Constraints on Phonological Rules and Representations: a Case Study of French

Jean-Philippe Watbled

Walter, H. (sous la dir. de) (1980). *Les Mauges, présentation de la région et étude de la prononciation..* Univ. d'Angers, Centre de recherches en littérature et en linguistique sur l'Anjou et le Bocage. Angers.

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CONSTRAINTS ON PHONOLOGICAL RULES AND REPRESENTATIONS: A CASE STUDY OF FRENCH

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1. INTRODUCTION

According to van der Hulst & Smith (1982: 2), there are two phases in the history of generative phonology. In the first phase, 'the degree of abstractness of underlying representations' was a central topic, but 'in the second phase attention has shifted to the structure of the phonological representations themselves'. However, the main theoretical principles of abstract phonology are tacitly adopted in most versions of non-linear phonology. These principles are minimized storage and maximized processing. A logical consequence of the first principle is what Lass (1984: 63) calls the 'Unique Underlier Condition', whereby speakers are supposed to assign a unique underlying representation to a morpheme. Besides, the theory is most highly valued when rules are as general as possible.

These basic tenets of modern phonology are controversial, insofar as the theory remains relatively unconstrained, and can hardly be empirically checked or falsified. Analyses are often indeterminate, essentially because morphophonemic alternations play a crucial role in the generative model: the underlying representation of a

morpheme can be set up only if we know its alternants and the rules governing alternations. But McCawley (1979: 239) rightly notes that whether you relate some forms or not 'will have no particular bearing on your ability to speak and understand English. There is in fact considerable individual variation with regard to what morpheme identifications different speakers make'. This means that divergent analyses of the same data by different speakers cannot impede communication, and that the role of morphophonemic alternations has been overestimated. It is therefore more sensible to build a different model.

The most important features of a possible constrained version of the phonological theory will now be expounded, and will be applied to some interesting aspects of French phonology.

II. A WORD-BASED MODEL

II.1. Morphemes vs word forms

Nespor & Vogel (1986: 11) ' propose that the prosodic hierarchy consists of 7 units', and 'these 7 units, from large to small, are: the phonological utterance (U), the intonational phrase (I), the phonological phrase (φ), the clitic group (C), the phonological word (ω), the foot (Σ), and the syllable (σ). Although the phonological word is not necessarily isomorphic with the morphosyntactic word, it can hardly be denied that 'we have at word-level the maximum congruence of phonological and grammatical structure' (Bynon 1977: 113). This explains why word identification is much easier than morpheme identification: morphemes do not belong to the prosodic hierarchy. Word forms can therefore be regarded as primordial, and morphemes as derivative units. We thus hypothesize that speakers store word forms in their lexical memory, rather than individual stems and affixes.

Linell (1979:VIII) gives very strong arguments for the lexicalization of word forms. In his theory, 'word forms are assumed to be primary units of grammar', essentially because 'morphemes are not surface forms' and 'surface-phonemic contrast seems to be a fundamental and significant concept in phonology' (p.151). It is obvious that surface contrasts concern word forms and not abstract representations of morphemes. Molino (1985: 28) adheres to this view: "Ce sont les mots et non les morphèmes qui sont codés et stockés dans la mémoire du locuteur' (of course, lexicalized word forms are internally structured).

Note that not **all** word forms have to be listed in lexical entries: storing phonemic representations of word forms 'does not mean that **all** word forms are lexicalized' (Linell 1979: 159). Only a subset of the forms of a paradigm will be listed, and more precisely the forms from which it is possible to infer:

(i) the morpheme alternants;
(ii) the morphophonemic rules which affect the various morphemes;
(iii) the basic allomorphs.

Regarding the word forms of a paradigm which must be listed, we certainly face a selection problem, because a certain degree of indeterminacy is inevitable (see Linell [1979:157]), but this apparent shortcoming is immaterial in a word-based model: the nature of the morphophonemic rules which are inferred does not depend crucially on the selection. There is only one imperative condition: the selected word forms must permit the above-mentioned inferences.

