(Final) Nasalization as an Alternative to (Final) Devoicing: The Case of Vimeu Picard *

Brian José and Julie Auger
Indiana University

The Vimeu variety of Picard (VP), spoken in northern France, exhibits stop~nasal alternations as in *réponne* [re.pɔ̃n] 'to answer' vs *répondu* [re.pɔ̃.dy] 'answered.' We attribute the nasalization of voiced stops in VP to a constraint against voiced obstruents, a constraint most often responsible for obstruent devoicing. Just as positional faithfulness often protects onsets from devoicing, it protects onset stops from nasalizing in VP, thus the /d/ of *répondu* surfaces faithfully. Variation in stop nasalization is due to overlapping, stochastic constraint rankings.

The co-occurrence of stop and vowel nasalization also leads us to discuss nasal(ized) vowels. Here, we argue that [Ṽ]~[VN] alternations, as in *chatchun* [ʃatʃœ̃] 'each-one.masc' vs *chatcheune* [ʃatʃøŋ] 'each-one.fem,' support the view of at least some nasal vowels in VP as underlying /V^n/ sequences, where the superscript 'n' represents a floating nasal. For the sake of representational consistency, we extend this representation to non-alternating nasal vowels as well.

1 Introduction

Recent literature has addressed the possible outcomes of various restrictions imposed on weak positions, i.e. syllable codas. For instance, in a recent chapter exemplifying the differences between restrictions against place and voicing specifications, Lombardi (2001a) points out the following asymmetry: neutralization, epenthesis, and deletion are all possible outcomes of a constraint restricting place specifications in coda position (cf. the hypothetical examples in (1), taken from Lombardi), but only neutralization is attested with respect to a ban against voicing specifications (cf. the hypothetical examples in (2), again taken from Lombardi). Of course, this refers to situations where, in terms of Optimality Theory (Prince & Smolensky 1993/2002), the appropriate markedness constraints outrank relevant faithfulness constraints; otherwise, place and voicing distinctions are, naturally, maintained.

*

This research is supported by NSF grant BCS-0091687 to the second author. Earlier versions of this paper, from which the present version differs substantially, were presented at the 11th Annual French and Italian Graduate Student Conference at Indiana University and the 32nd Linguistic Symposium on Romance Languages at the University of Toronto. We thank each of those audiences for their feedback. Additionally, we thank Stuart Davis, Kenneth de Jong, Daniel Dinnsen, Bryan Donaldson, Amanda Edmonds, Heather Goad, Linda Lombardi, Glyne Piggott, Timothy Pooley, Douglas Pulleyblank, Yvan Rose, Kathryn Tippetts, and Rachel Walker for discussing various aspects of this paper with us during its metamorphosis and/or for providing extensive comments on earlier versions of it. Finally, we also thank Jehan Vasseur and Jean-Luc Vigneux for their persistent help with data issues. Naturally, any errors and/or misrepresentations remain the sole responsibility of the authors.
Correspondence to : bjose@alumni.indiana.edu jauger@indiana.edu

1 **Coda place restrictions**

a Optimized by neutralization (attested)

/pip/ → [piʔ]
/pit/ → [piʔ]
/pik/ → [piʔ]

b Optimized by ‘loss’ of would-be coda due to V epenthesis (attested)

/pip/ → [pi.pi]
/pit/ → [pi.ti]
/pik/ → [pi.ki]

c Optimized by loss of would-be coda due to C deletion (attested)

/pip/ → [pi]
/pit/ → [pi]
/pik/ → [pi]

2 **Voice restrictions**

a Satisfied by neutralization (attested)

/pik/ → [pik]
/pig/ → [pik]

b *Satisfied by ‘loss’ of would-be coda through V epenthesis (unattested)

/pik/ → [pik]
/pig/ → [pi.gi]

c *Satisfied by loss of would-be coda through C deletion (unattested)

/pik/ → [pik]
/pig/ → [pi]

In this paper, a pattern other than that exemplified in (2a) is described. Specifically, in the Vimeu variety of Picard voiced stops are nasalized under certain conditions in order to satisfy a constraint against voiced obstruents. This process of stop nasalization should not be confused, though, with nasal substitution in languages such as Japanese (cf. Inkelas & Cho 1993: §5.3.1) and Ponapean (cf. Davis 2000); more on this in §2. Also, we should clarify from the start that we are not disputing Lombardi’s (2001a) observation – or her analysis – of the different patterns illustrated in (1) and (2); rather, given that Vimeu Picard does not constitute an instance of either pattern (2b) or pattern (2c), it supports Lombardi’s claims. At the same time, though, it demonstrates that outcomes other than (2a) are also possible. In this respect, then, we do take issue with Steriade’s (to appear) similar, but more extreme – or simply more explicit? – position that voiced obstruent nasalization as a response to voicing restrictions is unattested, much like vowel epenthesis (2b) and consonant deletion (2c). Our disagreement with Steriade requires qualification, however: while the patterns described and analyzed in this paper are problematic for her claim that nasalization is unattested as a response to voicing restrictions, they are not inconsistent with her argument that an input form such as /tœb/ should never surface as [tœm]; indeed, final nasalization is not predicted in such a form in Vimeu Picard (cf. our comparable (3b)). In what follows, it will become clear how both of these things can be true.

Picard is a Romance language very closely related to French and spoken in parts of northern France and southern Belgium; Vimeu Picard (VP) is spoken in France's Somme *département* and is bounded by the Somme River on the north, the Bresle River on the south, departmental highway 901 on the east, and the English Channel on the west. The data analyzed here is taken primarily from Vasseur's (1998) dictionary of the dialect, supplemented with data collected by the second author during fieldwork in the area from 1996-1998.

