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Edge Features and French Liaison

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16.1 Introduction

The sandhi phenomenon of consonant liaison in French has received a great deal of attention in pedagogical grammars as well as in more theoretical linguistic work. For the most part, theoretical studies have addressed the phonological aspects of liaison, focusing on the issue of syllabification at word boundaries or various mechanisms of deletion, insertion, or suppletion. See Klausenburger (1984) and Encrevé (1988) (ch. 3) for a chronological overview of this research.

Liaison is not a purely phonological phenomenon, however. The elements that trigger liaison cannot always be identified based on their phonology, and the elements targeted by liaison do not always have phonologically predictable forms. Furthermore, liaison is not necessarily realized at every word boundary where it is phonologically possible. It is subject to a wide range of lexical, syntactic, and stylistic conditions, as well as to the influence of speakers' conscious metalinguistic knowledge about the phenomenon. This combination of factors gives rise to a very diverse and variable set of facts, a situation not fully acknowledged in most (normative) descriptions of French.

This paper presents a descriptive overview of liaison, giving an idea of the scope of the phenomenon and possible approaches to its analysis. As for the contextual conditions on liaison, in many cases, the traditional notions of obligatory and prohibited liaison do not reflect speakers' actual behavior. It turns out that general syntactic constraints cannot determine the systematic presence or absence of liaison at a given word boundary (contrary to the proposals of Selkirk (1974), for example). At best, specific constraints can be formulated to target particular classes of constructions. To express such constraints, I propose a system of

		short form	long form
citation:	très	[tʀɛ]	*[tʀɛz]
before C:	trè(s) chic	[tʀɛʃik]	*[tʀɛzʃik]
before V:	très‿élégant	??[tʀɛelegɑ̃]	[tʀɛzelegɑ̃]

TABLE 1 Basic liaison alternation

representation in the framework of HPSG. The use of EDGE features (introduced by Miller (1992) for a GPSG treatment of French) provides the necessary link between phrasal descriptions and the properties of phrase-peripheral elements.

16.2 Description of the phenomenon

16.2.1 Overview

Liaison results from the fact that certain word-final consonants in French have a special status. Ordinarily, consonants are fixed: the [k] at the end of "chi**c**" [ʃik] is always pronounced, whatever the following context (if any). Without the final [k], the sequence [ʃi] is not recognized as a realization of the same word.

Contrast this to the pronunciation of the word "très" in isolation and before the adjectives "élégant" and "chic," shown in Table 1.[1] Broadly (and as we will see, somewhat inaccurately) speaking, when the following word begins with a vowel, the "long" form including the consonant of liaison (henceforth CL) [z] is chosen. Elsewhere (before a C-initial word or before a pause) the non-liaison short form "trè(s)" appears, demonstrating that speakers do not rely on CL for lexical recognition, a point emphasized by Encrevé (1988). In fact, as indicated in the table, the presence of CL in a non-liaison context is more strongly marked than its absence in a liaison context.

Only a subset of the consonantal segments appearing word-finally in French participate in the CL/∅ liaison alternation. All potential CLs are listed in Table 2, with their corresponding graphemes and examples:[2] These consonants do not always alternate, as shown by the following words with fixed final consonants: "ga**z**," "ne**t**," "che**r**," "splee**n**,"

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[1] I add a number of annotations to standard French orthography to indicate pronunciation at word boundaries. Unpronounced final consonants appear in parentheses, and liaison with enchaînement (see below, § 16.2.2) is signaled by a tie between words, or by more explicit means if necessary (e.g., "pa(s)-t-à moi" for *[pɑtɑmwa]).

[2] In constructing this table I have discarded final consonants that alternate only in fixed expressions (e.g., "che**f**" [ʃɛf] vs. "che(f)-d'œuvre" [ʃɛdœvʀ]) or word-internally as a result of derivation or inflection (e.g., "no(m)" [nɔ̃] vs. "nommer" [nɔme]). These do not represent productive, systematically conditioned word-boundary effects of the type in Table 1.

CL	Orthography	Examples
[z]	s z x	"sommes" "assez" "heureux"
[t]	t d	"tout" "grand"
[ʀ]	r	"premier"
[n]	n	"bon"
[l]	l	"bel" "nouvel"
[j]	il	"vieil" "gentil"
[p]	p	"beaucoup" "trop"
[g], [k]	g	"long"

TABLE 2 Possible liaison consonants

"se**l**," "a**il**," "ca**p**," "le**g**(s)," "la**c**." The first two rows account for the vast majority of liaisons, since they include the plural marker [z] and practically all finite verb endings.

Liaison can also have an effect on the quality of the vowel preceding CL. This is most commonly observed in the next two rows of Table 2 with [ʀ] and [n]: "premie(r) ministre" [pʀəmjeministʀ] vs. "premier‿étage" [pʀəmjɛʀetaʒ], "bo(n) sang" [bɔ̃sɑ̃] vs. "bon‿anniversaire" [bɔnanivɛʀsɛʀ]. See Tranel (1990) for a discussion, particularly concerning denasalization.

In the last four rows of Table 2, the examples provided are in fact an exhaustive list of all instances of these CLs, just seven words in all.[3] For the last example, Morin (1987) notes that most speakers prefer [g] to [k], or they may produce an [n]-liaison as in "lon(g)-n-hiver" or avoid liaison altogether ("lon(g) hiver" with hiatus, [lɔ̃ivɛʀ]). Nevertheless, the bottom half of the table includes some very high-frequency items, for which the effects of productive liaison can be readily observed.

