapjɛs] 'he does patchwork'
      empaquetage [ãpaktaž][44] 'packing up into parcels'
          cf. (elle) empaquette [ãpakɛt] '(she) packs up into parcels'
      opérette [ɔperɛt] 'operetta'
          cf. opéra [ɔpera] 'opera'

But CSA shows that it is not possible to associate # with the learned suffixes either. Were the underlying representations of, for example, *-al, -eux,* and *-aire* really /#al/, /#œz/, and /#ɛr/, respectively, then it would not be possible to derive the forms of (14).

_____

[44] The derivation of *empaquetage* is as follows:

	# an + pakət + ažə #		
CSA		___	
Nasalization	ã		
ə-Deletion Rules		φ	φ
Output:	[ãpaktaž]	.	

As for *métrage, rapiéçage, opérette,* and the like, some speakers may also allow, or even prefer, a pronunciation with [ɛ] instead of [e], i.e. [mɛtraž], [rapjɛsaž], etc. The appearance of [ɛ] can be attributed to the (optional) effects of vowel harmony (the vowel of the following syllable being [+low]). That the [e] does appear as a free variant of [ɛ] in this position indicates that CSA, an obligatory rule, is not at play here.
    Similar remarks may be made about the forms in (14).

(14) pénal [penal] 'penal'
    cf. peine [pɛn] 'sentence'
   vertébral [vɛrtebral] 'vertebral'
    cf. vertèbre [vɛrtɛbr(ə)][45] 'vertebra'
   miséreux [mizerö] 'poverty-stricken'
    cf. misère [mizɛr] 'misery'
   bibliothécaire [biblijɔtekɛr] 'librarian'
    cf. bibliothèque [biblijɔtɛk] 'library'

So these facts concerning the failure of CSA to apply both before nonlearned suffixes and before learned suffixes show that a word boundary must not precede suffixes from either of the two classes.

Further evidence that nonlearned suffixes cannot be preceded by a # is provided by other rules of French phonology. According to the rule of Final Schwa Drop (cf. Dell (1973, 224)), a schwa can be optionally deleted in the context CC____#. A schwa cannot be deleted before the nonlearned suffixes *-té, -ment,* and *-rie,* however. Compare the columns below (where the apostrophe stands for a deleted schwa):

(15) ferme-toi 'close yourself'   fermeté 'steadfastness'
    ferm'-toi   *ferm'té

    débarque-m'en deux 'land two for me'   débarquement 'landing'
    debarqu'-m'en deux   *debarqu'ment

    superbe rideau 'superb curtain'   fourberie 'cheating'
    superb' rideau   *fourb'rie

An additional rule, Liaison *s*-Voicing (cf. Selkirk (1972, 331; forthcoming a)), converts an underlying /s/ into [z] in the context ____#V. Yet the rule will not apply to an /s/ preceding a vowel-initial nonlearned suffix. Compare the columns in (16).

(16) doux ami[46] [duzami] 'sweet friend'   douceur [dusœr] 'sweetness'
    gros ami [grozami] 'big friend'   grosseur [grosœr] 'bigness'
    de bas en haut [dəbazão] 'from bottom to   bassesse [basɛs] 'lowness'
       top, low to high'

Further evidence is also available that # cannot precede the learned suffixes. First, Liaison *s*-Voicing fails to apply before *-iste, -if, -itude,* and *-eux,* as seen below:

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[45] A consonant cluster composed of an obstruent plus a sonorant does not cause CSA to apply, as any other CC cluster would. Consequently, the /e/ preceding /br/ in *vertébral* is not converted into [ɛ].

[46] See Selkirk (1972) for evidence that a single # intervenes between Adjective and Noun in French.

(17) grossiste [grosist] 'wholesaler'
progressif [prɔgrɛsif] 'progressive'
lassitude [lasitud] 'lassitude'
osseux [osö] 'bony'

Second, the rule of Round Vowel Raising (cf. fn. 5), whose formulation is [+round] → [−low] / ___#, does not apply when a root-final /ɔ/ precedes a learned affix. For example, the letter *o* is pronounced by all speakers as [o] in *héros* [ero] 'hero' and *Mao* [mao], whereas it can be pronounced as [ɔ] in *héroique* [ɛrɔik], *maoiste* [maɔist].

In sum, the phonology of French rules against the assignment of # to either the learned or nonlearned affixes, and, as a consequence, the application of LB cannot be explained as depending on a # vs. + opposition in the suffixes. Showing that the distinction in phonological comportment between the learned and nonlearned morphemes cannot be attributed to the presence of a "#" boundary before one sort and a "+" before the other does not demonstrate the impossibility of *any* boundary solution, but only the impossibility of the most plausible and potentially well-motivated one. If one were to insist on imposing a boundary solution, some boundary other than "+" or "#" would have to be created to perform the task of picking out the learned morphemes. One possible version of a solution involving this new boundary, call it "%", might be as follows. First, assign a "%" to the left of all the learned morphemes in the lexicon: %Root, %Suffix. The lexical items containing vowels affected by LB would therefore have the form [%Root % Suffix], [Root % *Suffix*%Suffix], etc. (where the italicized morphemes are those whose vowels would be backed). Second, formulate LB as in (18).

(18) $\begin{bmatrix} +\text{syll} \\ +\text{low} \end{bmatrix}$ → [+back] / % X ___ C₀ %

(where X contains no boundary)

Any other rule of French which applies only when learned morphemes are present in the word would also have to mention "%" in its structural description (cf. appendix B, where evidence for additional rules of this type in French is given). A solution like this allows for the following derivations with LB: *choral* (cf. *choeur*) #%kœr %al# $\overset{LB}{\rightarrow}$ #%kɔr%al#, *scolarité* (cf. *scolaire*) #skɔl%ɛr%ite# $\overset{LB}{\rightarrow}$ #skɔl%ar%ite#.

This latter type of solution, depending crucially on the introduction of a new boundary type whose function in the grammar of French is purely "diacritic", should be excluded in principle. It involves a confusion in the understanding of the nature of boundary elements and the role they play in phonology. Boundaries are essentially a representation of syntactic structure. We are led to this conclusion by a consideration of the boundaries "+", "#", and "##", which are universally attested and whose properties are rather well understood. For example, in the sentence, "#" and "##"

are placed between words, by universal convention, according to how "closely linked" syntactically the successive words are in the phrase marker.[47] Inside a word, "+" is assigned as a function of the internal syntax of the word; by universal convention, "+" marks the limits of the morphemes composing a word. The putative "%" boundary of French has no such syntactic motivation, however; it serves merely to differentiate between two classes of elements belonging to the same syntactic category (suffix or root).

The distinctions in the French morpheme classes which we have labeled learned and nonlearned are quite comparable to those among the declensional or conjugational classes one finds in inflectional morphology. In Latin and other Romance languages, for example, the declension or conjugation to which a root belongs may determine certain features of the phonetic realization of a word built on that root. Rules of the grammar must therefore make reference to declensional or conjugational class. Let us assume the hypothetical case of a language having four separate noun declensions, each one displaying a somewhat different phonological behavior, but where the internal structural (i.e. syntactic) characteristics of nouns from the different declensions are the same. Is it the morphological features [1 Declension], [2 Declension], etc., to which rules must be sensitive, or is each declension class paired up with a distinct boundary determining the applicability of rules, e.g. Root@, Root%, Root&, Root§? In our opinion, the theory of language must be constrained so as to reject in principle a solution of the latter sort which depends on a purely "diacritic" use of boundaries.

The most interesting hypothesis to maintain, and the one receiving the greatest empirical support at present, is that all boundaries are defined in purely syntactic terms in the phrase and in the word. We can make this hypothesis stronger and thus even more interesting by claiming that the syntactic conditions determining the placement of boundaries in a phonological representation are universally defined. (Progress towards a universal definition of boundary conventions has been made; cf. footnote 47.) Moreover, it seems quite reasonable to claim that universal grammar makes available a very limited repertory of boundary types, probably amounting to no more than four or five in number. This repertory includes minimally, the boundaries "+", "#", and "##". There may, in addition, be need for a sentence or intonation-group boundary.[48] And inside words, for some languages, it may be necessary to allow for the identification of the syntactic unit *stem* by flanking it with a boundary distinct from "+".[49,50] According to such a theory, there are rather strong restrictions on the use to

[47] For a definition of the universal conventions governing the insertion of # and ## see Chomsky and Halle (1968), Selkirk (1972; 1974).

[48] The need for a boundary marking the ends of the sentence or the intonation group has been demonstrated in analyses of a number of languages, e.g. Igbo (cf. Clark (in preparation)), Papago (cf. Hale (1977)), French (cf. Dell (1973, 227); Liberman (1975)).

[49] The investigation of numerous languages has shown that the rules of phonology must be able to tell whether segments belong to the stem of a word or not. It is conceivable that in some cases the information

which boundary distinctions are put in a language, the boundaries being defined in terms of rather abstract, and therefore quite general, properties of the syntax of sentences and words. The boundary "%" posited for French in order to distinguish between two subclasses of roots and suffixes clearly has no place in this scheme.