II.2 Inverse derivations

In morpheme-based models, computation is maximized, but in a word-based model, underlying representations are as 'shallow' as permitted by the theory: in most cases, they are not 'deeper' than classical phonemic representations (although mapping may remain indirect). Phonetic strings will be derived from phonemic representations by realization rules. However, in the model we propose, there is an additional requirement: it must be possible to 'read off' or extract a phonemic representation from its phonetic realization; inverse derivations must allow us to retrieve underlying forms. Imposing this 'recoverability condition' severely restricts abstractness. Note that inverse derivations must not be ambiguous. In French, this requirement rules out word-final underlying consonants leaving no trace on the surface. Consider the following adjectives:

(1) masculine: *noir* ('black')
vert ('green')
bavard ('talkative')

(2) feminine: *noire*
verte
bavarde

In Standard French, the phonetic realizations of the masculine forms are:

(3) [nwa(:)R], [vɛ(:)R], [bava(:)R]

and the phonetic realizations of the feminine forms are:

(4) [nwa(:)R], [vɛRt], [bavaRd]

In many analyses, in the wake of Schane (1968), the feminine forms are assumed to have an abstract word-final schwa, which is clearly an 'imaginary segment', and the stem-final obstruents are subject to various deletion rules, when schwa does not 'protect' them (rule ordering plays a crucial role in such analyses). So the following underlying representations are postulated for the items in (1):

(5) /nwaR/, /vɛRt/, /bavaRd/

In our model, this analysis is disallowed, because these abstract underlying forms are not recoverable (inverse derivations are ambiguous in this particular case) it is impossible to know whether a consonant has been deleted, or which one has been deleted, unless one makes reference to the feminine forms. Note that in a word-based theory, morphophonemic alternations involving different word forms do not condition the form of underlying representations. The underlying representations of the items in (1) (3) are therefore /nwaR/, /vɛR/, /bavaR/.

II.3 Well-formedness conditions

We shall assume that underlying representations cannot be 'illegal forms', and that phonotactic rules, which account for phoneme distributions, are not 'rescue rules' (cf. Lass (1984: 65-65)). In French, for example, a phonotactic rule bars schwa from the final position in polysyllabic word forms. This rule implies that the underlying representations of the items in (2) (4) are /nwaR/, /vɛRt/, and /bavaRd/, without final schwas.

Phonotactic rules will be primarily regarded as well-formedness conditions on underlying representations of word forms. Note that as many phonotactic rules involve syllable structure, it is clear that these representations are fully syllabified. Phonotactic rules can also perform a generative function, as far as non-lexicalized word forms are concerned. They apply in the word formation component, and interact with morphological rules. Non-automatic morphophonemic rules (= allomorphy rules), which are inferred from lexicalized word forms, also apply in the word formation component. All internal sandhi rules mapping phonemes on to phonemes, whether automatic or not, apply in the lexicon: they constitute the set of **lexical rules**. On the other hand, realization rules (the traditional allophonic rules) and external sandhi rules, which apply in connected speech when word forms are chained together, are **post-lexical**.

II.4 The form of the model

The general form of the model is as follows (as far as phonological rules are concerned; we do not deal here with the question of morphological rules):

(6) WORD-FORMATION COMPONENT: morphology

Lexical rules: —structure-building rules (see below):
— contrastive rules
— redundancy rules
—internal-sandhi rules:
—allomorphy rules
—phonotactic rules

↓

underlying representations

(7) PHONOLOGICAL COMPONENT:

Post-lexical rules: — realization rules
— external-sandhi rules

↓

phonetic representations

(For details on this 'constrained' version of generative phonology, see Watbled (1986: chapters VI & VII)).

II.5 Structure-building rules

Structure-building rules generate phonemic systems; they can be divided into two subclasses: redundancy rules and contrastive rules. A redundancy rule has the following form:

(8) [αF^{i}] -> [βF^{ii}] (where α and ß represent the values of a feature F)

Contrastive rules state possible underlying contrasts. In French, sonorant segments are necessarily voiced; this can be expressed by the following redundancy rule:

(9) [+sonorant] -> [+voiced]

However, obstruents contrast for the feature [voiced] (cf. *basse* /bɑs/ ('low', feminine), *base* /bɑz/ ('basis')). This contrast can be expressed by the following contrastive rule:

(10) [-sonorant] -> [± voiced] (the two values (+ and -) signal the contrast).