16.2.2   Related issues

H aspiré

The basic phonological condition given for liaison above—that the following word must be V-initial—is only a first approximation, because there is a class of V-initial words in French that do not trigger liaison

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[3]I have intentionally excluded "mol" and "fol," which are hardly productive nowadays (Bonami and Boyé, 2003). Furthermore, examples like "sang‿impur," "respec(t)-k-humain," and "joug‿odieux" appear in many grammars (e.g., Fouché, 1959, Grevisse, 1980), but none of these nouns shows a systematic [k]/∅ alternation outside of these (extinct) fixed expressions. And as mentioned in fn. 2, the appearance of a consonant in derived forms is not directly relevant for liaison: "cou(p)" vs. "couper," "siro(p)" vs. "sirupeux" (or "siroter").

to the left. These include words beginning with *aspirated h* ("mo(n) héros," "gran(d) hasard," "vieu(x) hibou") as opposed to *mute h*, which allows liaison ("mon‿héroïne," "grand‿honneur," "vieux‿homme").

¿From a historical point of view, most aspirated *h* words are derived from [h]-initial Germanic roots, and in modern French they retain the behavior of C-initial words. To explain this, many linguists have assumed an underlying initial /h/, glottal stop /ʔ/, or some empty consonantal element or syllable onset (Dell, 1970, Selkirk and Vergnaud, 1974, Encrevé, 1988). On the surface, however, for most speakers, aspirated *h* words are simply realized as V-initial words with irregular behavior.[4] Like other irregularities, aspirated *h* is subject to significant variation, and hesitations and 'errors' are common for lower-frequency items.

To account for these observations, Gaatone (1978) rejects abstract manipulations of the phonological representation and assumes that the words in question, in contrast to the vast majority of V-initial words, bear a feature [−SANDHI] that blocks word-boundary phenomena like liaison. The same feature is useful for the treatment of glide-initial words. In some words, glides pattern with consonants in blocking sandhi ("u(n) yaourt," "deu(x) week-ends") but a number of glide-initial words trigger liaison ("des‿oiseaux," "belles‿huîtres"). Again, one could propose an abstract phonological distinction. According to Milner (1973), for example, "oiseau" has the underlying V-initial representation /uazo/, which would trigger liaison to the left before undergoing glide formation to surface as [wazo]. "Week-end," on the other hand, would have an underlying glide from the start: /wikɛnd/. But as with aspirated vs. mute *h*, there is no concrete motivation for such an analysis, and Gaatone's feature [±SANDHI] captures the same facts more directly: "oiseau" is [+SANDHI] while "week-end" is [−SANDHI].

To the set of V-initial words marked exceptionally as [−SANDHI] must be added: the names of numerals and letters, unassimilated foreign words (especially proper nouns), and in general any metalinguistically mentioned material. In fact, usage can vary considerably in these cases, and I will not attempt to address the problem. Furthermore, I restrict my attention to liaison, without claiming that all French sandhi phenomena pattern together. I assume therefore that (the left edge of) a word is lexically specified as [+LIAISON] if it can trigger liaison in the preceding context, and [−LIAISON] otherwise.

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[4]Aspirated *h* words can be pronounced with a phonetic [ʔ] (e.g., "vieu(x) hibou" [vjø ʔibu]), but this is the result of a general process of [ʔ] epenthesis in empty onset positions (Encrevé, 1988) and does not motivate distinct phonological representations for aspirated *h* words and other V-initial words.

Elision and enchaînement

Two other word-boundary effects are often mentioned in connection with liaison, because they are triggered in similar (but not identical) environments. The first is the elision of the final vowel in a small number of monosyllabic function words (e.g., "la," "le," "de," "que"). For example, we have "la table" [latabl] but "l'église" [legliz] (not *"la église" *[laegliz]). Elision only occurs when the following word is V-initial, but not with aspirated *h* words or glide-initial words like "week-end" ("le hasard" not *"l'hasard," "de yaourt" not *"d'yaourt"). Given the overlap of elision-triggering words with [+LIAISON] words, some authors (e.g., Schane, 1965) have treated consonant liaison and vowel elision as instances of a single phenomenon.

In fact, the sets of triggers for liaison and elision may not coincide exactly. It is clear, for instance, that "arbre" triggers both and "table" triggers neither, but speakers may have distinct tendencies for liaison and elision with more exceptional and unstable cases like "ouate," "hiatus," or "handicap."[5] The two phenomena also differ with respect to their alternating target forms. Liaison applies to a much larger and more diverse set of forms (although not an open class), while elision is restricted to just a handful of items, mostly of the form Cə, whose syntactic status is debatable—they could be analyzed effectively as affixal elements (Miller, 1992, Miller and Sag, 1997). Furthermore, in an appropriate triggering context, elision is generally obligatory, whereas liaison is often optional.