It should be mentioned that these constraints on the theory of boundaries do not exclude in principle the analysis of the English "neutral" affixes offered by Chomsky and Halle (1968). In their analysis, the "neutral" suffixes are distinguished from the others by the presence of the word boundary "#" on their left, e.g. *#ness, #ly, #ish,* etc. In our opinion, the presence of this "#" is exceptional, in the sense that the universal conventions for inserting "#" cannot be held responsible for its placement. Neutral affixes must be listed in the lexicon with their associated "#".[51] In this case, the boundary must be thought of as a "diacritic", distinguishing one suffix class from another. But this diacritic character of the boundary should not oblige one to reject this solution. On the contrary, the "#" solution for the neutral affixes must be maintained, for the segments preceding them behave in every respect as if they were in word-final position, that is, as if they preceded the # introduced by universal convention into the phrase marker.[52] We thus want to allow for the possibility that boundaries serve a diacritic function, but constrain the set of boundaries that can so serve to those belonging to the universal repertory and having another function in language. No "diacritic" use of a boundary should be sanctioned when the phonological behavior of segments in its environment does not generalize with the behavior of segments in the environment of some syntactically motivated boundary.[53] In the case of French, therefore, we are forced to a morphological feature solution for the rule of LB, instead of relying on a new boundary "%".

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about stemhood will have to be represented in the form of boundaries. See, for example, the evidence from Arabic (Brame (1970)), Tunica (Phelps (1975a)), Sanskrit (Anderson (1970), Phelps and Brame (1973), Sag (1974), Phelps (1975b)), and the Athapaskan languages Dogrib (Howren (1968)) and Navaho (Stanley (1969); Lapointe (1976)).

[50] Few studies have been made in the framework of generative grammar which pay much attention to the array of boundaries required for the description of a particular language. Among those that have addressed the issue directly are McCawley (1968) in his impressive work on Japanese and Stanley (1969; 1973) in his on Navaho.

[51] Actually, Chomsky and Halle have a somewhat different conception of things. In their description, the universal conventions insert "#" before all affixes, neutral and nonneutral, producing [#[#serene#] ity#] and [#[#copious#] ness#], for example. The nonneutral affixes like *-ity* are considered to carry a special feature which triggers a readjustment rule reducing the "#" before them to "+". We differ with Chomsky and Halle in considering it undesirable that universal conventions insert "#" word-internally. English is in fact one of the few languages known which requires a # before an affix with any regularity. In our view, therefore, it is the neutral affixes that are to be treated as exceptions in the grammar.

[52] Cf. Chomsky and Halle (1968, 84–86).

[53] In our view of things, then, the well-known "=" boundary proposed in Chomsky and Halle (1968) to account for the various phonological peculiarities of words with the Latinate prefixes and roots, e.g. *per=mit, re=solve, com=pre=hend,* etc., is a boundary with a purely "diacritic" use. We consequently favor the elimination of this boundary in favor of an analysis employing a morphological feature such as [±latinate]. On this feature, see Aronoff (1976, 51ff.). On the elimination of "=", see Siegel (1974, 116–128).

As a final remark, it is worth noting that the morphological feature solution we propose makes predictions about what part of the grammar LB belongs to, about where it might apply in a derivation. Suppose that, once a greater understanding of the organization of grammars is obtained, it were to turn out that all rules of a grammar that mention only boundaries and phonetic features had to apply rather late, after all rules mentioning any other type of feature. (The first sort of rule we will call *phonological.*) And suppose furthermore that it turned out that all rules mentioning morphological features (call these *morpholexical* rules) applied either in the lexicon or as a component at surface structure, prior to the application of the phonological rules.[54] Our prediction is that LB would fall in with the morpholexical rules, and that it would thus precede the application of any of the phonological rules of French. Indeed, LB *can* precede all the phonological rules of French (e.g. Nasalization, Gliding, Truncation, Round Vowel Raising, Closed Syllable Adjustment, etc.; cf. footnote 5). At present, not enough is known about the interaction of phonological rules and morpholexical rules to draw any conclusions, but the way is paved for consigning LB to the lexicon, or to an early, prephonological component of the grammar.

4.2. A Phonetic Solution?

In this brief section, we seek to quiet any suspicions which might persist that the $\varepsilon \sim a$ and $\alpha \sim \jmath$ alternations are governed by factors of a phonetic character. We repeat our formulation of LB below:

$$(19) \quad \begin{bmatrix} +\text{syll} \\ +\text{low} \end{bmatrix} \rightarrow [+\text{back}] / \underbrace{\begin{bmatrix} Y \underline{\quad} C_0 \\ +L \end{bmatrix}}_{\text{a}} + \underbrace{\begin{bmatrix} X \\ +L \end{bmatrix}}_{\text{b}}$$

It is our belief that neither the class of morphemes providing the context for LB (i.e. part (b) of (19)) nor the class of morphemes whose vowel undergoes the rule (i.e. part (a) of (19)) can be distinguished in phonetic terms.

Let us first compare lists of the learned and nonlearned suffixes which could potentially provide a context for LB.

(20) | *Learned (from Tables 5,6)* | | *Nonlearned (from Table 11)* |
|---|---|---|
| -isme | -eux | -ier |
| -iste | -ien | -et |
| -iser | -ier | -(e)ment |
| -ifier | -ifère | -ade |

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[54] In Aronoff (1976) a conception of the grammar is outlined according to which morphological rules and rules of allomorphy apply in components distinct from those where phonological rules apply. Our bet is that this view of things is in general correct, though it is in some ways problematic; see Anderson (1974), Wilbur, (1973; 1974), Carrier (1975). This question of the organization of the grammar is treated at length in Selkirk (forthcoming a).

-ité	-oïde	-age
-at	-icide	-on
-in	-ifique	-(e)té
-ule	-ique	-u
-itude	-eur (-at-eur,	
-al	-t-eur)	
-aire	-ibond	
-el	-ain	

A glance at these lists should satisfy the reader that no phonetic property (or properties) provides an illuminating distinction between the two suffix classes. As a result, it is impossible to replace part (b) of our rule by a specification in terms of a phonetic feature matrix.

The possibility still remains that the morphological class marker [+L] could be dispensed with in part (a) of the rule, were it possible to characterize phonetically the class of morphemes concerned. The (learned) suffixes which undergo the rule are listed in Table 6; he roots subject to the rule are listed in Table 8. The (nonlearned) suffixes not subject to the rule are listed in Table 7; and the roots not undergoing the rule are listed in Table 9. Again, it seems impossible to provide a plausible phonetic characterization of the morphemes affected by LB which distinguishes them from the morphemes not affected by the rule. Our conclusion is thus that LB must rest intact, as it stands, formulated with the feature [+L].

4.3. Learned Fronting?

We have assumed from the start that the underlying vowels in *fleur* and *chair* were the front vowels œ and ɛ, and that the back vowels occurring in the suffixed forms *floral* and *clarifier* were to be derived through the operation of a rule rendering the vowels [+back]. Alternatively, it might seem that one could just as well propose that it is the back vowels of the forms containing learned suffixes which are the underlying ones and that the front vowels which appear in *fleur, fleurette, clair, clairement* are derived through the operation of a fronting rule. We will show, however, that in order to account for the œ ~ ɔ and ɛ ~ a alternations by means of a fronting rule it is necessary to introduce a diacritic feature [±K] into the lexical representation of morphemes, and this in addition to the feature [±L] which is required in any solution. For this reason, the backing solution is to be preferred, for it relies solely on [±L].

In what follows we will show why an additional diacritic feature is required by the fronting analysis. Note first that the fronting rule would have to operate in two contexts. It would affect morphemes in word-final position: [+low] → [−back] / ___ C_0#. (One could also think of word-final position as being defined by labeled brackets, as in . . . / ___ $C_0]_{N,A,V}$, where N,A,V are categories at the level of the word.) Such a rule would derive *fleur* [flœr] from underlying #flɔr# (or, alternatively, [$_N$flɔr]$_N$). The

fronting rule would furthermore affect morphemes preceding a nonlearned, i.e. [−L], suffix. (The fronting solution also requires a partition of all derivational suffixes into the two classes [+L] and [−L]; it would furthermore require that all inflectional suffixes be marked [−L].) This second part of the rule would provide for the derivations in (21):

(21) a. $/\text{flɔr} + \begin{bmatrix} \text{ɛt} \\ -\text{L} \end{bmatrix} + \text{ə}/$ [flœrɛt]   *fleurette*

    b. $/\text{flɔr} + \begin{bmatrix} \text{is} \\ -\text{L} \end{bmatrix} + \text{ez}/$ [flœrise]   *fleurissez*

    c. $/\text{flɔr} + \begin{bmatrix} \text{z} \\ -\text{L} \end{bmatrix}/$ [flœr]   *fleurs*

A first approximation to the rule would look like (22)

(22) $\begin{bmatrix} +\text{low} \\ +\text{syll} \end{bmatrix} \rightarrow [-\text{back}] / \underline{\quad} C_0 \, (+ \begin{bmatrix} X \\ -L \end{bmatrix} Y)\#$ [55]

(or, alternatively, (22′):

(22′) $\ldots / \underline{\quad} C_0 \, (+ \begin{bmatrix} X \\ -L \end{bmatrix} Y)]_{N,A,V}$

It could thus account for the alternations *fleur~fleurette~floral, clair~claire-ment~clarifier, rigueur~rigoriste, formel~formalisme.* But (22) needs to be further limited, for as written it will overapply. The fact is that there exist many morphemes which contain *a* or *ɔ* in all their realizations. One finds a multitude of examples among the root morphemes, e.g. *grave~gravement~gravité*, or *noble~noblesse~nobiliaire*, among others. Among the suffixes, examples of nonalternating *a* are provided by *-al* and *-at*, which appear in the pairs *royal~royalisme, doctorat~doctoratisme.*[56] Were rule (22) not further constrained, it would produce the ungrammatical **royel, *nœble, *nœblesse*, etc.