The paper is organized as follows. In §2, we describe the data and sketch our analysis. In §3, we argue against a possible alternative OT analysis (Prince & Smolensky 1993/2002) of nasalization that might be considered. In §4 we present our analysis, and then in §5, we propose minor modifications to it which, although this is not a quantitative study of variation, will allow us to account for observed patterns of variation. Finally, §6 concludes the paper.

2 Data and Analysis Summarized

2.1 Consonant Data

The first observation of import with respect to voiced obstruents is that they are frequently devoiced in final position in many Gallo-Romance varieties. For instance, final devoicing in the history of French is well-known: D. Walker (1987) describes Old French consonant devoicing in detail; Posner (1995: 219-220) adds that contact with Frankish is commonly thought to be the source of this phenomenon distinguishing Old French from most of the other Romance languages. And final devoicing continues to be attested in contemporary regional varieties of the French spoken in France (Temple 2000, Vilespy 1971) as well as in other Gallo-Romance languages such as Walloon (Francard 1984) and numerous dialects of Picard (cf. Dauby 1979 for Valenciennes; Dawson 2002 for Lille; Ledieu 1909 for some unspecified location, probably his hometown of Démuin; Mahieu 1984 for Tournai; Pooley 1994, 1996 for Roubaix). Like Posner for Old French, Pooley (1994; 1996: 114, 117) attributes final devoicing in Roubaix Picard to contact with Germanic, Flemish in particular. The Vimeu dialect of Picard, though, does not exhibit final devoicing: as the examples in (3a)-(3f) and (3g)-(3l) show for stops and fricatives, respectively, final obstruents in VP are faithful to their input voicing specifications.[1]

[1] Pooley (1994: 218), citing Vasseur (1950), notes that 'Speakers of the Vimeu dialect ... devoice only /ʒ/.' However, apart from a few isolated lexical items (e.g., *cite* [sit] 'cider'), we can find no evidence of final devoicing in VP – of /ʒ/ or of any other consonant – either in Vasseur (1950, 1998) or in Auger's oral corpus.

3 Final obstruents exhibit voicing faithfulness

a	*wépe*	/wep/	[wep]	'wasp'
b	*tube*	/tyb/	[tyb]	'pipe'
c	*tapette*	/tapɛt/	[tapɛt]	'mouse trap'
d	*bérleude*	/berlœd/	[berlœd]	'old ewe'
e	*fabrique*	/fabrik/	[fabrik]	'factory'
f	*gueugue*	/gœg/	[gœg]	'nut'
g	*tchéf*	/ʧef/	[ʧef]	'blade of a plow'
h	*cave*	/kav/	[kav]	'cellar'
i	*fouillousse*	/fujus/	[fujus]	'treasure'
j	*laveuse*	/lavœz/	[lavœz]	'washing machine'
k	*avrillache*	/avrijaʃ/	[avrijaʃ]	'light April rain'
l	*lisage*	/lizaʒ/	[lizaʒ]	'act of reading'

The examples in (4) show that, unlike the faithfulness that they normally exhibit, voiced stops become sonorant nasals when they occur in a nasal context. This is how stop nasalization in VP differs from nasal substitution: in VP, stops are only nasalized in a nasal context, whereas nasal substitution is said to occur when 'there is no triggering nasal ... in the input. Thus nasal substitution does not involve assimilation' (Davis 2000: 257).

Following works such as Dell & Selkirk (1978), Paradis & El Fenne (1995), Paradis & Prunet (2000, esp. §§2-3), Prunet (1992), and Schane (1968) with respect to French, it is assumed here that all nasal vowels in VP are derived from V+N sequences. Further, in those cases where the N in these V+N sequences fails to surface (that is, as a nasal consonant), this is because it is/was a 'floating' segment (cf., e.g., (4a), (4b), (4c)). Floating consonants, which, at times, have been conceived of as extra-syllabic, were first posited, to our knowledge, for the well-known problem of C/Ø alternations in French by Clements & Keyser (1983) and Encrevé (1983), although a number of researchers cite Vergnaud (1982) as an earlier source. Over the course of the next 20 years, numerous other researchers would adopt floating segments to account for the same problem. These include Booij (1983/1984), Hyman (1985), Paradis & El Fenne (1995), Prunet (1992), Tranel (1996a,b), and Zoll (1998), to name a few.[2]

2 Following Paradis & El Fenne (1995), floating nasals are represented here via a superscript 'n' (a notation extended to other floating consonants, as well (cf., e.g., (6b), (17a), (49a)). As will be shown in §4.1, the present analysis of [Ṽ] ~ [VN] alternations relies crucially on floating nasals; whether or not non-alternating nasal vowels, on the other hand, should be represented in this way is without dire consequences, although Lexicon Optimization (Prince & Smolensky 1993/2002, Itô *et al*. 1995) would dictate that they be represented as underlying (i.e. underived) nasal vowels. The reason that /V^n/ sequences are posited for these, too, is simply for consistency of representation (cf. McCarthy 2004a for arguments supporting this type of representational consistency across forms exhibiting morphophonemic alternations

The examples in (5) show that voiced stops in onset position are not subject to nasalization (also cf. the /g/ in (4a), the /b/ in footnote 4, and the /d/ in footnote 5). This is due to a positional faithfulness constraint (e.g., Beckman 1999) holding onset consonants to a more stringent requirement of faithfulness than non-onset consonants. In (4a)-(4c) the nasalized stops are all syllable codas; in (4d) it is an appendix.[3] Here, then, we see explicitly that which is only implicit in other studies: the parallel treatment of codas and appendices, which follows from them having something very basic in common – simply, neither of them is an onset.