The other sandhi effect often associated with liaison is *enchaînement*, the realization of a word-final consonant as the onset of the following syllable ([nwa.ʀe.blɑ̃] for "noi**r** e(t) blanc," for instance). Liaison is normally produced with enchaînement (and I assume this unmarked realization throughout this discussion): "sont importants" [sɔ̃.tɛ̃.pɔʀ.tɑ̃]. As Encrevé (1988) demonstrates, however, liaison without enchaînement ([sɔ̃t.(ʔ)ɛ̃.pɔʀ.tɑ̃]) is also found (e.g., in the speech of political figures), too frequently to be dismissed as a simple performance error, or in any case, an error that shows that the two phenomena can be dissociated.

In general, the domain of enchaînement is much wider than that of liaison, since it applies to all final consonants, not only CL. For example, the [ʀ] of "noir" in the example above is always pronounced; its

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[5]There is also the (unique?) example of "et," which clearly triggers liaison ("mesdames e(t) messieurs") but it is impossible to test whether it triggers elision, because in ordinary usage it cannot follow any of the forms that show a final-V/∅ alternation.

presence is not triggered by the [+LIAISON] word "e(t)." Moreover, the set of triggers for enchaînement is much larger. For example, aspirated *h* words allow enchaînement: "pur hasard" [py.ʀa.zaʀ], "quel héros" [kɛ.le.ʀo] (see Encrevé, 1988, p. 196ff). In fact, enchaînement even applies at C-C word boundaries: "il part pour Paris" [i.lpa.ʀpu.ʀpa.ʀi] (Delattre, 1951, cited in Encrevé, 1988, p. 24).

We can conclude that there are good reasons for treating liaison as a separate phenomenon from elision and enchaînement. Most striking, however, is the fact that liaison is subject to additional syntactic and stylistic constraints, while the other two phenomena are of a more purely phonological nature (modulo the extremely limited inventory of alternating elements targeted by elision). I discuss the non-phonological conditions on liaison in § 16.4. As a simple example, liaison is disallowed between an NP subject and the VP, but enchaînement is perfectly natural: "Le(s) gen(s) arrivent" vs. "Le publi**c** arrive" (where "c" is a non-alternating C, not CL).

16.3 Lexical forms

In the previous section I talked about the words that trigger liaison (specified as [+LIAISON]), and now I turn to the target words that exhibit the CL/∅ alternation. As indicated in Table 1, these words are traditionally described as having a short form and a long form. In most cases the two forms differ only with respect to CL, but as discussed in § 16.2.1, the preceding vowel sometimes alternates, and as we will see, suppletive and defective cases exist as well.

16.3.1 Relating short and long forms

¿From a derivational point of view, the most straightforward way to relate the two forms is to treat the long form, appearing in liaison contexts, as basic and derive the short form by deletion of CL. This is the idea behind, for example, the Truncation Rule of Schane (1965), which deletes final C before another C or before a pause. This approach reproduces the historical development of French, since this is precisely the kind of phonologically-conditioned deletion that gave rise to the liaison alternation in the 16th and 17th centuries. In modern French, however, the alternation is less regular. There are fixed final consonants that can never be deleted ("ave**c**," "ne**t**"), but without further stipulations the Truncation Rule would produce *"ave(c) Jean." Moreover, there are many contexts where liaison is left unrealized pre-vocalically ("pa(s) encore," "le(s) héros," "le(s) chef(s) arrivent"), but the Truncation Rule would not delete CL in these environments, giving rise only to "pas‿encore" and the ungrammatical *"les‿héros" and *"le(s)

gens‿arrivent."

The opposite approach, represented for example by Klausenburger (1974), is to take the short form as basic and derive the liaison form by CL insertion or Epenthesis. This kind of analysis accounts for the intuition that the short form is not incomplete or truncated in terms of its lexical identity. For instance, the citation form of a word is always the short form.[6] The CL epenthesis approach can also provide an explanation for the appearance of inappropriate consonants in liaison "errors": "chemin(s) de fer z-américains," "devra-t-y aller" (Morin and Kaye, 1982). Ordinarily, however, the lexical entry of a word must include some indication of which CL can be inserted, if any. Epenthesis cannot be formulated as a systematic phonologically-conditioned rule—i.e., insert CL before V—given the many cases of non-realization of liaison before V. Like the Truncation Rule, Epenthesis would force the realization of CL in "pas‿encore," *"les‿héros," and *"le(s) gens‿arrivent."

A third possibility is the treatment of liaison as suppletion. In other words, a given lexical item has one form for the realization of liaison and one non-liaison form. A priori, the forms are not directly related by any productive rule. And in fact, there are some clearly suppletive short/long form pairs: the masculine prenominal adjectives "nouveau/nouvel," "beau/bel," and "vieux/vieil," and the determiners "ce/cet" (masculine) and "ma/mon," etc. (feminine). These pairs cannot be accounted for with simple CL deletion or insertion. It has been observed (e.g., Perlmutter, 1998) that the suppletive form involves a gender switch; in other words, masculine "bel" is in fact identical to the feminine form "belle," and feminine "mon" is identical to the masculine form. This correspondence does not hold for all short/long pairs, however: we have masculine "grand" [ɡʁɑ̃]/[ɡʁɑ̃t] vs. feminine "grande" [ɡʁɑ̃d], and for some speakers "long" [lɔ̃]/[lɔ̃k] vs. "longue" [lɔ̃ɡ]. Masculine singular adjectives ending in [ʁ] ("cour(t)," "for(t)") show no liaison alternation, although an additional consonant appears in the feminine ("forte," "courte"). And finally, certain adjectives simply have no prenominal liaison form in the masculine singular (Morin, 1998, cited in Bonami and Boyé, 2003). For example, "un franc entretien" has no acceptable pronunciation: *"fran(c) entretien," *"franc‿entretien," *"franche entretien," *"fran(c) n-entretien," *"fran(c) t-entretien." Aside from these exceptional cases, however, most short/long form pairs are predictably related, given the identity of CL, and it would be unattractive simply to list the two forms for

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[6]This constitutes another argument against a unified treatment of liaison and elision: the non-elided long form shows up in isolation ([la], not *[l]).