The question is, then, how to further constrain (22). It will not do to further specify that the vowel fronted belongs to a [−L] morpheme, as, for example, in the formulation (23),

(23) $\ldots / \begin{bmatrix} W \underline{\quad} C_0 \\ -L \end{bmatrix} (+ \begin{bmatrix} X \\ -L \end{bmatrix} Y)\#$

because the rule would then fail to apply to all the [+L] suffixes like *-el, -aire, -eux*, etc., which according to this alternative analysis are underlyingly [al], [ar], [ɔz]. Neither will it help to specify that the vowel fronted belongs to a [+L] morpheme, as in rule (24),

    [55] Cf. Halle (1971), where it is argued that a rule applying in two contexts, one word-final (or initial) and the other word-internal, should be collapsed as in (22).

    [56] Though not attested in present-day French, the word *doctoratisme* is a perfectly possible neologism, meaning something like 'the ideology of the *doctorat* (= 'doctorate')'.

$$(24) \ \ldots / \left[\begin{matrix} W \underline{} C_0 \\ +L \end{matrix} \right] (+ \left[\begin{matrix} X \\ -L \end{matrix} \right] Y) \#$$

for in this case the rule would incorrectly front the learned suffixes -al and -at in such words as *royal* or *doctorat*. Recourse must be had to a totally new ad hoc marker, say [±K], which would specify which syllable and roots would and would not undergo fronting. It seems to us therefore that the solution involving Learned Backing is superior to this one, for it requires positing only one morpheme class marker, [±L].

Although very little is known at the present time about the relationships between successive grammars that speakers construct in acquiring their native tongue, it is interesting to speculate about the implications of the two competing analyses that we have been considering from the point of view of language acquisition. Lexical items ending in roots, such as *fleur, fleurir, clair, éclairer*, occur much more frequently in speech than *floral, clarifier*, and they are doubtless acquired first by children. Whatever analysis is chosen to account for the front-back alternations in the adult grammar, we can assume that *fleur* and *clair*, when first encountered by the child, are stored with the underlying representations /flœr/, /klɛr/, since the underlying segments /œ/ and /ɛ/ must be available anyway for the storage of such items as *beurre, terre*, which always show up with phonetic [œ] and [ɛ]. What are the implications of the two analyses for the subsequent stages of learning, when the child encounters (or retains) derived lexical items containing learned suffixes (like *floral, clarifier*, etc.) and must as a consequence modify his grammar in order to account for the systematic relationship between these forms and the corresponding unsuffixed roots? If the child adds Learned Backing, or some version of it, to his grammar, he can keep *fleur, clair*, etc., with the underlying representations /flœr/, /klɛr/, etc., that he had previously posited for them. On the other hand, if the child adds to his grammar a rule of fronting, he will furthermore have to restructure his lexicon, replacing the phonological representations /flœr/, /klɛr/, etc., by /flɔr/, /klar/, etc. Hence we see that positing a grammar containing the rule LB implies a simpler view of the sequence of changes which lead to this grammar in the course of first language acquisition.

We have independent reasons for preferring the grammar containing the rule LB to the one containing fronting, and now we see that this grammar is also the one whose acquisition by native speakers requires a minimal restructuring of the phonological representations of morphemes in the lexicon. We may ask ourselves whether this state of affairs is merely fortuitous, or whether it reflects the existence of some general principle at work in the phonology of natural languages.

5. The Place of Morphological Features in the Representation of the Word

5.1. The Problem

Having established that the grammar of French must indeed include the rule of LB, and having shown it to be sensitive to morphological class markers which distinguish among

the suffixes of the derivational morphology, we would like at this point to investigate the status of features like [±Learned]. In particular, we want to ask "where" in a representation such features as [±L] are to be found. It seems that two options present themselves: either [±L] is included (only) in the distinctive feature matrix of a morpheme, like [±coronal], etc., and is thus included in the representation of phonetic segments, or [±L] is associated (only) with the category symbol dominating a morpheme and as such is more akin to a syntactic feature.[57]

It seems quite likely that rules having some phonological properties which appeal to categorial information like [±Feminine], [±Common], [±Plural], [±Accusative], [±Subjunctive], and so on may have a status quite distinct in the grammar from those referring only to boundaries and the (phonetic) features included in the feature matrix. It is not unreasonable to imagine, for example, that the first sort apply in a block before any of the others, perhaps in the lexicon, and that such categorial information is in principle unavailable to the second sort, which necessarily apply at a late stage of the derivations. There is some interest, then, in seeing where the facts of French concerning the morphological feature [±L] fall. The issues about rule types and their place in the grammar will not be decided until sufficient evidence accumulates, and here we hope to contribute to that accumulation.

The facts we want to bring under consideration are included in the two lists below:

(25) a.

sel	'salt'	saler	'to salt'
faim	'hunger'	affamer	'to deprive of food'
braise	'live coal'	embraser	'to set fire to s.t.'
chair	'flesh'	décharné	'emaciated'
contraire	'opposite'	contrarier	'to thwart'
notaire	'notary public'	notarié	'authenticated by a notary public'
paire	'pair'	apparier	'to match'
main	'hand'	manier	'to manipulate'
étain	'tin'	étamer	'to tin'
pain	'bread'	paner	'to fry in bread-crumbs'
vapeur	'steam'	évaporer	'to evaporate'
majeur	'major'	majorer	'to increase'
meilleur	'better'	améliorer	'to better'
honneur	'honor'	honorer	'to honor'
couleur	'color'	colorer; colorier	'to color; to hand-color'
pleurer	'to cry'	déplorer; éploré	'to regret; tearful'

[57] Of course, it is also possible that both options could obtain at once, if, for example, the presence of [±L] in the category symbol "induced" the presence of the feature in the feature matrix dominated by the symbol, or vice versa.

neuf	'new'	innover; rénover	'to innovate; to renovate'
douleur	'pain'	endolorir	'to make ache'
feuille	'leaf'	défolier	'to remove foliage'
vigueur	'vigor'	revigorer	'to cause to be strong again'
labeur	'work'	collaborer; élaborer	'to cooperate; to elaborate'
odeur	'odor, smell'	subodorer	'to suspect'
fleur	'flower'	déflorer	'to deflower'
b. odeur	'smell'	inodore	'odorless'
couleur	'color'	incolore	'colorless'
douleur	'pain'	indolore	'painless'
fleur	'flower'	flore	'flora'
chair	'flesh'	carne	'tough meat'
majeur	'major'	major	'military rank'

The lists in (25) contain derived verbs ((a)) and adjectives and nouns ((b)) whose derivation does not involve any overt derivational suffix, and where the last vowel of the root is nonetheless subject to LB.

At first blush, the items of (25a) might be taken as evidence that verbal inflectional suffixes should be marked [+L]. In all the examples examined so far, the operation of LB in a morpheme could always be ascribed to the presence of a following morpheme ([terreur]$_N$/[[terror]$_N$ is]$_V$, [clair]$_A$/[[clar]$_A$ ifi]$_V$), and it is tempting to try to account for the forms of (25a) by assigning the specification [+L] to the verbal endings, since in this case they are the only (overt) morphemes present after the morphemes subject to LB. But it seems to us that such an account for the verbs in (25a) must be rejected. Notice first that alongside the forms of (25a) one finds a number of verbs which are also derived without any overt derivational suffix from nominal and adjectival roots, but where the root still shows up with a phonetic front vowel. We have independent evidence that these roots are [+L]:

(26)	lainer	'to teasel'	laine	'wool'
	amerrir	'to land on the sea'	mer	'sea'
	braiser	'to cook on charcoal'	braise	'live coal'
	peupler	'to populate'	peuple	'people'
	esseulé	'solitary'	seul	'alone'
	fleurir	'to flower'	fleur	'flower'
	effeuiller	'to pluck off the petals of a flower'	feuille	'leaf'
	meubler	'to furnish'	meuble	'piece of furniture'
	éclairer	'to light'	clair	'light, clear'
	assainir	'to cleanse'	sain	'healthy'

Notice in particular the triplets *feuille/effeuiller/défolier, fleur/fleurir/déflorer, braise/ braiser/embraser,* where the same [+L] root gives rise to two derived verbs, one with a front vowel and the other with a back one. Were the verb endings marked [+L], the verb forms of (26) should not exist.