4	Voiced stops are subject to nasalization				
	a	*gamme*	/ga^{n}b/	[gãm]	'leg' [4]
	b	*réponne*	/repɔ^n+d/	[repɔ̃n]	'to answer' [5]
	c	*rudemint*	/rydmɛ^n/	[rynmɛ̃]	'roughly' [6]
	d	*dmi*	/demi/	[n-mi]	'half' [7]

5	Voiced onset stops are not nasalized				
	a	*banque*	/ba^{n}k/	[bãk]	'bank'
	b	*blanboteu*	/bla^{n}botø/	[blã.bo.tø]	'to gossip'
	c	*démi*	/demi/	[dẽ.mi]	'half'
	d	*sin-medi*	/sɛmdi/	[sɛ̃m.di]	'Saturday'

Unlike the voiced stops /b d g/, the voiceless stops /p t k/ are not subject to

---

and non-alternating forms alike).

3

[n] (=/d/) is an appendix here because the /e/ has been lost due to a variable process of vowel syncope, resulting in a cluster that is not a possible complex onset in the language due to not meeting sonority sequencing/distance requirements. Therefore, the word-initial [n] is licensed as an appendix by a higher level of prosodic structure rather than by the syllable; this is indicated by the notation [n-] (also cf. (6c), (7b), (44a,b,c)). See Auger (2001) and Steele & Auger (2002) for discussion.
The difference between a single-consonant onset preceded by an appendix and a complex onset correlates with the possibility of an epenthetic /e/ in the former case (e.g., *énmi* [ẽn.mi] 'half') and its impossibility in the latter case (e.g., **égrand* *[e.grã] 'big.masculine').

4

Cf. *gambet* /ga^{n}be/ [gãbe] 'action of kicking one's leg over the head of a young/short/little person'

5

Cf. *répondu* /repɔ^{n}dy/ [repɔ̃dy] 'answered'

6

Cf. *rude* /ryd/ [ryd] 'rough'

7

Cf. *démi* (5c) /demi/ [dẽmi] 'half'

nasalization (cf. (6)); nor are fricatives (cf. (7)), liquids (cf. (8)), or glides (cf. (9)).

6 Voiceless stops are not nasalized

a	*lampe*	/la^{n}p/	[lãp]	‘lamp’
b	*attirante*	/atira^{nt}+fem/	[atirãt]	‘seductive.feminine’
c	*cmise*	/kmiz/	[k-miz]	‘shirt’

7 Fricatives are not nasalized

a	*mince*	/mɛ^{n}s/	[mɛ̃s]	‘thin’
b	*jnou*	/ʒnu/	[ʒ-nu]	‘knee’
c	*tchinze*	/ʧɛ^{n}z/	[ʧɛ̃z]	‘fifteen’

8 Liquids are not nasalized

a	*calmeu*	/kalmø/	[kalmø]	‘to calm (down)’
b	*torneu*	/tornø/	[tornø]	‘to turn’

9 Glides are not nasalized [8]

a	*dépouillemint*	/depuɟmɛ^{n}/	[depuɟmɛ̃]	‘tallying (of votes)’
b	*déraillemint*	/deraɟmɛ^{n}/	[deraɟmɛ̃]	‘derailment’

2.2 Vowel Data

Although the primary focus here is the nasalization of voiced stops, as described above, it is also important to consider the question of vowel nasalization. The primary reason for this is that understanding the status of nasal and nasalized vowels helps support the presence of floating nasals in underlying forms. Additionally, as we will see in §3, vowel and consonant nasalization can interact, yielding what appears to be iterative spreading and potentially suggesting a different type of analysis than the one argued for here.

Taking Vasseur’s (1950, 1998) distinction between nasal vowels and half-nasal vowels in VP as a point of departure (and then deviating somewhat from his classifications of these), we submit that there are two types of nasal vowels in VP. In one type, corresponding to the ‘nasal’ vowels, the [nasal] feature is primarily linked to the vowel itself (although it may also spread to a neighboring consonant, as in *gamme* [gãm] and *réponne* [repɔ̃n], etc. (compare *gambet* [gã.be] and *répondu* [re.pɔ̃.dy], etc.)). In the other type, corresponding to the ‘half-nasal’ (or ‘nasalized’) vowels, the [nasal] feature is linked to the vowel only by autosegmental spreading from some neighboring segment to which it is

8 The only glide that we could find in the appropriate structural configuration is the palatal glide /ɟ/.

primarily linked.[9] In this section, we limit our description of the data to the nasalized, or half-nasal, vowels (e.g., *lame* ‘blade’ /lam/ → [lãm]). The analysis of this allophonic nasalization presented in §4.1 will require an explanation for why some vowels are not subject to ‘nasalization’ but can be ‘nasal’ under other circumstances; in the end, this will support floating nasals and underlying /V^n/ sequences, as introduced in §2.1.