FemSg
[pətit]

MascSg (long)   FemPl   MascSg (short)
[pətit]   [pətit(z)]   [pəti]

                                        MascPl
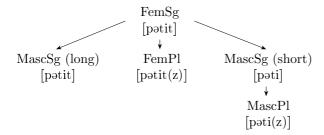   [pəti(z)]

FIGURE 1 "petit" (adapted from Bonami and Boyé, 2003)

each word.

16.3.2 Paradigm functions

I assume a paradigm-based analysis along the lines of Bonami and Boyé (2003), a model that allows the statement of morphophonological regularities and subregularities, while at the same time accommodating irregular (suppletive or defective) forms. Bonami and Boyé focus on the problem of French prenominal adjectives. They propose a paradigm of 5 forms for each lexeme, resulting from the combination $(masc \lor fem) \times (sg \lor pl)$, plus the fact that the masculine singular has short and long forms. The root of the paradigm is the feminine singular, and the other forms are generated by various functions. The paradigm for the completely regular adjective "petit" provided by Bonami and Boyé is shown in Figure 1. The forms of "petit" illustrate the regular output of the morphophonological functions, but other adjectives have irregular or defective forms. For example, the MascSg long (liaison) form is normally identical to the FemSg, but we have already seen some exceptions: "grande"/"grand" ([d] → [t]), "courte"/"cour(t)" (loss of final C after [ʀ]), "franche"/∅ (gap in paradigm). The MascSg short form is typically generated by dropping the final consonant (if any) of the FemSg, but there are also non-alternating adjectives ("nette"/"ne**t**") and suppletive pairs ("vielle"/"vieu(x)"). Pluralization is always regular in the feminine (add [(z)]), while some masculine plurals are exceptional ("éga**l**"/"égaux").

The advantage of Bonami and Boyé's model is not only that it accounts for both regular and irregular alternations, but also the fact that it generates an organized paradigm of forms, without reference to the eventual phonological context. Thus it avoids the pitfalls of the rules of truncation and epenthesis discussed above, which apply or fail to apply at the actual word boundaries that result from syntactic combination. In the paradigm-based approach, all the necessary forms are

FemSg
FemPl [−L]
[pətit]

MascSg [+L]   FemPl [+L]   MascSg [−L]
[pətit]   [pətitz]   [pəti]

MascPl [+L]   ←   MascPl [−L]
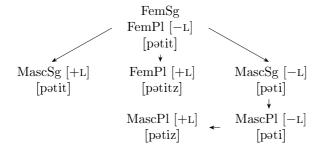[pətiz]   [pəti]

FIGURE 2 "petit" revised

made available in the lexicon, and it is left up to other principles and
constraints to license or block their appearance in particular contexts.
For this to work, each form has to carry some indication of whether it
is a long or short form for liaison. I will (temporarily) use the feature
[±L] for this purpose: [+L] for long forms, [−L] for short forms. Recall
that in § 16.2.2, I introduced the feature [±LIAISON] to indicate liaison
trigger status; here [±L] encodes liaison target status. In § 16.5, I will
explain the interaction of these two features.

In Figure 2, I update Bonami and Boyé's paradigm for "petit" using
the [±L] feature. I also expand the distinction represented by [(z)] in
the plural forms in Figure 1. French plural nouns and adjectives sys-
tematically have a [+L] long form with [z] and a [−L] short form, which
is usually identical to the corresponding singular [−L] form (except for
"égau(x)" type plurals). So in fact, prenominal adjectives like "petit"
have a paradigm of 6 (potentially) distinct forms, resulting from the
combination $(masc \vee fem) \times (sg \vee pl) \times ([+L] \vee [−L])$, with some leveling
of feminine forms at the root of the paradigm.

16.3.3   Inventory of forms

Masculine singular (prenominal) adjectives represent the largest class
of mono-morphemic elements that show a liaison alternation, and the
most complex realization of this alternation, with suppletion and other
irregularities. As we have seen, feminine singular forms do not alter-
nate, and in the plural, the alternation always and only involves [z], the
plural marker. In the end, there are relatively few masculine singular ad-
jectives with distinct [+L] and [−L] forms, if we discount derived words
ending in "-ant," "-eux," and so on, whose liaison forms are determined
predictably and uniquely by the suffix. There are perhaps several dozen
high-frequency items like "grand" and "petit," but less common mono-
morphemic adjectives are rarely produced in prenominal position, and

give rise to the problem of 'ineffability' seen above with "franc entretien." The question deserves further attention; for now I only suggest the hypothesis that alternating adjectives form a closed (and diminishing) class. Similar considerations apply to other prenominal elements (articles, numerals, quantifiers): high frequency items participating in liaison, restricted to a closed class.