All structure-building rules must respect general conditions on rules (see 11.7 below), which ensures that the phonemic systems which they generate are based on surface forms. Redundancy rules and contrastive rules cannot be contradictory: this prevents absolute neutralization. A redundancy rule such as (8) cannot coexist with the following contrastive rule:

(11) [αF^{i}] - [± F^{ii}]

11.6 Full specification

In our constrained version of generative phonology, phonotactic rules, but also structure-building rules, are well-formedness

conditions on underlying representations, which may not violate them. This formal constraint entails that lexicalized forms are fully specified. The descriptive level and the interpretive level (evaluation of complexity) are thus kept distinct (for a similar idea, see Vennemann (1973: 235) and Lass (1984: 279) for whom 'it's a good idea for all markedness considerations to be excluded from phonological characterizations'). Note also that if underlying representations were partially specified, redundancy would be expressed twice (in the lexicon and in the rule component). Moreover, unspecified feature values in lexical forms constitute violations of phonotactic or redundancy rules, since their outputs are specified. It must be added that the limit between neutralization and defective distribution is very tenuous: insofar as it is very difficult to select the proper option in most cases, it seems more sensible to regard neutralization as a **consequence** of defective distribution.

Speech error data reveal that the 'blank-filling' rules of the partial specification theory apply after segments are moved; in the following English example, vowel nasalization (a 'blank-filling' rule) applies after nasal consonant movement:

(12) bank of Italy > * back of Intaly
[bæ̃ŋ ..'ɪtəli:] > [bæk .. 'ĩntəli:/]

Fromkin (1975: 52) notes that 'these errors [...] point to the fact that the nasalization of the vowels depends on whether or not the nasal is present'. Consider now the following spoonerism:

(13) gin and mint > * gint and min
[dʒĩn .. mĩnt] >[dʒĩnt .. mĩn]

Advocates of partial specification would posit archisegmental underlying representations: /dʒɪn/, /mɪNt/ (/N/ = nasal

unspecified for place of articulation). After nasal movement, we are left with the representation /mɪN/, and no rule can specify the place of articulation of the nasal consonant at this stage.

In some recent theories (such as Archangeli (1984), underlying representations are 'underspecified': unmarked feature values are excluded from the lexical level, and are introduced in the course of derivations. This possibility is also disallowed in our model, because contrastive rules, which insert specified values, must not be violated.

II.7 A condition on rules

We shall hypothesize that all phonological rules must respect the following constraint:

(14) a rule R of the form WXZ - *WYZ can be postulated only if there are phonetic strings WYZ which are produced by this rule R*

This constraint accounts for the learnability of rules: the effects of a rule must be observable in at least some derivations. In Standard French, it rules out a process nasalizing vowels before homosyllabic nasal consonants: there are no nasal vowel plus nasal consonant strings which would be the output of a nasalization process. We are therefore allowed to posit a contrastive rule:

(15) [+ vocalic] -> [± nasal]

Nasal vowels are thus phonemes of French. There is also a phonotactic rule barring sequences of nasal vowel plus nasal consonant in word-final position (note that this rule is surface-true):

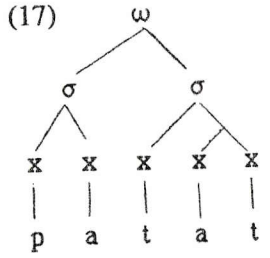
(16) [+ vocalic] -> [- nasal]/__ [+ nasal] #

III. AN ANALYSIS OF FRENCH LIAISON

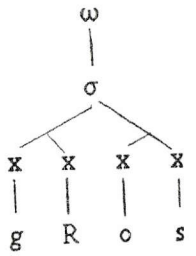
III.1 Liaison and enchaînement

We know (see II.3) that underlying representations are fully syllabified: they are the outputs of lexical syllabification rules. Assuming that a syllable can be represented in terms of a binary branching constituent structure (with an onset-rime bipartition), lexical rules produce the following representations for *patate* ('potato') and *grosse* ('big', feminine):

(17)



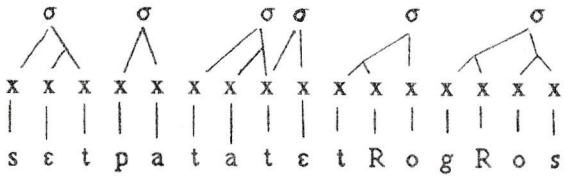
(18)



(x = segmental slot; ω = phonological word; σ= syllable; we omit the foot tier every time the foot is monosyllabic)

Enchaînement can be defined as the post-lexical reassociation of a word-final consonant (or consonant cluster in some cases) with the first σ-node of the following word in connected speech:

(19) *cette patate est trop grosse* ('this potato is too big'):