Second, and more important in our eyes, it seems correct to contend that LB is a matter strictly internal to inflectional stems. This contention is based on the fact that there does not exist a single instance where a given root or suffix is subject to LB when followed by some inflectional suffixes and not by others.[58]

Third, that a solution involving the marking of inflectional suffixes as [+L] is a technically feasible one depends crucially on the fact that in French sentences verbal inflectional stems can never constitute a word all by themselves, i.e. they are always followed by some (phonologically nonnull) inflectional suffix(es). However, a similar analysis could not work for the items in (25b), which are nouns and adjectives, since nouns and adjectives appear as bare inflectional stems in the singular and masculine singular, respectively, and hence are not always followed by a phonologically nonnull suffix to which one could attach the diacritic [+L].

Our problem is that our rule of LB, as formulated, will not apply to derive the [a] and [ɔ] of *saler, honorer,* etc., because these words contain no overt (derivational) suffix with which the "triggering" context feature [+L] could be associated.[59]

5.2. *A Possible Solution*

Below we intend to show that any reformulation of LB that would allow it to account for the generation of *saler* [sale] from the underlying root [sɛl] will require that the feature [±L] be part of the category symbol dominating roots, stems and suffixes.

One possible solution to the problem involves the positing of an "empty" derivational suffix in words like *saler, inodore,* etc., one which would bear the feature [+L] required by LB but be phonologically unrealized. According to this solution, the

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[58] As far as we know, the only form which might be taken as an exception to this is the past participle *mort* 'dead' of the verb *mourir* 'to die', whose root is underlying /mœr/ (cf. *il meurt* 'he dies'). None of the other verbs which take /t/ as a past participle ending show a similar alternation that one might want to attribute to the operation of LB, so we think it is best to treat *mort* as an isolated idiosyncrasy. We have not listed the noun *(la) mort* 'death' in (25), for it does not yield any additional evidence of an æ ~ ɔ alternation in the morpheme /mœr/. This noun is not directly derived from the verb *mourir*, but rather from its past participle *mort* (compare with *venir/elle est venue/la venue; prendre/elle est prise/la prise; craindre/elle est crainte/la crainte*). Notice incidentally that the nominalization *mort* is morphologically irregular in not having a final feminine schwa like the other feminine deverbal nouns derived from past participles: *elle est morte,* but *la mort,* not **la morte.*

[59] Alongside the morphological process deriving verbs from nouns without the help of any overt derivational suffix, exemplified in (25), there is one which derives nouns from verbs in a similar fashion: *appeler* 'to call'/*appel* 'call', *(se) reposer* 'to rest'/*repos* 'rest', *retourner* 'to go back'/*retour* 'return', *aider* 'to help'/*aide* 'help', etc. Contrary to what is often said, deriving *appel* from *appeler* does not involve any truncation of the inflectional suffix; it simply involves turning the verbal stem [apəl]$_V$ into a nominal stem [[apəl]$_V$]$_N$. That there are no longer any verbal endings following the noun *appel* is just a consequence of the fact that it is a noun. For details, cf. Dell (1970).

underlying representation of *saler* would be as in (27), where the noun root *sel* together with the empty suffix $-[_{+L}\phi]_{+L}-$ make up the verb inflectional stem (that inflectional stem plus the inflectional suffixes making up the verb):

(27) $[_V[_{Vstem}[_{Nroot}$ sɛl $_{Nroot}] + [_{+L} \phi _{+L}]_{Vstem}] + ə + r _V]^{60}$

In this way, the internal composition of *saler* is made to resemble that of the related verb *salifier* 'to salify' (with its overt derivational suffix *-ifi-*) in the relevant respects:

(28) $[_V[_{Vstem}[_{Nroot}$ sɛl $_{Nroot}] + [_{+L} ifi _{+L}]_{Vstem}] + ə + r _V]$

Notice that the very notion of an empty, feature-matrix-less suffix bearing the morphological feature [+L] implies that [+L] is not part of a distinctive feature matrix, but rather part of a category symbol that would dominate the terminal string (i.e. distinctive feature matrix), if there were one. This point is perhaps better illustrated by the tree (29), which corresponds to the bracketing of (27). Note as well that to be consistent, one would also assign the feature [+L] associated with the root *sel* to the category feature bundle dominating the root, as in (29).

(29)
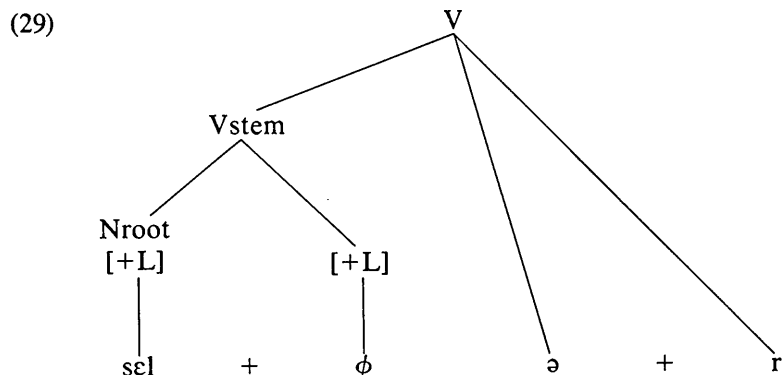
The rule of LB applying to such a representation could now be formulated as in (30)

(30) $\begin{bmatrix} +syll \\ +low \end{bmatrix} \rightarrow [+back] / [W_{[+L}\ X \underline{\hspace{1cm}} C_0\ _{+L}][_{+L}\ Y\ _{+L}]]$

(where W, X, and Y are variables over terminal strings and may be null). The "empty" suffix solution, then, implies that [±L] would have a "suprasegmental" status, one similar to that of syntactic features.

A second, alternative solution does not involve the positing of an empty suffix, but relies on the possibility of associating the [±L] feature with the stem category which dominates roots and suffixes (if there are any). According to this view, *saler* would be represented as in (31).

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[60] We are assuming that the underlying form of the theme vowel appearing in the first conjugation is [ə]. See Selkirk (1972) and Basbøll (1975) for arguments in support of this position.

(31)
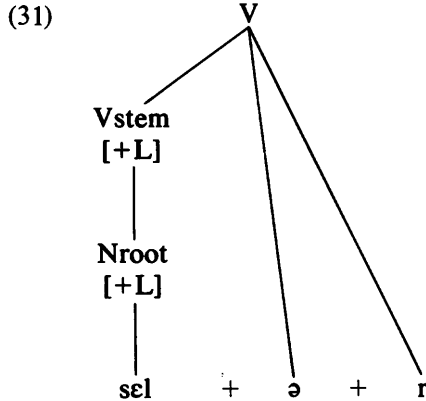
Such a representation would permit a modification in the formulation of LB, as follows:

(32) $\begin{bmatrix} +\text{syll} \\ +\text{low} \end{bmatrix} \rightarrow [+\text{back}] \; / \; [_{+L} \; X \; [_{+L} \; Y \; \underline{\hspace{1cm}} \; C_0 \;_{+L}] \; Z \;_{+L}]$

The peculiarity of the verb stem of *saler,* therefore, would be in being marked [+L]. The marking must be considered exceptional, in this case.[61]

The verb stem of *salifier* would also have to be marked [+L], in order for the formulation (32) of LB to apply in similar fashion. In the case of *salifier,* however, the [+L] marking on the stem is not exceptional, but must be thought of as having been "induced" by, or projected from, the learned suffix *-ifi-* which the stem immediately dominates. The representation of this verb would be as shown in (33), and it would be subject to LB as formulated in (32).

(33)

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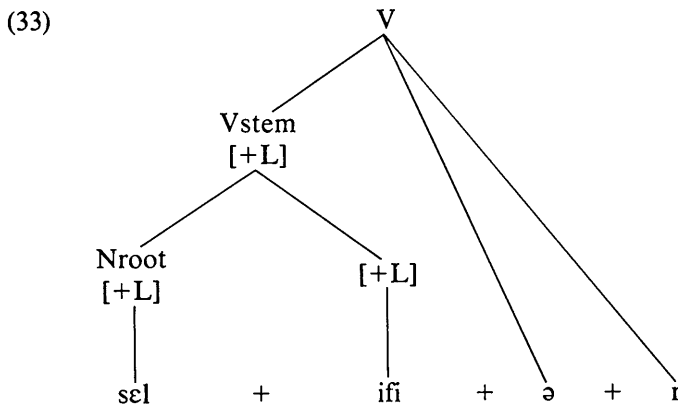
[61] Note that either formulation requires that the labeled bracketing on an internal, potentially cyclic, domain be maintained. The representation of a word at the point at which LB applies must therefore include all the information about the internal structure of the word. Cf. Grimshaw (forthcoming) for evidence that a rule of Attic Greek requires the maintenance of word-internal bracketing.