Liaison effects involving adjectives in postnominal or predicative position are rarer and less well documented. They seem to be limited to a few specific items ("prêt," "sujet"), and never in the plural (Morin and Kaye, 1982), but further investigation is called for. Nouns themselves are a simpler case. Singular nouns never alternate productively with respect to liaison: "solda(t) anglais," *"soldat‿anglais." As mentioned above (fn. 2), for morphological purposes one might postulate a 'latent' final consonant in the representation of these words (to derive "soldate" or "soldatesque" for example). Or final consonants may be preserved in frozen expressions ("accent‿aigu," "porc‿épic").[7] But singular nouns never contain CL; they always have a single lexical form unspecified for [±L]. For plural nouns, we find the same systematic [z]/∅ alternation as for adjectives.

Verbal liaison forms are completely determined by inflection. The account of French conjugation based on paradigm functions given in Bonami and Boyé (2002) can be enriched by the specification of [+L] and [−L] forms for each verb ending, when appropriate. CL for finite verbs and participles is always [z] or [t]. Some speakers also have alternating [ʀ] for "-er" infinitives ("laisser‿u(n) message"). Again, the set of verb endings that give rise to liaison-based alternation is a closed class.

Finally, a subset of prepositions (e.g., "dans," "devant," "après"), conjunctions ("mais," "quand," but not "e(t)"), adverbs ("bien," "trop," "plus," "très," "tout," "jamais"), and a few other items ("pas," "dont," "beaucoup," "rien") have distinct [+L] and [−L] forms. The adverbial suffix "-ment" also creates alternating forms.

The inventory provided here is not necessarily exhaustive. It serves, however, to give an idea of the scope of the liaison alternation. Since I adopt an approach in which all alternating forms are generated in the lexicon, it is important to establish that the set of elements (i.e., roots and suffixes) requiring the idiosyncratic specification of distinct [+L] and [−L] forms is of manageable size. Empirical work remains to be

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[7]An interesting question is whether lost consonants can reappear in newly formed expressions. For example, Encrevé (1988) observes the pronunciation "Crédit‿agricole" by F. Mitterrand (p. 58), an instance of orthographically induced hypercorrection that could eventually gain acceptance.

done, but I estimate the number of alternating elements to be around one hundred, not hundreds or thousands.

16.4 Liaison contexts

Pedagogical grammars of French include lists of contexts where liaison is obligatory (when possible), and contexts where it is prohibited. In other environments, liaison is considered optional but recommended, given that the realization of optional liaison is an explicit indicator of 'cultivated' speech, and normative grammars aim to promote "le bon usage," which does not always correspond to speakers' natural behavior. In this section I try to present an unbiased classification of liaison contexts.

16.4.1 Invariable liaison

Empirically, we can pick out a small subset of the so-called obligatory liaison contexts where all speakers do in fact produce liaison all the time, and in all registers. These include:

(1)   Invariable contexts

    a.   between Det and $\overline{\text{N}}$: "les‿oiseaux," "mon‿ancie(n) collègue"

    b.   between two pronominal clitics: "elles‿en‿on(t) parlé"

    c.   between clitics and the verb: "nous‿acceptons," "allez‿y"

    d.   in many fixed expressions: "États‿Unis", "le cas‿échéant"

Interestingly, all of these cases allow a fully lexical treatment. Fixed expressions, for example, presumably require multi-word lexical entries to account for their syntactic and semantic idiosyncrasies; the obligatory realization of the CL can be specified along with this information. Note that fixed expressions can also specify the obligatory non-realization of liaison: compare "de part‿e(t) d'autre" with "de par(t) en par(t)" and "à par(t) entière."

    French pronominal clitics have been analyzed persuasively as verbal affixes (Miller and Sag, 1997), and Miller (1992) proposes a treatment of determiners as phrasal affixes, lexically prefixed to the left-most word of the $\overline{\text{N}}$. If we adopt these analyses, invariable liaison is no longer a word-boundary effect, but a question of morpho-phonological realization.

    Other liaisons that are declared obligatory in a normative sense turn out not to be invariable. These include the following contexts: between a monosyllabic preposition and its complement ("en‿une journée"/"e(n) une journée"), after monosyllabic adverbs ("trop‿innocent"/"tro(p) innocent"), and after a prenominal adjective ("un grand‿appartement"/

"un gran(d) appartement"). It is true that speakers are very likely to produce liaison in these cases, and particular lexical items encourage liaison more than others, but overall these syntactic contexts must be considered to be variable liaison contexts (see § 16.4.3).

16.4.2 Erratic liaison

If we turn to prescriptively prohibited liaisons, certain cases are indeed erratically produced or non-existent in actual speech, while others are actually commonly observed 'mistakes.' As discussed above, liaison is not found after singular nouns, or before aspirated *h* words. The non-realization of liaison in these cases can be analyzed without reference to syntactic context: non-alternating words simply have a single lexical form for [+L] and [−L] (§ 16.3.2), and words that fail to trigger liaison to the left are specified as [−LIAISON] (§ 16.2.2).