Let us call this reassociation rule 'LINKING' (whether the word-final consonant undergoing 'linking' is ambisyllabic or not is immaterial). 'Linking' is a cost-free rule, since it obeys a universal principle maximizing syllable initial consonants (see Clements & Keyser (1983: 37)). Note that the phenomenon of enchaînement has no bearing on the problem of the form of underlying representations, but that liaison rules raise some difficult questions. Consider the following strings:

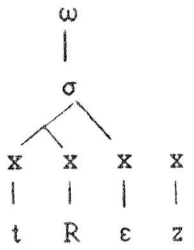
(20) (i) **enchaînement** *rapide* [Rapid] ('fast')
rapide avion [Rapidavjõ] ('fast plane')
(ii) **liaison:** *gros* [gRo] ('big')
gros avion (gRozavjõ] ('big plane')

In enchaînement the prepausal variant of word forms is typically preserved. In liaison an additional consonant appears ([z] in (20) (ii)). Two different interpretations of these data are possible: either the liaison consonant is not part of the underlying representation, and is inserted by a post-lexical rule of liaison (before a vowel), or it is underlying and deleted in the complementary contexts (before a pause or a consonant). In the first alternative diacritic features are necessary because insertion is

not general, and also because the feature composition of the liaison consonant is not predictable: Clements & Keyser (1983: 101) rightly note that 'if [...] we take the vowel-final shapes as underlying and insert the appropriate consonants by an epenthesis rule, then we will be unable to predict which consonant will be inserted on phonological grounds. Moreover, we will be faced with a small number of exceptions consisting of vowel-final words to which epenthesis never applies *(joli, fichu, vrai, demi, sacré)*'.

The analysis with 'epenthesis' rules is adopted by Tranel (1981) in a linear 'concrete' framework. The second alternative characterizes 'abstract' analyses, whether they be linear (Schane 1968, Selkirk 1972, Dell 1973) or non-linear. As regards liaison consonants, Clements & Keyser (1983: 102) suggest that 'These consonants will be present in the underlying representation of a word, but, unlike other segments, they will be marked by a feature which excludes them from the domain of core syllabification'. Liaison consonants are thus underlying and word-final, but are also 'extrasyllabic'. The underlying representation of e.g. *très* ('very') is assumed to be:

(21)

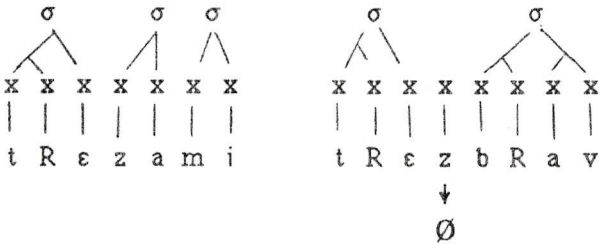


(Clements & Keyser reject binary branching, but this difference is not pertinent).

In liaison contexts, the extrasyllabic consonant (/z/) 'is linked to the syllable node dominating an immediately following vowel,

providing the appropriate syntactic conditions are satisfied' (Clements & Keyser 1983: 102). When the association cannot take place, a context-free rule deletes the floating segment:

(22) (i) *très amis* ('close friends') (ii) *très brave* ('very kind')

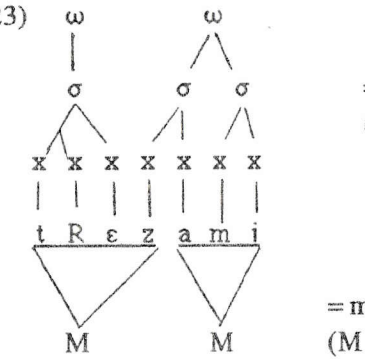


Durand (1986) adopts a very similar solution in a dependency framework. Note that in these non-linear analyses, exception features are also necessary: 'This means that floating consonants are marked as exceptions to the rules of syllable formation within the lexicon' (Durand 1986: 175), and this exception feature is referred to as [-coda attachment] (p. 177). The 'concrete' solution cannot therefore be revoked on the ground of complexity, since this drawback also affects the non-linear approach.