The first relevant observation with respect to vowel nasalization is that both tautosyllabic and heterosyllabic vowels are regressively nasalized before a nasal consonant. This is illustrated in (10). The examples in (11) demonstrate that epenthetic vowels are also targeted. However, as (12) and (13) show, neither front round vowels nor high vowels are targeted. The non-nasalization of mid front round vowels reflects their markedness in vowel inventories. For instance, while [œ̃] persists in some varieties of French, such as that spoken in Québec (Prunet 1992: 45 (fn1)) and Brussels (Féry 2003: 248-249), other varieties, such as Standard Parisian French, have dispensed with this segment, opting, instead, for an inventory of only three, instead of four, nasal vowels. The non-nasalization of high vowels is not surprising, either. The total absence of high nasal vowels in the language can be attributed to a general cross-linguistic incompatibility between high vowels and nasality, compared to a general compatibility of low vowels and nasality (Schourup 1973: 192; also cf. R. Walker 2000: 69-70). This explains why, during the period of allophonic nasalization in the history of French, low [a] was nasalized prior to mid vowels, which, in turn, were nasalized prior to high vowels (cf. Schourup 1973: 192).[10] R. Walker (2000: 69-70) notes that such a compatibility of some vowels but not others with nasality may be related to the

9

We diverge somewhat from Vasseur’s (1950, 1998) classifications because while his ‘nasal’ vowels typically correspond to nasal vowels in French and his ‘half nasal’ vowels to oral vowels followed by nasal consonants in French (some examples follow in (i) and (ii), respectively), there are a number of cases where he transcribes half nasal vowels but where, based upon the aforementioned correlations, we would expect full nasal vowels and vice versa (some examples of these apparent exceptions follow in (iii) and (iv), respectively).

(i) nasal vowels (Vasseur 1998)
lampe [lãp] ‘lamp’ cf. French [lãp]
mission [misjɔ̃] ‘mission’ cf. Fr [misjɔ̃]

(ii) half nasal vowels (Vasseur 1998)
lame [lãm] ‘blade’ cf. French [lam]
missionnaire [misjɔ̃nɛr] ‘missionary’ cf. Fr. [misjɔnɛʀ]

(iii) half nasals (Vasseur 1998) where nasals expected
pointe [pwɛ̃t] ‘tip’ cf. French [pwɛ̃t]
tènte [tɛ̃t] ‘tent’ cf. French [tɛ̃t]

(iv) nasals (Vasseur 1998) where half nasals expected
gomme [gɔ̃m] ‘eraser’ cf. French [gɔm]
grainne [grɛ̃n] ‘seed’ cf. French [grɛn]

10

It has been claimed that this low > mid > high compatibility with nasalization that is observed in the history of French is universal (cf. Hajek 1993). For his part, Hajek argues against its universality. What he does not do, though, is argue against it in language-specific cases; in fact, he admits that ‘a tendency towards a more general low > high correlation may be apparent in some languages’ (p. 157) and that ‘there is some indication that low vowels may be preferentially nasalized in some languages’ (p. 159).

need to maintain perceptible height contrasts, which can be blurred under nasalization (also cf. Beddor 1993, esp. §3.1). Finally, the examples in (14) show that vowels are not progressively nasalized after a nasal consonant.

10	Tautosyllabic and heterosyllabic vowels are regressively nasalized			
a	(*al*) *donne*	/dɔn/	[dɔ̃n]	‘(she) gives’
b	*donneu*	/dɔnø/	[dɔ̃.nø]	‘to give’

11	Epenthetic vowels are regressively nasalized			
a	*émiette*	/mjɛt/	[ẽmjɛt]	‘crumb’
b	*émsureu*	/mzyrø/	[ẽmzyrø]	‘to measure’

12	Front round vowels are not nasalized			
a	*feume*	/føm/	[føm]	‘woman, wife’
b	*lumiére*	/lymjer/	[lymjer]	‘light, lightning’

13	High vowels are not nasalized			
a	*batimint*	/batimɛ^{n}/	[batimɛ̃]	‘building’
b	*froumiére*	/frumjer/	[frumjer]	‘ant hill’
c	*lumiére*	/lymjer/	[lymjer]	‘light, lighting’

14	No vowels are progressively nasalized			
a	*midi*	/midi/	[midi]	‘midday, noon’
b	*meilleu*	/mejø/	[mejø]	‘millet’
c	*meur*	/mœr/	[mœr]	‘ripe, mature’
d	*mateu*	/matø/	[matø]	‘to erect, put upright’
e	*mollir*	/molir/	[molir]	‘to soften’
f	*mouche*	/muʃ/	[muʃ]	‘bull’s eye’

2.3 Preview of Analysis

The OT analysis (Prince & Smolensky 1993/2002, McCarthy & Prince 1995) of the preceding facts that we offer in this paper is the following. First, vowels, very simply, are nasalized before but not after nasal consonants because of a very specific local prohibition against oral vowels occurring immediately before nasal consonants: $*_{[ORAL]}V_{[NASAL]}C$. Those vowels that are not nasalized, in violation of this constraint (e.g. (12) and (13)), remain faithful to their input forms because of higher-ranking co-occurrence restrictions against front round nasal vowels and high nasal vowels.

Second, voiced stops are nasalized because of a constraint banning voiced obstruents, a constraint which we call simply *VOICED OBSTRUENTS. The effect of this constraint on the phonology of VP is that voiced coda and appendix stops in a nasal context can nasalize, in violation of a low-ranking no-spreading constraint, thereby satisfying *VOICED OBSTRUENTS. Just as positional faithfulness protects onsets from devoicing under the pressure of *VOICED OBSTRUENTS in many languages (cf. Lombardi 1999), it protects them from nasalizing under the pressure of *VOICED OBSTRUENTS in VP. Unlike voiced stops, voiced fricatives are not subject to nasalization because transforming a fricative, e.g. /z/, into a nasal sonorant, e.g. [n], would require a change of continuancy. Voiceless obstruents are not nasalized because they inherently satisfy *VOICED OBSTRUENTS; liquids and glides are not nasalized because this constraint does not target them. In an oral context, on the other hand (e.g., *tube* [tyb] 'pipe'), voiced stops are tolerated because (i) nasalizing them would violate a higher-ranking constraint against inserting nasality, as opposed to simply spreading it, and (ii) devoicing them would violate a higher-ranking voicing faithfulness constraint, MAX[VOICE]. The ranking MAX[VOICE] » *VOICED OBSTRUENTS, permitting voiced obstruents to surface in the majority of cases, generally obscures the fact that *VOICED OBSTRUENTS is ranked high enough in the constraint hierarchy in order to trigger any observable processes. In this way, stop nasalization in VP constitutes a sort of *emergence of the unmarked* (McCarthy & Prince 1994).