Syntactically defined erratic liaison contexts include:

(2)   Erratic contexts

    a.   between a non-pronominal subject and the verb:
        *"les‿ovnis‿existent"

    b.   between a noun or an adjective and its complement:
        *"verres‿à bière," *"bon‿en mathématiques"

    c.   between the complements of a ditransitive verb:
        *"donne le(s) livres‿à Marie"

Other types of supposedly 'incorrect' liaison are in fact quite frequently realized. For example, Morin and Kaye (1982) discuss extensions of nominal and verbal marking, as in "quatre-z-enfants," "le(s) chemin(s) de fer-z-anglais," and "il devra-t-y aller." These occur in variable liaison contexts (discussed next), so in fact they respect the syntactic conditions on liaison. What needs to be explained is the appearance of a lexically unmotivated CL. For "quatre" and "devra" we may have overgeneralization by analogy with other numerals ("deux," "trois") and other third person verbs ("doit," "devrait"). The plural [z] after "chemins de fer" is more problematic; Morin and Kaye argue against a compound word analysis and take such examples as evidence that [z] may be a prefix inserted in plural contexts (and that [t] can be inserted in verbal contexts).

Finally, it is usually said that liaison is subject to prosodic conditions, blocked in particular by pauses or parenthetical intonation. While this is generally true, speakers often realize liaison around a pause (as in Encrevé's liaison without enchaînement, or hesitations like "au(x)... z-étudiants"). These examples are possible, in fact preferable,

with normal connected prosody, but Tranel (1990) identifies one dislocation construction where a pause is required, and liaison is nevertheless obligatory: "J'en ai un peti(t), t-éléphant."

16.4.3   Variable liaison

In all contexts where liaison is neither invariable nor erratic—that is, in the majority of contexts—liaison is possible and realized with varying frequency. Many factors interact to determine the realization of variable liaison. Across speakers, there is variation based on social class, age, and even sex (women make more liaisons than men), and a given speaker will show different behavior in different registers, with distinct tendencies for particular CLs, particular words, or particular constructions (Booij and de Jong, 1987). This is also an area where metalinguistic knowledge (e.g., of prescriptive rules and orthography) and the conscious desire to produce more or less 'cultivated' speech strongly influence linguistic performance.

Naturally I cannot take all of these factors into account here. From a purely syntactic point of view, every word boundary must somehow be marked as allowing liaison or not, and those that do can also enforce obligatory liaison. The contexts listed in (2) are not exhaustive, but it seems clear that relatively few broadly-defined syntactic combinations block liaison categorically. There is usually some instantiation of the structure in which speakers can produce and accept liaison.

There have been attempts to formulate syntactic generalizations for liaison; the proposals of Selkirk (1974, 1986) are the best known. She offers a general procedure for identifying domains for 'unmarked' (i.e., invariable) liaison based on syntactic structure (or in terms of a prosodic structure directly derived from the syntax). Then these domains are extended to account for 'stylistically elevated' (i.e., variable) liaison. Morin and Kaye (1982), however, call Selkirk's results into question, first of all because the sharp distinction she assumes between obligatory and optional liaison, based on normative grammars (Delattre, 1966, Fouché, 1959), is not empirically accurate. Second, Selkirk's rules both over- and undergenerate. Morin and Kaye conclude that liaison contexts cannot be specified syntactically by means of broad, crosscategorial rules, but have to be listed more or less exhaustively, as in traditional descriptions of French.

A partial inventory of variable liaison contexts (some of which have already been discussed above) is given below:

(3)   Variable contexts

      a.   between a verb, preposition, or adverb and its complement

   b.   between a prenominal adjective and the modified noun

   c.   between a plural noun and an adjective: "enfants‿innocents"

The lists in (1)–(3) are a first approximation and do not provide a classification of all possible word boundaries. Much empirical work remains to be done, especially with respect to liaison in coordination and modification structures, and in extraction and dislocation constructions.

16.5   Edge features

Given the features introduced in § 16.2.2 and § 16.3.2, the realization of liaison can be described as the concatenation of a [+L] target word with a [+LIAISON] trigger word. But as we just saw in the previous section, liaison is also syntactically conditioned, and at the level of syntactic combination, the objects manipulated are generally phrases, not words. We will therefore need a mechanism for propagating [±L] and [±LIAISON].

16.5.1   Right and left liaison features

As an example, consider the prenominal MascSg adjective "grand," with the two lexical forms, [ɡʁɑ̃] ([−L]) and [ɡʁɑ̃t] ([+L]). The former must be chosen if the following word is, for example, "studio" ([−LIAISON]), while the latter can be used if the next word is "appartement" ([+LIAISON]). But we see the same effect with the phrase "trè(s) grand"—i.e., the following word must be allowed to trigger the appropriate form of the embedded adjective, so its [±L] specifcation must be visible at the level of AdjP. In this example, "grand" happens to be the syntactic head of "très grand," and so we could rely on head-driven feature propagation, but this is not always possible. For example, in the phrase "deux‿[autre(s) livres]," the choice of the [+L] form [døz] is triggered by the [+LIAISON] word "autres," embedded inside the N̄ and not its syntactic head. What is essential in each case is not the syntactic status of the liaison trigger or target word, but the fact that "grand" is the rightmost word in "très grand" and "autres" is the leftmost word in "autres livres."