III.2 Prosodic and morphological planes

In an 'abstract' non-linear analysis it can be assumed that floating consonants belong to the first word of the sequence concerned by liaison on the morphological plane, but to the second word of the sequence on the prosodic plane. If we omit the foot tier, the proper representation of *très amis* is (in a 'classical' metrical framework):

(23)

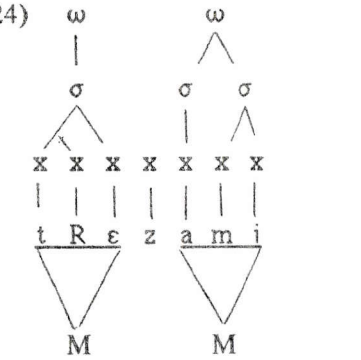


= prosodic plane
(ω = phonological word)

= morphological plane
(M = morphological word)

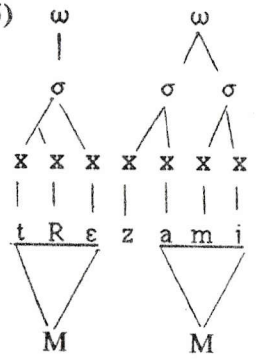
The hypothesis of insertion is naturally compatible with a non-linear analysis. Let us assume, for argument's sake, that the liaison consonant of *très amis* is not underlying and that the lexical representations of *très* and *amis* are /tRɛ/ and /ami/. Liaison consists in the insertion of /z/ when the context requires it. The liaison consonant, once inserted, is extrasyllabic and also extramorphological, since it is not part of the lexical representation of *très* (the connective /z/ is not linked to any M-node on the morphological plane):

(24)



The insertion of the liaison consonant feeds 'linking' (the rule which applies in enchaînement):

(25)



[z] belongs to the second word (ω) on the prosodic plane, but remains unassociated on the morphological plane.

III.3 Arguments for insertion

There are several arguments pointing towards the validity of the insertion analysis. We shall review some of them. In the deletion analysis (see Durand (1986:195-198)), two different resyllabification rules account for liaison and enchaînement; this is absolutely necessary if there are floating consonants in underlying representations, because enchaînement is much more general than liaison: liaison attaches a floating consonant to the next σ-node only if it immediately precedes a syllabic nucleus. A floating /t/, e.g., is deleted before /R/.

(26) *petit rat* [pøtiRa], * [pøtitRa] ('little rat')

whilst enchaînement takes place in similar contexts:

(27) *patate rouge* [patatRu:ʒ] ('red potato')

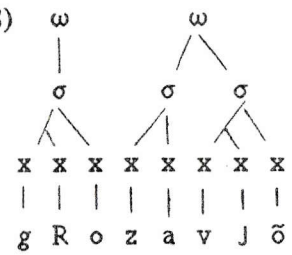
Moreover, several complex syntactic, prosodic, and lexical conditions restrict the applicability of liaison, but the domain of enchaînement is generally the intonational phrase *(I)*, without such restrictions.

If liaison consonants are inserted,only one post-lexical syllabification rule is necessary ('linking'), because the above-mentioned restrictions will affect the insertion rule itself, but not (re)syllabification. Once the liaison consonant is inserted, 'linking' is automatic. This rule is absolutely cost-free and it is applicable both in enchaînement and in liaison (concerning marginal occurrences of backward linking, see III.6).

In Clements & Keyser (1983) and Durand (1986), lexical syllabification rules are not exceptionless (see above), but if liaison consonants are inserted (rather than present underlyingly) lexical syllabification can remain fully automatic.

Another structural argument leads us to favour insertion. It is certainly highly desirable to constrain the possibilities of non-isomorphism between phonological words (ω) and morphological words (M). The striking fact is that (obligatory) liaison consonants are never dominated by the same ω-node as the phoneme preceding them:

(28)



Let us assume that the following constraint is correct:

(29) If two adjacent segments never belong to the same phonological word (ω), they do not belong to the same morphological word (M).

This constraint entails that liaison consonants are not dominated by the M-node which precedes them on the morphological plane, and are not underlying. Our hypothesis accounts for instances of 'false liaisons':

(30) *donne-moi-z-en* [dɔnmwazɑ̃] ('give me some')
= Standard *donne-m'en*

and for the reinterpretation of /z/ as a prefix by some speakers:

(31) *z-yeux*, treated as the postpausal variant of the plural of *œil* ('eye'), hence *zyeuter* ('to watch')

Liaison in the German dialect of Zurich confirms the validity of (29). Keller (1979: 54) mentions a situation which is reminiscent of French liaison in this area. He notes that the consonant /n/ appears before an inflectional ending: *Maa* ('man'), plural *Mane*. The same consonant is inserted before an initial vowel (external sandhi): *Fraue* ('woman'), *Frauen und Chind*. Keller writes that

'This mobile -n is rather felt to be part of the following word. The syllabic boundary lies before the consonant n, hence the hyphenated spellings preferred by dialect writers: gstande-n-isch'. External evidence, in the form of analogical extension, reveals that the 'mobile n' is inserted: 'To break a hiatus an n is frequently introduced in analogy to the above cases where it is historically not justified: *wo-n-er* 'when he', *wie-n-er* 'as he'. These data reveal that speakers fail to interpret the mobile consonant as word-final because it is always syllable-initial. This is predicted by (29).