Of course, a constraint banning voiced obstruents would most often be invoked in analyses of obstruent devoicing. However, other outcomes are also possible. For example, Féry (2003) indirectly argues that a markedness constraint against voiced obstruents – or, possibly, a positional markedness constraint against voiced coda obstruents – is at least partly responsible for what she calls *semisyllables* in her analysis of French syllable structure. While such a constraint doesn't actually figure into her analysis, she does say that 'some consonants prefer to be onsets. This may be true of voiced fricatives in general – maybe even of voiced obstruents, though the universality of such an observation still needs to be validated' (p. 264). According to Féry's analysis, then, in (Brussels) French, voiced fricatives prefer to be peakless semisyllables instead of coda consonants, accounting for vowel lengthening before these segments (e.g., *chose* [ʃo:z] 'thing', *nage* [na:ʒ] 'swims'). Likewise, Pooley (1994: 218) points out that final devoicing is not the only possible result of a prohibition against voiced obstruents; he precedes us in observing that nasalization is another possibility:

> In these regions, two other phenomena ... also occur in items which are potential sites for WFCD [word-final consonant devoicing]: firstly zézaiement ... and secondly, forms such as tout le monne 'tout le monde' ['everybody'] and prenne 'prendre' ['to take'] cited ... for the Vimeu region and ... prenn 'prendre' ['to take'] for the Calaisis. Indeed this latter phenomenon would actually block devoicing.

This is one of the advantages of Optimality Theory itself: there are multiple possible repairs to a given prohibition, according to language-specific constraint rankings. In the usual case, *VOICED OBSTRUENTS triggers obstruent devoicing, but it doesn't have to; in some cases it could result in something else, such as stop nasalization. This is what McCarthy (2002) dubs 'homogeneity of target / heterogeneity of process' (cf., esp., pp. 25-26, 51, 93-101).

Finally, it is noteworthy that phenomena of stop nasalization similar to that found in VP occur in other languages, including St-Lucie Creole (Bhatt & Nikiema 2000), Haitian Creole (Iskrova & Valdman 2001), and French (Tranel 1981, citing Morin 1971). While these authors do not analyze stop nasalization in the way that we are proposing here, we suspect that similar analyses could be developed for those languages. Such an analysis would be complicated in the case of French, however, in that, there, voiceless stops are also nasalized (cf. Tranel 1981: 76, citing Morin 1971).

3 Against a Nasal Harmony Analysis for VP

The interaction of consonant and vowel nasalization, yielding what appears to be iterative leftward nasal spreading, as seen in (15), and similarities between the blocking effects in nasal spreading observed by R. Walker (2000, 2003) and the non-nasalization of fricatives, liquids, and glides in VP (cf. (7), (8), (9)) could lead one to consider a nasal spreading analysis for VP.[11]

15 Looks like iterative spreading

a	*admètte*	/admɛt/	[ãnmɛt]	'to admit'
b	*édminueu*	/dminɥø/	[ẽnminɥø]	'to diminish'

R. Walker (2000, 2003) posits the universal markedness hierarchy in (16) to account for cross-linguistic patterns of nasalization. By ranking a nasal spreading constraint, SPREAD[+NASAL], at various locations within the hierarchy, she accounts for varying degrees of robustness of nasalization phenomena in various languages. For example, if the spreading constraint is ranked between *NASOBSTSTOP and *NASFRIC, as in the Applecross dialect of Scottish Gaelic, then fricatives, liquids, glides, and vowels (and nasals) participate in nasal spreading while obstruent (i.e., oral) stops block it. Likewise, if the spreading constraint is ranked between *NASGLIDE and *NASVOWEL, as in Sundanese, then only vowels (and nasals) participate in nasalization; stops, fricatives, liquids, and glides all block its spreading. Nasal spreading is more robust in Applecross Gaelic than in Sundanese in the sense that it targets more segments.

11 We do not mean to imply here that Walker ever considered or endorsed a spreading analysis for VP. On the contrary, when we discussed our data and a preliminary analysis of it with her, she argued against a nasal spreading analysis (p.c.).

16 R. Walker's (2000, 2003) universal nasality compatibility hierarchy
*NasObstStop » *NasFric » *NasLiq » *NasGlide » *NasVowel » *NasSonStop

A first complication with such an analysis for VP is explaining why voiced stops participate in nasal spreading while voiceless stops do not. According to R. Walker (2000: 35), 'if a segment blocks nasalization, all segments less compatible by the nasalization hierarchy will also block nasal spreading. Further, if a segment undergoes nasalization or behaves transparent, all segments more compatible with nasality will undergo nasal spreading.' That is, the voiced and voiceless stops should pattern together either by all participating in or by all blocking nasal spreading, depending upon whether Spread[+nasal] » *NasObstStop or whether *NasObstStop » Spread[+nasal]. A second complication with such an analysis would be to account for why vowels are targeted by leftward nasal spreading but not by rightward nasal spreading (cf. (10) and (11), on the one hand, vs (14), on the other hand). A third complication with such an analysis is that nasality doesn't spread leftward to more than a single vowel in VP. The examples in (17) demonstrate this.