To account for this pattern of propagation, I use EDGE features to encode liaison information. My HPSG analysis is loosely based on the GPSG treatment of French function words in Miller (1992). Every sign carries a set of left edge attributes, and a set of right edge attributes, and specifications relevant for liaison are found on both edges. The value of LEFT | LIAIS indicates liaison trigger status, while RIGHT | LIAIS indicates liaison target status. Up to now I have referred to these features as [±LIAISON] and [±L], respectively, but now with the left and

right edge distinction I only need a single (boolean) attribute.

I summarize the results of previous sections using this new terminology. The lexical entries for most V-initial words have the specification [L | LIAIS: +], while C-initial words have [L | LIAIS: −]. Aspirated h words and certain other V- or glide-initial words that fail to trigger liaison are also marked [L | LIAIS: −]. Words that exhibit liaison-based alternation have distinct lexical forms for their [R | LIAIS: +] (long form) and [R | LIAIS: −] (short form) lexical entries. Most cases involve a straightforward CL/∅ alternation, but there are a small number of suppletive and defective paradigms. Words that do not alternate have a single lexical form with an underspecified value for R | LIAIS.

16.5.2 Edge Feature Principle

EDGE features require a special propagation mechanism, since they are sometimes contributed by the head daughter, and sometimes by a non-head daughter. The LEFT features of a phrase are shared with its leftmost daughter, and its RIGHT features are shared with its rightmost daughter. The formalization of this principle has to refer to the surface word order, which does not necessarily correspond to syntactic constituency. Here I use the DOMAIN list of Reape (1994):

(4)   EDGE Feature Principle
        $phrase \Rightarrow$

$$\begin{bmatrix} \text{EDGE} & \begin{bmatrix} \text{LEFT} & \boxed{1} \\ \text{RIGHT} & \boxed{2} \end{bmatrix} \\ \\ \text{DOMAIN} & \left\langle \begin{bmatrix} \text{EDGE} \mid \text{LEFT} & \boxed{1} \end{bmatrix}, \ldots, \begin{bmatrix} \text{EDGE} \mid \text{RIGHT} & \boxed{2} \end{bmatrix} \right\rangle \end{bmatrix}$$

Here I do not follow Miller's (1992) proposal, which relies on LP rules to ensure that EDGE feature carriers end up at the appropriate periphery of the phrase, because in the present analysis, every element carries EDGE features. In (4) the phrase takes its EDGE specifications from the peripheral daughters as determined by the (independent) LP component.

In Figure 3, I give an example structure for the adjunct-head phrase "ancien(s) collègues-z." The [+LITE] adjective precedes the noun according to liteness constraints (Abeillé and Godard, 2000). The left-peripheral daughter "anciens" contributes its LEFT features, and the right-peripheral daughter "collègues" contributes its RIGHT features, to the phrase. The resulting phrase is therefore specified as capable of triggering liaison to the left ([L | LIAIS: +]) and requiring a liaison context to the right ([R | LIAIS: +]). In other words, this phrase could be

$$
\begin{bmatrix}
\text{EDGE} & \begin{bmatrix} \text{L}\boxed{1} \mid \text{LIAIS} & + \\ \text{R}\boxed{2} \mid \text{LIAIS} & + \end{bmatrix} \\
\text{DOM} & \langle \boxed{3}, \boxed{4} \rangle
\end{bmatrix}
$$

$$
\boxed{3}
\begin{bmatrix}
\text{PHON} & \langle \tilde{\text{a}}\text{sj}\tilde{\varepsilon} \rangle \\
\text{LITE} & + \\
\text{EDGE} & \begin{bmatrix} \text{L} & \boxed{1} \\ \text{R} \mid \text{LIAIS} & - \end{bmatrix}
\end{bmatrix}
\qquad
\boxed{4}
\begin{bmatrix}
\text{PHON} & \langle \text{kɔlɛgz} \rangle \\
\text{EDGE} & \begin{bmatrix} \text{L} \mid \text{LIAIS} & - \\ \text{R} & \boxed{2} \end{bmatrix}
\end{bmatrix}
$$

anciens   *collègues*

FIGURE 3 EDGE feature percolation

used to build the larger phrase "deux‿ancien(s) collègues‿américains"). Within the phrase, the R | LIAIS value of "anciens" and the L | LIAIS value of "collègues" interact to ensure the non-realization of liaison at their word boundary (see the following section), but this information is not encoded on the mother phrase.

16.6 Boundary constraints

Liaison is governed by constraints on the EDGE feature specifications of adjacent elements in a DOMAIN list. These constraints determine if a given boundary will give rise to liaison always, never, or variably.

16.6.1 Licensing of liaison

The following constraint applies to all phrases:[8]

(5)   Realization of liaision

$$
\begin{bmatrix}
\text{DOM} & \langle \ldots \boxed{1}[\text{R} \mid \text{LIAIS} \quad +], [ ] \ldots \rangle
\end{bmatrix} \Rightarrow
$$
$$
\begin{bmatrix}
\text{DOM} & \langle \ldots \boxed{1}, [\text{L} \mid \text{LIAIS} \quad +] \ldots \rangle
\end{bmatrix}
$$

This constraint says that whenever an element with the feature [R | LIAIS: +] appears, it must be immediately followed by an element spec-

---

[8]A disjunctive formulation of this constraint is also possible, for those concerned about the complex antecedent in (5): For every pair of adjacent elements in a DOM list, either the first element has the feature [R | LIAIS: −], or the first element has [R | LIAIS: +] and the second has [L | LIAIS: +].

ified as [L | LIAIS: +]. In other words, a liaison form like "grand" [grɑ̃t] must be licensed by a triggering word like "amour," not like "mépris."