Our analysis of liaison has important consequences in the field of inflection. We know that in French a phonotactic rule bars schwa from word-final position in the underlying representation of polysyllabic items. As liaison consonants are not present underlyingly, the lexical representations of *gros* ('big'), *grand* ('large') and *heureux* ('happy'), for example, are /gRo/, /gRɑ̃ / and /œRø/ respectively. We can therefore assume that the only possible implementation of the morphosyntactic feature [+feminine] in the forms *grosse, grande, heureuse* (the feminine variants of the above items)—whose phonetic representations are normally [gRo(:)s], [gRɑ̃(:)d], [œRø(:)z] —is the final consonant, and that this final consonant is inserted by a morphologically conditioned rule (the feature [+ feminine] triggers this rule). The lexical representations of the feminine forms are:

(32) *grosse* /gRos/ ('big')
grande /gRɑ̃d/ ('large')
heureuse /œRøz/ ('happy')

This morphologically conditioned rule relates the feminine forms to their masculine counterparts. Note that the two forms are listed in each lexical entry by virtue of the general principles of our word-based model. Moreover, the nature of the consonant which is inserted by the liaison rules after adjectives (in [- plural] phrases) is

predictable, precisely because the feminine forms are lexicalized (in [+ plural] phrases, the liaison consonant is always /z/):

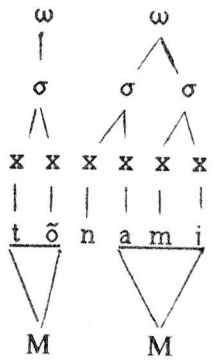
(33)

inflection:		**liaison:**
/s, z/	=>	/z/
/t, d/	=>	/t/
/n/	=>	/n/
/r/	=>	/R/

III.4. Nasal vowels

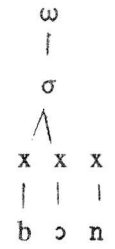
We already know that French nasal vowels are underlying, by virtue of the condition on rules (see II.7.). The underlying representations of e.g. *mon, ton* ('my', 'your') are /mõ/, /tõ/. In liaison, [n] is inserted, and undergoes 'linking'.

(34)



If the liaison consonant were underlying, the phonotactic rule (16) would be violated (this phonotactic rule disallows nasal vowel plus nasal consonant sequences in word-final position). In some non-linear analyses it is assumed that nasal consonants occurring in liaison are underlying and extrametrical; for Durand (1986: 180) 'there is *prima facie* evidence in favour of representing a word like *bon* with a floating /n/', and (pp. 182-183) 'We also assume that the contrast between *bon ami* [bɔnami] and *mon ami* [mõnami] [...] is to be accounted for as in Selkirk (1972/81) by treating words of the *mon* type [...] as having a nasal vowel followed by a floating consonant underlyingly'. According to this analysis, the underlying representation of *bon* is therefore:

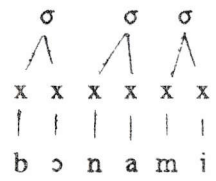
(35)



(The representation of syllable structure in Dependency Phonology is different, but this has no bearing on our discussion.)

In liaison, /n/ is picked up by the following vowel as usual:

(36)



(note that the vowel of *bon* remains [- nasal] in liaison)

This form [bõ] is more difficult to account for, since nasal vowels are allowed in lexical forms (cf. *mon, ton* etc. . .). The variant [bõ] occurs before a pause or a consonant. The context-free rule (see (22)) deleting floating consonants in this analysis accounts for the loss of /n/, but [o] can only be the output of a nasalization process. Durand (1986: 180) assumes that nasalization 'applies only if the nasal consonant involved is floating' (note that nasalization must be crucially ordered before the deletion of /n/ and after 'linking'). In our framework, the condition on rules (see II.7 above) excludes the possibility of such a process, since it is **never** surface-true (floating consonants either cease to be extrametrical or are deleted). Moreoever, such strings as (36) violate the well-known phonotactic rule of o-raising, which neutralizes the contrast between /ɔ/ and /o/ or /œ/ and /ø/ in word-final position (only the higher-mid rounded vowels occur in this context):