17 No leftward spreading throughout the prosodic word [12]

a	*géant*	/ʒea^{nt}/	[ʒeã]	'giant.masculine'
b	*téon*	/teɔ^{n}/	[teɔ̃]	'great grandfather'

These are some of the problems that arise with a nasal spreading analysis for VP. Of course, our purpose here is not to single out R. Walker's theory of nasal harmony; rather, we aim to argue that a nasal harmony analysis in general is not the right one in this case. Indeed, alternate proposals for analyzing harmony phenomena, such as barring featural disagreement (Pulleyblank to appear-b) or minimizing featural spans (McCarthy 2004b), seem equally ill-equipped to account for the facts in an uncomplicated manner, thereby strengthening the arguments against a harmony analysis here. In other words, R. Walker's approach to nasal harmony is not the problem, any harmony analysis is problematic. This is not to say, though, that a nasal harmony analysis is impossible, only that it is not the best analysis of the data.

Indeed, solutions to each of the problems described above are available. For instance, realizing that voiced stops are nasalized as sonorant stops, thereby satisfying *NasObstStop, offers a solution to the first problem. Specifically, if we reject R. Walker's (2000: 160-161) claim that Ident-IO[-sonorant] universally outranks Spread[+nasal], then the different behavior of voiced and voiceless stops in VP follows naturally. R. Walker insists on the fixed ranking Ident-IO[-sonorant] » Spread[+nasal] on the grounds that

---

[12] The list of such forms is apparently very short. We've ultimately found fewer than 10 altogether. In addition to *géant* and *téon*, there are: *accordéon* 'accordion', *s'anéantir* 'to get tired', *fainéant* 'lazy', *ratéon* 'great-great grandfather', *séance* 'session', *séant* 'seat, butt', and *taon* 'horsefly'. (Another form, *paon* 'peacock', is monosyllabic, [pã], as in French.)

only sympathy mapping, and not nasal spreading, can change stops into nasals. This ranking allows her to capture the reluctance of stops to participate in nasal spreading. However, as Lombardi (1999: 272 (fn 3)), commenting on a different but similar proposal, puts it: 'all plausible cases of universal rankings ... in the OT literature are rankings within a single constraint family, so that thus far it seems that we should assume that this is the only type of ranking fixed in UG.' Likewise, the second problem can be solved by appealing to McCarthy's (1997) analysis of process-specific constraints in OT. If SPREAD-L[+NASAL] outranks *NASALVOWEL which outranks SPREAD-R[+NASAL], yielding the complete ranking in (18), this would account for the nasalization of vowels before but not after a nasal (compare the /o/s of the second and third syllables in *déshonoreu* [dezɔ̃norø] 'to disgrace'). Thus, leftward nasal spreading would target both vowels and voiced stops while rightward nasal spreading would target only voiced stops. Finally, the absence of leftward nasal spreading to [e] in *géant*, *téon*, *accordéon*, and so forth (and to [a] in the case of *taon*), means that if a spreading analysis is going to work, the spreading constraint must be restricted to a single syllable. This, of course, is possible given that syllable-level spreading is attested in other languages, such as Standard Yoruba as analyzed by Pulleyblank (to appear-a). Therefore, solutions to each of the problems discussed above exist, and a nasal harmony analysis remains theoretically possible.

18 Process-specificity and the universal nasality compatibility hierarchy
*NASOBST » *NASLIQ » *NASGLIDE » SPREAD-L[NAS] » *NASV » SPREAD-R[NAS] » *NASSONSTOP
(where *NASOBST = *NASOBSTSTOP » *NASFRIC)

Nonetheless, the series of steps that must be taken to salvage that analysis suggest that it is inferior to the analysis outlined in §2.3 which accounts for the facts in a straightforward manner. In the next section, we present the details of that analysis. Although our primary interest is the nasalization of voiced stops, we begin with the question of vowel nasalization described in (10)-(14). The reason for this is simply that discussing vowel nasalization before stop nasalization allows us to simplify discussion of the latter by establishing floating nasals in underlying forms. In what follows, nasality is assumed to be a privative feature (cf. Steriade 1995: 148-149), but nothing critical hinges upon this assumption. The analysis can be made to work equally well with only small-scale changes if it is taken to be a binary feature.

4 Vowel and consonant nasalization in VP

Like Lombardi (2001a) and Pulleyblank (1996, to appear-a), we 'assume here feature-based faithfulness and reference in faithfulness constraints to feature paths' (Pulleyblank to appear-a: 17). However, this should not be taken as an outright rejection of the more traditional IDENT[F] constraints any more so than using IDENT[F] should be taken as a rejection of MAX[F]. Rather, our intent is simply to test whether we can get by without IDENT[F] constraints in this particular situation. We agree with Lombardi (2001a: 39) that 'replacing

Ident with MaxF in all situations is not trivial.'[13]

4.1 Vowel nasalization

The discussion of nasal vowels begins with an analysis of regressive nasalization (e.g., *lame* 'blade' /lam/ → [lãm]). Here, the non-nasalization of front round vowels and high vowels (e.g. *feume* 'woman, wife' [føm] / *[fœ̃m], *froumiére* 'ant hill' [frumjer] / *[frũmjer]) raises the question of why (some of) these vowels are readily nasalized in [Ṽ] ~ [VN] alternations. Ultimately, these patterns argue in favor of floating nasals and underlying /V^n/ sequences, offering support for the underlying forms assumed in §2 and throughout the rest of the paper.