We think the latter approach is the right one, for there is independent evidence that the grammar requires a mechanism by which suffixes induce features on the category nodes that dominate them. Given that such a mechanism is required, and that as a consequence morphological features can, and even must, be associated with a category node higher than that of a suffix, it would be desirable to exclude in principle an analysis which posits empty suffixes whose sole function is to bear a morphological feature. In eliminating the possibility of an empty suffix solution, we could narrow down the number of possible grammars that can be constructed on the basis of the available data.

The independent motivation for the "induction" of features is provided by the analysis of gender specifications in French nouns. The specification of gender is a property of a lexical item as a whole, like the features [±Common] or [±Count], and thus [±Feminine] is to be associated with the complex category symbol of a noun. Gender specifications are unpredictable for monomorphemic lexical items (except for those designating animates). So the fact that *terre* 'earth' is feminine and *sel* 'salt' is masculine must be marked idiosyncratically (the same holds for the fact that *sel* is [+L] and *terre* is [−L]). In derived nouns, however, gender can generally be predicted from the rightmost derivational suffix: *sent-i-ment-al-isme* and *evolu-tionn-isme* are masculine, while *arm-ur-erie* and *dent-ist-erie* are feminine, since all nouns derived with the suffix *-isme* are masculine while all those derived with *-erie* are feminine. (In the same manner, all nouns derived with *-isme* will have a [+L] diacritic attached to their outermost labeled brackets, while all those derived with *-erie* will have a [−L] diacritic.) Finally, gender is not usually predictable in derived nouns lacking an overt suffix. The noun *dépôt* 'deposit' derived from *déposer* 'to deposit' is masculine, while the noun *pose* 'pose' derived from *poser* 'to pose' is feminine. (This can be put in parallel with the fact that *effeuiller* must be assigned the specification [−L] whereas *défolier* must be [+L].)

Returning now to the lists of (25), we see that the forms of (25b) can be accounted for in the same way as those of (25a). The lexical representation of *inodore* should be the one given below in (34), and *incolore* and *indolore* will have parallel ones:[62]

(34) [$_A$ in [$_{Nroot}$ od + œr $_{Nroot}$] $_A$]
      +L   +L   +L   +L

Similarly, *flore, carne,* and *major* can be accounted for by LB if they are given the lexical representations [[flœr]$_N$]$_N$, [[šɛrn]$_N$]$_N$, and [[maž + œr]$_A$]$_N$, with both brackets labeled as [+L]. None of the pairs in list (25b) are representative of general

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[62] The initial vowel of *odeur* is pronounced [o] in *odeur,* but [ɔ] in all the derived lexical items (*odorat, inodore, désodoriser,* etc.). This alternation does not reflect the existence of any regular process. For a few other similar instances see Schane (1968, 52–53). About the first [ɔ] of *incolore* and *indolore,* see fn. 70.

morphological processes in French, however, so we do not want in any way to insist that they provide crucial evidence in these matters.[63]

Consider next the forms in (35):

(35) a. embrasement 'conflagration'
dessalement 'removal of salt'
appariement 'pairing'
b. peuplement 'peopling'
éclairement 'lighting'
ameublement 'furnishing'

They all contain roots which are susceptible to LB (*braise, sel, pair, peuple, clair, meuble*) and all precede the suffix *-ement*. Why then doesn't LB apply in a uniform fashion? The answer lies in the morphological analysis of these words. The morpheme *-ement* is a nominalizing suffix which forms nouns from verbs. The verbs corresponding to the nouns in (35) are, for (a), *embraser* 'to set fire to', *dessaler* 'to remove salt from', and *apparier* 'to pair', and for (b), *peupler* 'to people', *éclairer* 'to light', and *ameubler* 'to furnish'. Which vowel appears in the words of (35) has nothing to do with the suffix *-ement*, but is determined by the vowel in the verbs upon which the *-ement* nouns are built. (Only the verbs of (35a) are marked [+L], like *saler*. They permit LB to apply to the [+L] noun or adjective root in the way described above.)

A similar explanation can be given for the appearance of the low back vowels in *saloir* 'salting tub', *étamage* 'tin plating', *coloriage* 'coloring by hand', *panure* 'bread-

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[63] The reader must keep in mind that by including a pair of items in the lists under examination, we do not necessarily imply that we ourselves think that an adequate grammar of French should at all costs relate them. In the case of *fleur/flore, chair/carne*, and *majeur/major*, for example, it is difficult for us to see at present just what significant semantic generalizations a grammar would miss by failing to relate them. All we are saying here is that, should these forms turn out to be related when more is known about derivational morphology, the rule LB as stated can handle them.

Other interesting cases reminding us of how much an adequate phonological account depends on prior morphological analysis are provided by the pairs *barbe* 'beard'/*imberbe* 'beardless' and *bas* 'low, adj.'/*baisse* '(a) lowering'. The question is whether the phonetic variants of the roots can be directly related by LB. Consider first *barbe/imberbe*. One might want to think of this pair as analogous to *odeur/inodore*, but notice that the back vowel appears in the bare root and the front vowel in the derived lexical item. Our analysis would account for this pair only if the vowels were distributed the other way around: **berbe/*imbarbe*. Hence *imberbe* must be left unaccounted for. (Notice that it is the only item containing the root *barbe* where [ɛ] shows up. All the others contain an [a], whatever the suffix: *barbu, barbifiant, barbier*, etc., as would be expected if underlying /a/ were assumed.)

The case of *bas/baisse* is even more striking. The noun *baisse* is derived from the verb *baisser*, which is itself derived from the adjective *bas*. (Cf. *sécher* 'to dry'/*sec* 'dry', *chauffer* 'to heat'/*chaud* 'warm, hot', *hausser* 'to raise'/*haut* 'high', *rougir* 'to become red'/*rouge* 'red', *salir* 'to dirty'/*sale* 'dirty'.) The morphological analysis of *baisse* is [$_N$[$_V$[$_A$bas$_A$]$_V$]$_N$]. It is evident that its [ɛ] vowel should not be related directly to the [a] of *bas*. That *baisse* has an [a] is just a natural consequence of the fact that *baisser* has an [ɛ], and that the bracketing involved in the suffixless derivation of nouns from verbs does not usually trigger the operation of LB. As for the presence of the [ɛ] in the verb *baisser* while the derivational base *bas* has an [a], it should be considered idiosyncratic. (A similar conclusion holds for the [ɛ] in *engraisser* 'to fatten', from *gras* 'fat'.)

crumbs', *majorable* 'increasable', etc. The suffixes *-oir, -age,* and *-ure* form nouns, and the suffix *-able* adjectives, on the basis of verbs. (For example, *-oir* attaches to a verb to form a noun of place or instrument: *abattre* 'to slaughter'/*abattoir* 'slaughterhouse', *cracher* 'to spit'/*crachoir* 'spittoon', *fumer* 'to smoke'/*fumoir* 'smoking room'.) Corresponding to these nouns are the verbs *saler, étamer, colorier, paner, majorer.* The quality of the vowel in the noun is therefore attributable to the structure of the verb, not to the effect of the particular nominalizing suffix. The word *saloir* has the following underlying representation, with LB applying to the verb stem.

(36) $[_N [_V [_N sɛl _N] v] uar _N]$
       $\;\;\;$ −L +L +L $\quad$ +L +L $\quad\;\;$ −L

In general, then, any word derived from the verb *saler* will have the low back vowel [a]: *salage* 'salting', *salaison* 'salt provisions', *saleur* 'salter', *dessaler* 'remove the salt'.[64] The appearance of *sal-* in all these forms may be compared to the appearance of *popul-* (for *peuple*) in *populaire, populairement, populariser, popularisation.* The root *peuple* shows up phonetically as *popul-* when the adjective ending *-aire* is appended; any word subsequently built on the adjective *populaire,* e.g. *populairement* (37), will automatically incorporate this effect.

(37) $[_{Adv} [_A [_N pœpl _N] ɛr _A] ment _{Adv}]$
       $\quad\;\;$ −L $\;\;\;$ +L +L $\qquad$ +L $\;\;\;$ +L $\qquad\;$ −L

5.3. The "Local" Application of Morpholexical Rules

The preceding discussion brings us to a more general point about LB: it has the property of applying "locally". A [+L] morpheme will not undergo LB if the [+L] element triggering LB is "too far away" in the word.[65] So, for example, from the fact that the vowel of the [+L] root *clair* remains phonetically front in *éclairer,* one can predict that it will remain front in all the lexical items derived in turn from these, whatever the suffixes involved in the derivations. The [+L] suffix *-iste* will not bring about an application of LB in *éclairagiste,* whose structure is as follows:

(38) $[_N [_N [_V e [_A klɛr _A] v] až _N] ist _N]$
       $\;\;$ +L −L −L +L $\qquad$ +L −L $\quad\;$ −L $\;\;\;$ +L

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[64] *Saloir, saleur, dessalement* are only apparent counterexamples to LB. A real counterexample, one we will have to leave unexplained, is *salière* 'salt shaker'. This noun, formed with the [−L] suffix *-ière,* is built directly on the noun base *sel.* Cf. appendix A for some discussion of this case.