Constraint (5) does not apply to [R | LIAIS: +] elements at the end of a DOM list. In these cases, according to the EDGE Feature Principle (4), the phrase itself will also carry the feature [R | LIAIS: +], which will eventually have to be licensed by an appropriate trigger in a higher DOM list. A top-level constraint is needed to ensure that all complete utterances (i.e., sentences, or words or phrases pronounced in isolation) have the specification [R | LIAIS: −].

This analysis treats optional or variable liaison as the default, because the constraint in (5) says nothing about non-liaison forms ([R | LIAIS: −]). They are free to appear in all positions, no matter what liaison triggering properties the following element has. Liaison is also possible, but it must be properly licensed.

16.6.2   Further constraints

Syntactic combinations where liaison is not acceptable, for example in the constructions listed in (2), must match descriptions of the following form:

(6) $\left[\text{DOM}\quad \left\langle \left[\text{R} \,|\, \text{LIAIS}\quad - \right], [] \right\rangle \right]$

This corresponds to a phrase with two daughters, and the left daughter is not allowed to be a liaison form, even if the right daughter happens to be a liaison trigger. For structures with more than two daughters, the description (6) will have to modified to apply to just a sub-list of DOM.

In an obligatory or invariable liaison context, adjacent EDGE specifications must match:

(7) $\left[\text{DOM}\quad \left\langle \left[\text{R} \,|\, \text{LIAIS}\quad \boxed{1} \right], \left[\text{L} \,|\, \text{LIAIS}\quad \boxed{1} \right] \right\rangle \right]$

In this binary phrase, the left daughter *must* be a liaison form if the right daughter is a liaison trigger. Such a description applies, for example, if we adopt a syntactic analysis for the specifier-head structures in (1a).

The descriptions in (6)–(7) must be incorporated into the constraints associated with the corresponding phrases. Assuming a construction-based approach, there is a type that groups together all the grammatical properties of subject-head phrases, for example, and an additional constraint can be added here to block liaison. Similarly, the constructional

type for Det-$\overline{\text{N}}$ phrases can specify obligatory liaison. As established in § 16.4.3, very few cross-constructional generalizations can be stated for the realization of liaison; an adequate analysis should allow idiosyncratic constraints to be associated with specific constructions.

The data for variable liaison also indicate that speakers are more or less likely to produce liaison depending on the particular construction involved. This again suggests the need for a hierarchy of constructional types, although I make no proposals about the formalization of these preference constraints.

16.7   Discussion

16.7.1   Phonological context

In a recent paper, Asudeh and Klein (2002) propose an HPSG analysis of (among several other sandhi phenomena) prenominal liaison effects in French. With their extension of the PHON feature, every sign has access to the first phonological segment of the immediately following sign (and to this sign's SYNSEM value). This allows, for example, the 1st person feminine possessive pronoun to take the form "ma" before a consonant and "mon" before a vowel.

As I have shown in this paper, however, the triggers for liaison cannot be identified phonologically, given the exceptional behavior of words like "hasard," "onze," and "yaourt" (vs. "yeux"). Apart from this, the major difference of Asudeh and Klein's analysis is that all of the licensing conditions for the liaison and non-liaison allomorphs are specified in the lexical entry of the alternating word. Thus, in a way, the word itself decides which of its forms will appear in a given context. In my analysis, the lexicon simply provides two possible forms, and the eventual context allows one (or both) of them.

In many situations, the two approaches are indistinguishable, but the crucial cases are words that can appear in different syntactic contexts, with different results for liaison. For instance, a plural noun followed by a modifying adjective shows optional liaison (3c), but the same noun followed by a verb or a complement PP cannot (2a)–(2b). With my proposed analysis, I say nothing in particular in the lexicon, and nothing in particular for the N-Adj combination, and I specify that subject-head phrases and nominal head-complement structures disallow liaison (6). Asudeh and Klein can also account for this contrast, but at the cost of complicating the PHON value of every plural noun. They could allow the noun to access to the following word's syntactic category through its P-CTXT value. Then they would have to cross the phonological contexts with all possible syntactic contexts, determine the allowable combina-

tions, and assume the resulting (potentially very complex) disjunction to be the noun's PHON value.

In order to account for distinct liaison preferences for words of the same class (prepositions, for example), Asudeh and Klein's approach may be useful, since contextual constraints are built into lexical entries. But more general syntactic conditions on liaision should be stated at the constructional level, as I have proposed.

16.7.2   Conclusion

In this paper, I have described several aspects of French consonant liaison, and presented an analysis that assumes the lexical specification of alternating and triggering forms, and the phrasal or constructional formulation of constraints on the realization of liaison. The analysis relies on the introduction of EDGE features whose values are propagated along the right and left peripheries of phrases.

Several empirical issues call for further investigation, most importantly a more complete classification of word boundaries in French with respect to the possibility of liaison. Also, an extension of the analysis presented here that encodes the identity of CL as the value of LIAIS might provide a treatment of liaison 'errors' where the consonant [z] or [t] seems to be specified by the construction ("chemin(s) de fer-z-anglais"). The introduction of these consonants and their realization in the chain of speech present an interesting problem for models of the syntax-phonology interface.

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