The analysis of vowel nasalization is very simple: nasalized vowels result from a constraint prohibiting oral vowels from occurring immediately before a nasal consonant: $*_{[ORAL]}V_{[NASAL]}C$. The effect of this constraint is illustrated in tableau (23), but, first, since this constraint doesn't say anything about the presence or absence of an intervening syllable boundary, it is equally responsible for the nasalization of vowels before tautosyllabic and heterosyllabic nasals (cf. (10a) vs (10b)). Likewise, since it doesn't distinguish between underlying and inserted vowels, it also targets epenthetic vowels, as in (11) and (15b). Also, given that the direction of application is encoded directly into the constraint, it is able to account for the pattern of regressive, but not progressive, vowel nasalization that the data requires. Recall the earlier comparison of the /o/s in the second and third syllables of *déshonoreu* [dezɔ̃norø] 'to disgrace.' Here, the vowel of the second syllable immediately precedes a nasal consonant and the nasalization constraint is relevant; the vowel of the third syllable does not, and the constraint does not apply. Finally, just as post-nasal vowels are not targeted by this constraint, it also fails to target vowels that precede another nasal vowel, as in *géant* and *téon*, etc. (cf. (17), footnote 12). Regressive vowel nasalization and the lack of progressive nasalization are illustrated through the example *déshonoreu* in tableau (23). The relevant constraints are presented and defined in (19)-(22).

---

[13] Pulleyblank (1996: 298 (fn 3)), on the other hand, seems to be less concerned with the triviality of this move: he suggests that 'the class of IDENT conditions proposed by McCarthy and Prince (1995) is redundant when faithfulness is feature-based.' Downing (2000: 11) similarly summarizes: 'as Cassimjee & Kisseberth (1998) and McCarthy & Prince (1999) have pointed out, featural MAX and/or DEP is necessarily also violated if IDENT is, rendering IDENT generally redundant.'

19 MAX-SEG : Every segment in the input has a correspondent in the output

20 MAX[NASAL] : Every occurrence of the feature [nasal] in the input must be present in the output

21 $*_{[ORAL]}V_{[NASAL]}C$: A vowel that immediately precedes a nasal consonant cannot be oral

22 DEPPATH[NASAL] : Every path associating the feature [nasal] to a root node in the output is present in the input (i.e., do not spread nasality) [14]

23 Vowels are nasalized before, but not after, N

/dezonorø/ 'to disgrace'	MAX-SEG	MAX [NASAL]	$*_{[ORAL]}V_{[NASAL]}C$	DEPPATH [NASAL]
a. [dez_norø]	*!			
b. [dezo_orø]	*!	*		
c. [dezo[d]orø]		*!		
d. [dezonorø]			*!	
e. [dezonɔ̃rø]			*!	*
f. [dezɔ̃nɔ̃rø]				**!
☞ g. [dezɔ̃norø]				*

In tableau (23), candidates (a) and (b) are eliminated for attempting to satisfy the vowel nasalization constraint, $*_{[ORAL]}V_{[NASAL]}C$, by deleting either the vowel or the nasal consonant in violation of MAX-SEG. Note that deleting the nasal consonant (candidate (b)) violates MAX[NASAL] in addition to MAX-SEG (see Lombardi 2001a for discussion, but centered around MAX and MAX[VOICE]). Similarly, attempting to satisfy $*_{[ORAL]}V_{[NASAL]}C$ by deleting only the nasality of the nasal consonant, as in candidate (c), results in a fatal violation of high-ranking MAX[NASAL]. Simply not nasalizing the pre-nasal vowel, as in candidates (d) and (e), is not an option either; this results in a fatal violation of the vowel nasalization constraint. So, the pre-nasal vowel must be nasalized. If the post-nasal vowel is also nasalized, as in candidate (f), this results in an unnecessary (thus fatal) faithfulness violation. Therefore, candidate (g), exhibiting regressive but not progressive vowel nasalization is selected as optimal.

Given this situation, the question that arises is why front round vowels and high vowels are not nasalized in a pre-nasal context (cf. (12) and (13)). Abstracting away from some fairly important details for the time being, the non-nasalization of these vowels can be

[14] This constraint and our other DEPPATH constraints in (42), (43) and (47) are inspired by Pulleyblank's (1996, to appear-a) DEPPATHATR, DEPPATHRTR, and DEPPATHTONE and are conceptually identical to McCarthy's (2000 (p. 9 in ROA version)) $\text{NO-SPREAD}_{S1\text{-}S2}(\tau, \varsigma)$.

accounted for by ranking appropriate co-occurrence restrictions above the vowel nasalization constraint. Tableaux (26) and (27) illustrate this for front round vowels and for high vowels, respectively, with relevant new constraints being presented in (24)-(25).

24 $*_{[\text{ANT, RND, NAS}]}$V : Front round vowels are not nasal
25 $*_{[\text{HI, NASAL}]}$V : High vowels are not nasal

26 Front round vowels are not nasalized

/føm/ 'woman, wife'	$*_{[\text{ANT, RND, NAS}]}$V	$*_{[\text{ORAL}]}\text{V}\ _{[\text{NASAL}]}\text{C}$	DEPPATH [NASAL]
a. [fœ̃m]	*!		*
☞ b. [føm]		*	

27 High vowels are not nasalized

/frumjer/ 'ant hill'	$*_{[\text{HI, NASAL}]}$V	$*_{[\text{ORAL}]}\text{V}\ _{[\text{NASAL}]}\text{C}$	DEPPATH [NASAL]
a. [frũmjer]	*!		*
☞ b. [frumjer]		*	

In each of these tableaux, the (a) candidates satisfy the vowel nasalization constraint at the expense of faithfulness, but this results in a violation of the higher-ranking co-occurrence restriction; therefore, it is better not to nasalize the vowel, as in the (b) candidates.