[65] Suppletion also seems to have this property of "localness". Consider for instance the various French verbs built on *-primer: exprimer, réprimer, opprimer,* etc. The root takes a suppletive form *-press-* in lexical items derived with the suffixes *-if* and *-ion* (*expressif, expression, répressif, répression,* etc.) and also in the lexical items derived from these (*expressivement, expressivité, expressioniste*). This last fact is taken for granted. But one could conceive of a language identical to French in all relevant respects except for the fact that the suppletive variants *-prim-* and *-press-* would depend on the rightmost derivational suffix in the word. In such a language, one would expect to find, for example, *exprimer, expressif, *exprimivement.*

(*Eclairagiste* 'lighting expert' is derived from *éclairage* 'lighting', which is derived from *éclairer* 'to light'.) Other similar examples are hard to find due to the fact that the derivational morphology of French allows very few combinations in which a non-learned suffix is followed by a learned one. However, one can coin unattested but plausible words derived from [+L] roots and containing comparable sequences of suffixes. Native speakers accept *feuillagiste* 'someone whose job is to deal with *feuillage*' (cf. *feuillage* 'foliage'),[66] *ameublemental* 'pertaining to *ameublement*' (cf. *ameublement* 'furnishing'),[67] *amerrissabilité* 'fitness for landing on the sea' (cf. *amerrissable* 'fit to land on the sea'),[68] *éclairabilité* 'ability to be illuminated' (cf. *éclairable* 'illuminatable'). The forms with LB are rejected out of hand: **foliagiste, *amobilmental, *amarrissabilité, *éclarabilité*.

This property of "localness" is denied by Schane's (1968) analysis, which assumes that the presence of a learned suffix in a word has an effect on any vowel to the left, however far away it is from that suffix.[69] This assumption allows him to account for the fact that the verbal root *aim-* shows a phonetic [ɛ] in *aimable* (derived from *aimer*), but an [a] in *amabilité*, the lexical representation of which is given below:

(39) $[[[\varepsilon m \ _V] \ abl \ _A] \ i + te \ _N]$
    +L   −L   +L

In Schane's analysis, it is this one example, *amabilité*, which represents the normal case and *éclairagiste* and the others which have to be marked as exceptions to his tensing rule.[70] We think it is *amabilité* which is exceptional, and we have no way to account for the presence of [a] in our system.[71]

Though our demonstration has been limited to LB, it is probable that all *morpholexical rules of French are local in application. We will assume that localness is* one of the defining properties of morpholexical rules in French, and will attempt to formulate it as a constraint on possible morpholexical rules. Notice that if we adopt the empty suffix solution outlined in 5.2, the localness property can be stated as follows:

(40) In a morpholexical rule of French, a morpheme A undergoing some change must be adjacent to a morpheme B which provides the context for the change.

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[66] Cf. *bandagiste, esclavagiste, étalagiste, paysagiste,* etc.

[67] Cf. *ornemental, gouvernemental, sentimental,* etc.

[68] Cf. *skiabilité, navigabilité,* etc.

[69] See Schane (1968, 43, 65).

[70] On this tensing rule, see references in preceding footnote. Schane's tensing rule would have similar consequences for other vowel alternations having to do with the [+L]/[−L] distinction in suffixes. For instance, it would predict **régulmentaire, *régulmentation* instead of *réglementaire, réglementation* (cf. *règle/régulier*).

[71] Our analysis also leaves unexplained the appearance of [ɔ] in first vowel position in the root in the words *colorer* (cf. *couleur*), *endolorir* (cf. *douleur*), and *coronal* (cf. *couronne*). To our knowledge, these are the only forms in the language which show this type of alternation.

The formulation of LB in (30) meets this condition. A rather different statement of this property would be required in the grammar containing LB formulated as in (32). In this case, some condition must be put on the variables X and Z. It could be expressed in the following way:

(41) In a morpholexical rule of French whose structural description has the form $[_B X[_A \ldots _A] Z _B]$ where X and Z are variables, B must immediately dominate A.

(Such a formulation will prevent the LB of (32) from applying to *éclairagiste*.) One can think of the condition on local application in (41) as being a condition on morphological *subjacency* not dissimilar to the subjacency condition on syntactic rules proposed by Chomsky (1973; 1976; 1977). (See also Bresnan (1976).) In some interesting recent work, Siegel (1977) has proposed an "adjacency" condition on morphological rules which is quite similar in spirit to our (41).

We hope that further research will help establish which formulation of "localness" is correct. We also hope that, with time, it will be revealed whether "localness" is a property of morpholexical rules in other languages of the world.

Appendix A: Exceptions to Learned Backing

In this appendix, we would like to make a review of the words that the rule of LB as formulated does not yet account for. We have compiled lists that are as nearly complete as possible. We have been so liberal in what we have permitted to be considered to be related words in a synchronic description of present-day French that subsequent studies of French derivational morphology will no doubt reduce these lists, rather than extend them, by excluding some of the word pairs they contain. No doubt a careful screening of dictionaries, especially technical ones, will add to these lists a few forms that we have overlooked or that are known only to specialists of various fields, but we are confident that these additions will not alter the basic picture.

(42) fleuriste   'dealer in flowers'
     lainier   'pertaining to wool (adj.)'
     laineux   'woolly'
     valeureux   'brave'
     chaleureux   'warm (person)'
     doucereux[72] 'sweetish'
     vigoureux[73] 'strong'
     langoureux   'languid'
     savoureux   'tasty'

[72] Cf. footnote 43.
[73] Cf. footnote 42.

rigoureux   'severe'
douloureux 'painful'
amateurisme 'amateurism'

List (42) contains lexical items in which a morpheme that we have independent reasons to consider to be marked [+L] (cf. *floral, lanifère, valoriser,* etc.) precedes a [+L] suffix but nevertheless retains a front vowel. These *words,* but not the *morphemes* that compose them, will have to be marked with an exception feature [−Rule LB].

(43) clarté 'clarity'   clair 'clear'
     santé 'health'   sain 'healthy'
     volonté 'will'   (ils) veulent '(they) want'
     léproserie 'leper hospital'   lépreux 'leprous'
     salière 'salt-box'   sel 'salt'
     charnier 'charnel-house'   chair 'flesh'
        charnu 'fleshy'
     brasier 'clear glowing fire'   braise 'live charcoal'
        braséro 'charcoal-pan'
     doctoresse 'woman doctor'   docteur 'doctor'
     amant 'lover'   aimer 'to love'
     dolent 'whining'   douleur 'pain'
     odorant 'fragrant'   odeur 'smell'
     florissant 'flourishing'   fleur 'flower'
        floraison 'flowering'
     favorable 'favorable'   faveur 'favor'
        favorite 'favorite'
     coloris 'coloring'   couleur 'color'
     solo 'solo'   seul 'alone'
     populace 'populace'   peuple 'people'
        populo 'people (slang)'
     marâtre 'cruel (step)mother'   mère 'mother'
     marée 'tide'   mer 'mer'
        marais 'swamp'
     manette 'handle'   main 'hand'
     famine 'starvation'   faim 'hunger'

List (43) contains items in which a [+L] root is followed by a [−L] suffix, in addition to various other forms with [+L] roots whose morphological structure is unclear (e.g. *marais, dolent*) or abnormal (e.g. *favorable, volonté*). While in the forms of list (42) the rule LB did not operate in a context where it should have, in the forms of (43) LB seems to have applied, though its structural description is not met. We will leave these

forms unaccounted for without too much remorse, for very few of them fit into a productive pattern of the derivational morphology of modern French.

One last remark might be worth making. We claim that list (43) is as complete a list as possible of words in which LB operates where it "shouldn't", yet we have not included items such as *saloir, embrasement, coloriage, étamage, panure, majorette, majorable,* even though *-oir, -ement, -age, -ure, -ette, -able* are indeed [−L] suffixes. Our reason for not including these items in list (43) is simply that they are not in fact counterexamples to our formulation of LB. As we showed in 5.2, the root *sel* undergoes LB in *saloir* because *saloir* is built on the verb *saler,* a lexical item in which *sel* is subject to LB. But things are different in the case of *salière,* for it can be shown that *salière* derives directly from the noun *sel,* (cf. *soupière/soupe, théière/thé, tabatière/tabac, bonbonnière/bonbon,* etc.).[74] The morphological analysis of *salière* is thus as shown in (44):

(44) [[sɛl $_N$] jɛr $_N$]
       +L   −L

The outermost bracket is [−L], and hence the fact that *sel* undergoes LB in this lexical item is truly idiosyncratic. This is why *salière* is listed in (43).

Appendix B: Additional Evidence for the [±L] Distinction

In this appendix we examine briefly additional vowel or consonant alternations of French which, though limited in scope, nevertheless seem to constitute subregularities. What is important to observe is that the alternations we discuss here are conditioned by exactly the same suffix classes that conditioned Learned Backing. The [±L] distinction thus receives confirmation from these other morpholexical phenomena of the language.