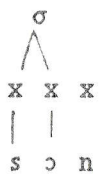
(37) *sotte* [sɔt] ('stupid', feminine)
sot [so] ('stupid', masculine)
veulent [vœl] ('they) want')
veut [vø] ('(he) wants')

This rule applies even when a liaison consonant follows:

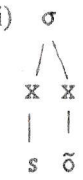
(38) *il veut y aller* [ilvøtiale] ('he wants to go there')

If the underlying representation of *bon* were (35), the expected pronunciation of *bon ami* would be * [bonami], but this phonetic realization is unacceptable (see Tranel (1981: 120)). The recoverability condition (see II.2) would also be violated in this analysis: the underlying representation of e.g. *son* [sõ] ('sound') would be (39) (i), with a floating /n/, because this item is related to *sonore* ('sonorous'), but the underlying representation of *son* [sõ] ('bran') would be (39) (ii), with an invariant nasal vowel:

(39) (i)



(39) (ii)



In our word-based theory, an alternative solution can be envisaged. We assume that liaison consonants are not underlying, and that both the masculine and the feminine forms of items are lexicalized. The forms which will be listed in the lexical entries of the adjectives *bon* ('good'), *commun* ('common'), *plein* ('full'), *divin* ('divine'), e.g., are:

(40) *bon* /bõ/, *bonne* /bɔn/
commun: /kɔmœ̃/, *commune* /kɔmyn/
plein: /plɛ̃/, *pleine* /plɛn/
divin: /divɛ̃ /, *divine* /divin/

A morphologically conditioned rule relates the two members of each pair. When the adjective is [+ feminine], the nasal vowel is converted into a sequence of oral vowel plus nasal consonant. The exact nature of the structural changes (compare *plein/pleine, divin/divine*) induces us to postulate several subrules (/õ/ -> /ɔn/; /œ̃/ -> /yn/; /ɛ̃/ -> /ɛn/; /ɛ̃/-> /in/ etc. . .).

The item *commun* is subject to the rule of liaison, which inserts an extramorphological /n/ in this particular case:

(41) *commun accord* [kɔ m œ̃ n a k ɔ R] ('common agreement')

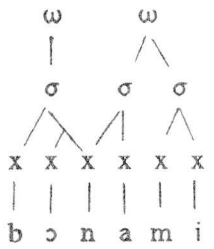
This /n/ undergoes 'linking', as usual:

(42) [$kɔ$mœ̃nakɔR$] ($ = syllable boundary)

(Note that rule (16) see II.7) is not violated, since [n] is unassociated on the morphological plane).

However, we shall assume that *plein, divin, bon* are not subject to liaison proper. In order to account for the non-application of o-raising in *bon ami* we must reject structures like (36), and suppose that the syllable structure of the string is (after 'linking'):

(43)



The syllabic nucleus of *bon* is not raised to [o] because it is not syllable-final, and it is [-nasal] by virtue of rule (16) (see II.7.). 'Linking' attaches /n/ to the following σ-node, and /n/ is not extrametrical at any stage of the derivation. What happens is *enchaînement*, and not *liaison*.. There is strong evidence that it is the feminine form of *bon* which is selected in liaison contexts, although the adjective is marked [- feminine] by syntactic agreement rules. Several facts motivate this interpretation. On the one hand, the inverse process—that is, the selection of the masculine form in a feminine string—is obviously operative in French, in such sequences as *mon amie* ('my friend', feminine). In this case, the phrase is [+ feminine], but the masculine variant precedes the nominal head (note that it also undergoes liaison). On the other hand, some items without nasal vowels are involved: *nouveau, beau, fou, mou, vieux, ce*. In liaison contexts, the feminine form of these words is regularly selected:

(44) *nouveau* [nuvo] ('new', masculine)
nouvelle [nuvɛl] ('new', feminine)
nouvel ami [nuvɛlami] ('new friend')

The Spanish definite article behaves like *mon, ton, son* ('my, 'your', 'his'): the masculine form, *el*, is selected before a stressed /a/, even when the head of the phrase is [+ feminine] (*el alma* ('the soul')). The fact that analogous phenomena are attested in Romance languages other than French tends to confirm the validity of our analysis.