Consider first the list in (45):[75]

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[74] The various claims made in this article about the derivational morphology of French cannot be substantiated here. Some have been demonstrated in Dell (1970), but for others the reader must wait for the publication of research currently in progress.

[75] Translations from list (45) are as follows:

a.	rule	to rule, small rule	regular
b.	nail	armed with claws, tab (of thumb-index), manicure-set	ungulate
c.	angle		bony (face)
d.	show		spectacular
e.	eye-glasses	four-eyes	binocular
f.	miracle		miraculous
g.	fable	book of fables	fabulous
h.	oracle		oracular
i.	table	small table, to seat (s.o.) at table, company at table	tabular
j.	muscle	muscular	muscular
k.	furuncle		furunculous
l.	people	to populate, tribe	populous, intended for the people

(45) [XCL] *alternates with* [XCVL]

a.	règle	régler, réglette	régulier
b.	ongle	onglé, onglet, onglier	ongulé
c.	angle		anguleux
d.	spectacle		spectaculaire
e.	binocle	binoclard	binoculaire
f.	miracle		miraculeux
g.	fable	fablier	fabuleux
h.	oracle		oraculaire
i.	table	tablette, attabler, tablée	tabulaire
j.	muscle	musclé	musculaire
k.	furoncle		furonculeux
l.	peuple	peupler, peuplade	populeux, populaire
m.	noble	noblesse, nobliau, annoblir	nobiliaire
n.	meuble	meubler, ameubler	mobilier, immobilier
o.	sensible	sensiblerie	sensibilité
p.	visible		visibilité
q.	diable	diablesse, diablerie	diabolique
r.	libre	librement	libérer, libéral, liberté[76]
s.	arbre	arbrisseau	arboricole, arborescence
t.	ministre	ministrable	ministériel
u.	dextre		dexterité
v.	cadavre		cadavérique
w.	respectable		respectabilité
x.	stable		stabiliser
y.	genre		générique
z.	astre	**astral, astronome,[77] astrologue**	astéroïde

m.	noble	nobility, minor noble, ennoble	pert. to the nobility
n.	piece of furniture	to furnish, id.	set of furniture, real estate
o.	sensitive	sentimentalism	sensitiveness
p.	visible		visibility
q.	devil	she-devil, devilry	diabolic
r.	free	freely	to free, liberal, freedom
s.	tree	shrubby tree	tree-dwelling, arborescence
t.	member of Cabinet	prospective member of Cabinet	pertaining to Cabinet
u.	right hand		skillfulness
v.	corpse		cadaveric
w.	respectable		respectability
x.	stable		to stabilize
y.	kind		generic
z.	star	astral, astronomer, astrologer	asteroid

[76] The suffix -té, being [−L], should not provide the environment for the appearance of the vowel.

[77] These suffixes are [+L] and so should cause the vowel to appear.

Note that the form of the roots (and of the suffixes *-ible, -able,* and *uble*) is the same when no suffix follows, and when preceding a [−L] suffix. But when these particular morphemes precede a learned suffix, they show an additional vowel (*u, i, e,* or *o*) between the consonant and liquid that were final in the root elsewhere. However this alternation is to be accounted for, whether by deletion or insertion of the extra vowel, the rule must appeal to the distinction between [+L] and [−L] suffixes. List (45) contains what we hope is a (nearly) complete list of morphemes whose form before [+L] suffixes differs from the form they take otherwise only by the presence of an additional vowel. List (46) extends the list of morphemes showing the appearance of the additional vowel between stop and liquid in a [+L] context, but the roots in this list also show alternations of lesser currency, ones which one may not want to regard as being rule-governed in a grammar of modern French.

(46) [XCL] *alternates with* [XCVL][78]

		Nonlearned suffix	Learned suffix
a.	étrangler	étrangleur, étranglement	strangulation
b.	aigle		aquilin
c.	siècle		séculaire
d.	oncle		avunculaire
e.	cercle	(en)cercler	circulaire
f.	couple	coupler, accoupler	copuler

[78] Translations from list (46) are as follows:

a.	to strangle	strangler, strangling	strangulation
b.	eagle		aquiline (profile)
c.	century		century-old
d.	uncle		avuncular
e.	circle	to ring	circular
f.	couple	to couple, to join in pairs	to copulate
g.	to talk	speaker	utterance
h.	to tremble	to tremble slightly	tremolo, to have a quaver in one's voice
i.	to seem	alike, such to pretend	similar, similarity, to assimilate to simulate, semblance
j.	humble	humbly	to humiliate
k.	room	little room, chambermaid	double-chamber system
l.	number	numerous, to count	numeral, numerical, to enumerate
m.	ash	ash-tray, ash-grey	to incinerate
n.	generate	generation	generation, generative, to generate, generator
o.	harsh	harshness	asperity
p.	purple	to become crimson	purplish
q.	Vespers		pertaining to evening
r.	four	fourth	quaternary
s.	letter	literate, lettrism	literal, literary, literature
t.	other	otherwise	state of being different
u.	poor	poverty	pauperism
v.	pepper	to pepper, pepper box	piperaceous, peppery

g.	parler	parleur	parole
h.	trembler	trembloter	tremolo, tremuler
i.	sembler	semblable	similaire. similitude. assimiler
		faire semblant	simuler, simulacre
j.	humble	humblement	humilier
k.	chambre	chambrette, chambrière	bicamérisme
l.	nombre	nombreux, dénombrer	numéral, numérique, énumérer
m.	cendre	cendrier, cendré	incinérer
n.	engendrer	engendrement	génération, génératif, générer, générateur
o.	âpre	âpreté	aspérité
p.	pourpre	s'empourprer	purpurin
q.	vêpres		vespéral
r.	quatre	quatrième	quaternaire
s.	lettre	lettré, lettrisme[79]	littéral, littéraire, littérature
t.	autre	autrement	altérité
u.	pauvre	pauvreté, apauvrir	paupérisme
v.	poivre	poivrer, poivrier	pipéracé

In the list (47) we see examples of related pairs containing a root which in the [+L] context shows a prestop *s* which is absent otherwise.

(47) *Prestop* s *alternates with* ϕ[80]

		Nonlearned suffix	*Learned suffix*
a.	hôpital		hospitaliser, hospitalier
b.	arrêter	arrêt	arrestation
c.	goûter	goûteur	gustatif
d.	fête	fêtard	festivité, festival
e.	chrétien	chrétienté	christianisme
f.	vêpres		vespéral
g.	âpre	âpreté	aspérité

In (48), an *s* again appears in the root, this time in initial position, when it precedes a

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[79] See fn. 77.

[80] Translations from list (47) are as follows:

a.	hospital		to admit s.o. to a hospital, pertaining to hospitals
b.	to stop, arrest	stop	(to take s.o. into) custody, arrest
c.	taste	taster	gustative
d.	feast	roisterer	rejoicing, festival
e.	Christian	Christianity	Christianism
f.	Vespers		pertaining to evening
g.	harsh	harshness	asperity

[+L] suffix. In these cases, when the *s* disappears in the unsuffixed forms, and in those with a [−L] suffix, an *e* crops up in initial position, "taking the place" of *s*.

(48) [s - *stop* - X] *alternates with* [é - *stop* - X][81]

	Nonlearned suffix	Learned suffix
a. éponge	éponger	spongieux
b. école	écolier	scolaire
c. éternuer	éternuement	sternutation
d. étudier	étudiant	studieux
e. étrangler	étrangleur	strangulation

In (49), the roots lack the initial *e* in [+L] contexts which they show, preceding an *s* plus stop combination, in [−L] and suffixless contexts.

(49) [es - *Stop* - X] *alternates with* [s - *Stop* - X][82]

	Nonlearned suffix	Learned suffix
a. estomac	estomaquer	stomacal
b. espace	espacer	spacieux, spacial
c. espèce		spécifique
d. esprit		spiritisme, spirituel
e. estropier		·stropiat

Finally, in list (50) we give examples of (we hope) all of the morphemes (roots and the suffix *-ic/-ique*) which show softening of their final /k/. (There exist other morphemes which in the same contexts do not show an *s* variant of the final *k*.)

(50) *Velar Softening*[83]

	Learned suffix
a. toxique	toxicité
b. historique	historicisme

[81] Translations from list (48) are as follows:

a. sponge	to mop	spongy
b. school	school boy/girl	pertaining to school life
c. to sneeze	sneeze	sneezing
d. to study	student	studious
e. to strangle	strangler	strangulation

[82] Translations from list (49) are as follows:

a. stomach	to impress s.o.	gastric
b. space	to space	spacious, spatial
c. species		specific
d. spirit		spiritism, spiritual
e. to cripple		cripple

[83] Translations from list (50) are as follows:

| a. toxic | toxicity |
| b. historical | historicism |

c.	authentique	authenticité
d.	attique	atticisme
e.	technique	technicien
f.	rauque	raucité
g.	opaque	opacité
h.	laïc	laïciser
i.	streptocoque	streptococique
j.	grec	gréciser
k.	Languedoc	languedocien
l.	Balzac	balzacien
m.	caduc	caducité
n.	réciproque	réciprocité
o.	talc	talcique
p.	public	publicité
q.	vaincre	invincible

The examples attested of Velar Softening all contain [+L] suffixes. We suspect that this rule is limited to the [+L] context, for even though no words are to be found in the dictionary in which a root susceptible to Velar Softening precedes an *i*-initial [−L] suffix, when one invents such words with a [−L] suffix, e.g. *talquier* 'a talc container', *streptocoquier* 'a streptococcus box', the intuition is that *k* remains unaltered.