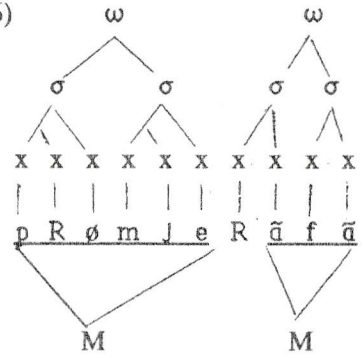
III.5. Liaison in [R]

We can account for the two variants of *premier* ('first') or *léger* ('slight') in liaison contexts:

(45) *premier enfant* ('first child')
[pRømjeRãfã] or [pRømjɛRãfã]

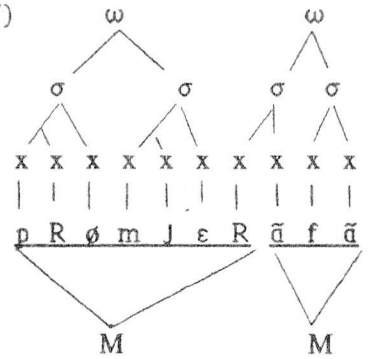
The underlying representation of *premier* is /pRømje/. When the variant with [e] occurs in liaison, an extramorphological /R/ is inserted, and undergoes 'linking':

(46)



When the vowel is [ɛ], the feminine form is selected, and /R/ is word-final at the lexical level, which explains why the law of position operates (this rule disallows /e/ in checked syllables). The word-final /R/ is also subject to 'linking':

(47)



The variant with [ɛ] remains mysterious in most analyses (especially if /R/ is assumed to be extrametrical in lexical representations), but our approach accounts for it in a very natural way.

III.6. Forward and backward linking

Thus far, we have only examined cases of **forward** linking. However, forward linking is sometimes inhibited by the presence of a 'protective' pause (//):

(48) *sept as* ('seven aces')
[sɛt // as] (no enchaînement)
(A glottal stop is usually inserted after //)

When liaison is obligatory, the pause regularly precedes the liaison consonant, which undergoes forward linking:

(49) *nos amis* ('our friends')
[no // zami] = [nozami] ($ = syllable boundary)

In natural spontaneous speech, the pause is not normally compatible with the application of **optional** liaison rules, although the variant with liaison is acceptable:

(50) *ils sont ici* ('they are here')
[ilsõ // isi] or [ilsõ // tisi]

But in 'political' style (see Lucci (1983: 74)) the optional liaison consonant sometimes precedes the pause: [ilsõt//isi], and it is necessarily **backward** linking which applies:

(51) [ilsõt$i$si$]

Concerning backward linking, Lucci (1983:79) writes that 'ces derniers exemples, non majoritaires, répétons-le, mais tout de même réels, semblent surprendre (par leur apparente bizarrerie ?) la conscience linguistique des auditeurs francophones'. This entails

that the analysis of obligatory liaison in **normal** styles cannot be based on such marginal data.

In our account, backward linking is obligatory: the direction of linking is strictly determined by the relative position of the liaison consonant and the pause. Note also that a stylistic constraint must prevent the insertion of an obligatory liaison consonant before //: the landing site of laison consonants is therefore conditioned by the stylistic status of the rule (as backward linking is stylistically marked, just like optional liaisons, it is a matter of stylistic congruence).

In (48), the pause intervenes **between** the two word. In a sequence like *bon ami* , it will never precede [n], while it regularly precedes obligatory liaison consonants (see (49)):

(52) (i)*bon ami* [bɔn // ami], * [bɔ // nami]
(ii)*mon ami* [mõ // nami], * [mõn // ami]

This fact confirms our analysis of such strings in II.4. The [n] of *bon* is part of the morphological word (M) and necessarily precedes //. The [n] of *mon* is extramorphological and necessarily follows //, by virtue of the above-mentioned stylistic constraint.

IV. CONCLUSION

Our interpretation of the data solves several problems:

— the nasalization rule can be dispensed with;
— o-raising applies normally (no *ad hoc* revision of this rule is necessary);
— the vowel of *bon* in *bon ami* is non-nasal by virtue of rule (22), since it is word-final;

— the underlying representations of *mon, ton* etc. do not violate (22) because the liaison consonant (/n/) is not underlying;
— the condition on rules and the recoverability condition are respected;
— the two variants of *premier, léger* etc. in liaison are accounted for;
— there is only one post-lexical syllabification rule for enchaînement and liaison;
— there are no abstract 'phonological' or 'morphological' schwas.

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