In summary, lists (45) through (50) contain related forms which quite likely should be related by some rule, however "minor", in the grammar of French. Our purpose here has not been to give a formulation to these rules, but only to show that, when and if formulated, the rules would be obligated to appeal to the same bifurcation of the suffixes into the classes [±L] which are found to be necessary for Learned Backing.

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c.	genuine	genuineness
d.	Attic	Atticity
e.	technique	technician
f.	hoarse	hoarseness
g.	opaque	opacity
h.	secular	to secularize
i.	streptococcus	streptococcic
j.	Greek	to hellenize
k.	Languedoc	of Languedoc
l.	Balzac	after the manner of Balzac
m.	decaying, null	decayed state, nullity
n.	reciprocal	reciprocity
o.	talc powder	containing talc
p.	public	publicity
q.	to defeat	invincible

References

Anderson, S. R. (1970) "On Grassmann's Law in Sanskrit," *Linguistic Inquiry* 1, 387–396.

Anderson, S. R. (1974) "On the Typology of Phonological Rules," in A. Bruck, R. Fox, and M.

LaGaly, eds., *Papers from the Parasession on Natural Phonology,* Chicago Linguistic Society, University of Chicago, Chicago, Illinois.

Aronoff, M. (1976) *Word Formation in Generative Grammar,* Linguistic Inquiry Monograph 1, MIT Press, Cambridge, Massachusetts.

Basbøll, H. (1975) "Schwa, jonctures et syllabification dans les représentations phonologiques en français," *Acta Linguistica Hafniensia* XVI.2, Copenhagen.

Brame, M. (1970) *Arabic Phonology: Implications for Phonological Theory and Historical Semitic,* unpublished Doctoral dissertation, MIT, Cambridge, Massachusetts.

Bresnan, J. W. (1976) "Evidence for a Theory of Unbounded Transformations," *Linguistic Analysis* 2.4.

Carrier, J. (1975) "The Interaction of Reduplication and Infixation with the Phonology in Tagalog," unpublished paper, MIT, Cambridge, Massachusetts.

Chomsky, N. (1973) "Conditions on Transformations," in S. R. Anderson and P. Kiparsky, eds., *A Festschrift for Morris Halle,* Holt, Rinehart and Winston, New York.

Chomsky, N. (1976) "Conditions on Rules of Grammar," *Linguistic Analysis* 2, 303–350.

Chomsky, N. (1977) "On WH Movement," in P. Culicover, T. Wasow, and A. Akmajian, eds., *Formal Syntax,* Academic Press, New York.

Chomsky, N. and M. Halle (1968) *The Sound Pattern of English,* Harper and Row, New York.

Clark, M. (in preparation) *Dynamic Tone,* Doctoral dissertation, University of Massachusetts, Amherst, Massachusetts.

Dell, F. C. (1970) *Les règles phonologiques tardives et la morphologie dérivationnelle du français,* unpublished Doctoral dissertation, MIT, Cambridge, Massachusetts.

Dell, F. C. (1972) "Une règle d'effacement de *i* en français," *Recherches Linguistiques* 1, 68–87.

Dell, F. C. (1973) *Les règles et les sons: Introduction à la phonologie générative,* Hermann, Paris.

Dell, F. C. (forthcoming) "On Vowel Alternations in *French Phonology and Morphology.*" to appear in *Studies in French Linguistics.*

Dubois, J. (1962) *Etude sur la dérivation suffixale en français moderne et contemporain,* Librairie Larousse, Paris.

Grimshaw, J. (forthcoming) "On Word-Internal Labeled Bracketing in Ancient Greek."

Hale, K. (1977) "Three Cases of Overgeneration," in P. Culicover, T. Wasow, and A. Akmajian, eds., *Formal Syntax,* Academic Press, New York.

Hale, K. (forthcoming) "Papago Intonation and Word Order."

Halle, M. (1971) "Word Boundaries as Environments in Rules," *Linguistic Inquiry* 2, 540–541.

Harris, J. W. (1974) "Lo morfológico en una gramática generativa: alternancias vocálicas en las formas verbales del español," in J. Guitart and J. Roy, eds., *El español y la lingüística generativo-transformacional,* Ediciones 62—Peninsula, Barcelona.

Howren, R. (1968) "Stem Phonology and Affix Phonology in Dogrib (Northern Athapaskan)," in B. Darden, C. Bailey, and A. Davidson, eds., *Papers from the Fourth Regional Meeting of the Chicago Linguistic Society,* University of Chicago, Chicago, Illinois.

Lapointe, S. (1976) "Navaho Verb Allomorphy: A Second Look," unpublished paper, University of Massachusetts, Amherst, Massachusetts.

Liberman, M. (1975) *The Intonational System of English,* unpublished Doctoral dissertation, MIT, Cambridge, Massachusetts.

Liberman, M. and A. Prince (1977) "On Stress and Linguistic Rhythm," *Linguistic Inquiry* 8, 249–336.

Lightner, T. (1968) "On the Use of Minor Rules in Russian Phonology," *Journal of Linguistics* 4, 69–72.

Lightner, T. (1972) *Problems in the Theory of Phonology,* Linguistic Research, Edmonton.

Morin, Y.-C. (1971) *Computer Experiments in Generative Phonology: Low-Level French Phonology,* Natural Language Studies, No. 11, Department of Computer and Communication Sciences, The University of Michigan, Ann Arbor, Michigan.

McCawley, J. (1968) *The Phonological Component of a Grammar of Japanese,* Mouton, The Hague.

Phelps, E. (1975a) "Iterative and Disjunctive Domains in Phonology," *Linguistic Analysis* 1, 137–172.

Phelps, E. (1975b) "Sanskrit Diaspirates," *Linguistic Inquiry* 6, 447–464.

Phelps, E. and M. Brame (1973) "On Local Ordering of Rules in Sanskrit," *Linguistic Inquiry* 4, 387–400.

Reichstein, R. (1960) "Etudes des variations sociales et géographiques des faits linguistiques," *Word* 16, 55–99.

Sag, I. (1974) "The Grassmann's Law Ordering Pseudoparadox," *Linguistic Inquiry* 5, 591–607.

Schane, S. A. (1968) *French Phonology and Morphology,* MIT Press, Cambridge, Massachusetts.

Schane, S. A. (1972) "How Abstract is French Phonology?" in J. Casagrande and B. Saciuk, eds., *Generative Studies in Romance Languages,* Newbury House, Rowley, Massachusetts.

Selkirk, E. O. (1972) *The Phrase Phonology of English and French,* unpublished Doctoral dissertation, MIT, Cambridge, Massachusetts.

Selkirk, E. O. (1977) "The French Foot: On the Status of 'Mute' *e,*" in the proceedings of the Colloquium on Current Issues in French Phonology, Indiana University, September 1977. To appear in *Journal of French Linguistics.*

Selkirk, E. O. (forthcoming a) *Phonology and Syntax: On the Relation between Sound and Structure,* MIT Press, Cambridge, Massachusetts.

Selkirk, E. O. (forthcoming b) "Prosodic Domains in Phonology: Sanskrit Revisited," in M. Aronoff and M.-L. Kean, eds., *Juncture.*

Selkirk, E. O. (forthcoming c) "On Suprasyllabic Structure in French," *Linguistic Inquiry.*

Siegel, D. (1974) *Topics in English Morphology,* unpublished Doctoral dissertation, MIT, Cambridge, Massachusetts.

Siegel, D. (1977) "The Adjacency Condition in Morphology," unpublished ms.

Stanley, R. (1969) *The Phonology of the Navaho Verb,* unpublished Doctoral dissertation, MIT, Cambridge, Massachusetts.

Stanley, R. (1973) "Boundaries in Phonology," in S. R. Anderson and P. Kiparsky, eds., *A Festschrift for Morris Halle,* Holt, Rinehart and Winston, New York.

Vergnaud, J.-R. (1975) *Problèmes formels en phonologie générative,* Rapport de Recherches No. 4, Laboratoire d'Automatique Documentaire et Linguistique, Département de Recherches Linguistiques, Université de Paris VII.

Walker, D. (1975) "Word Stress in French," *Language* 51, 887–900.

Wilbur, R. (1973) *The Phonology of Reduplication,* Doctoral dissertation, University of Illinois, Urbana, Illinois. [Reproduced by the Indiana University Linguistics Club, Bloomington, Indiana.]

Wilbur, R. (1974) "Reduplication and Rule Ordering," in C. Corum, T. Smith-Stark, and A. Weiser, eds., *Papers from the Ninth Regional Meeting of the Chicago Linguistic Society,* University of Chicago, Chicago, Illinois.