Now, a more accurate account of the facts requires us to confront the observation that high vowels and front round vowels can be nasalized under very limited circumstances. Or, at the very least, that certain high vowels and front round vowels – /i/ and /ø/ in particular – can be nasalized under specific circumstances. Given a distinction between anchored nasals and floating nasals, we take the position that although /i/ and /ø/ are not nasalized before anchored nasals, they are nasalized before floating nasals if the [nasal] feature would not otherwise surface. In other words, /i/ and /ø/ can be nasalized where vowel nasalization is the only way to realize a floating nasal; since anchored nasals always surface, vowel nasalization is not a necessary means of nasal realization in that context.[15] We illustrate this interesting characteristic of /i/ and /ø/ with the [ṽ] ~ [VN] alternations of *chatchun* and *chatcheune*, *bazin* and *bazineu*:

15 There do appear to be a handful of exceptions where /i/ is nasalized before anchored (tautosyllabic) nasals: e.g., *abinmes* [a.bɛ̃m] 'damage(2sg)' and *linme* [lɛ̃m] 'file (noun)'. Cf. *abimeu* [a.bi.mø] 'to damage' and *limeu* [li.mø] 'to file'. It is important to note, though, that when the high vowel /i/ is nasalized, it is also lowered, thereby respecting the co-occurrence restriction against high nasal vowels (cf. tableau (37)).

28	*chatchun*	/ ʃatʃø^{ŋ} /	[ʃatʃœ̃]	‘each-one.masculine’
29	*chatcheune*	/ ʃatʃø^{ŋ} + fem /	[ʃatʃøŋ]	‘each-one.feminine’
30	*bazin*	/ bazi^{n} /	[bazɛ̃]	‘(a keysmith’s tool)’
31	*bazineu*	/ bazi^{n} + ø /	[bazinø]	‘to use a *bazin*’

Paradis and Prunet (2000: 343, 344) explain that [Ṽ] ~ [VN] alternations such as these – what they call ‘nasal vowel unpacking’ – are ‘one of the main arguments traditionally invoked for the biphonemicity of French nasal vowels’ and that these alternations are ‘justly explained if we assume that a nasal vowel is an underlying VN or V^N sequence and that empty onsets are universally disfavored’. We’re willing to take this one step further than Paradis and Prunet and contend that the alternations in (28)~(29) and (30)~(31) support underlying V^N sequences in particular. Following Zoll (1994, 1998, 2001), we assume that the difference between a floating segment and an anchored segment is that the former is unassociated to a root node in the input while the latter is underlyingly linked to a root node (thus, we differ from Paradis & Prunet on the representation of floating segments).

In the bare forms in (28) and (30), the floating segment surfaces on the vowel and not as an independent segment because there’s nothing motivating the insertion of a root-node for the floating nasal to surface on. That is, there’s nothing forcing the necessary violation of a relatively high-ranking constraint DEP-RT. However, because of a high ranking constraint against nasal deletion, the floating nasal must be realized; therefore, in order to satisfy both MAX[NASAL] and DEP-RT, the floating nasal docks onto the preceding vowel. In the morphologically marked forms in (29) and (31), on the other hand, another constraint is involved, a constraint requiring that all morphemes be realized. In order to satisfy this constraint, dubbed REALIZE-MORPHEME by Kurisu (2001), as well as MAX[NASAL], lower-ranked DEP-RT is violated. Consequently, the floating nasal surfaces as an independent segment. Tableaux (34) and (37) illustrate, with relevant new constraints being introduced in (32)-(33) and (35)-(36). The fact that /i/ is subject to lowering (cf. (30)) means that MAX[NASAL] and the co-occurrence restriction against high nasal vowels outrank height faithfulness: MAX[NASAL], $*_{[\text{HI, NASAL}]}$V » MAX[HI].

32 REALIZE-MORPHEME : Every underlying morpheme must receive some phonological exponence

33 DEP-RT : Every root node in the output is present in the input

34 /ø/ nasalization is preferred to [nasal] deletion; /ø/ is not nasalized before N

/ ʃaʧø^{ŋ}/ 'each-one.masc'	REALIZE MPHEME	MAX [NASAL]	DEP-RT	*$_{[ANT, RND, NAS]}$V	*$_{[O]}$V $_{[N]}$C	DEPPATH [NASAL]
a. [ʃaʧø]		*!				
b. [ʃaʧøŋ]			*!		*	*
c. [ʃaʧœ̃ŋ]			*!	*		**
☞ d. [ʃaʧœ̃]				*		*
/ ʃaʧø^{ŋ} + fem / 'each-one.fem'	REALIZE MPHEME	MAX [NASAL]	DEP-RT	*$_{[ANT, RND, NAS]}$V	*$_{[O]}$V $_{[N]}$C	DEPPATH [NASAL]
e. [ʃaʧø]		*!				
☞ f. [ʃaʧøŋ]			*		*	*
g. [ʃaʧœ̃ŋ]			*	*!		**
h. [ʃaʧœ̃]	*!			*		*

In tableau (34), we compare *chatchun* and *chatcheune*. In the top half of tableau (34), *chatchun*, in the masculine, surfaces with a nasalized front round vowel in spite of the relevant co-occurrence restriction, *$_{[ANT, RND, NAS]}$V, because the alternatives would mean the non-realization of the nasal feature (candidate (a)) or the insertion of a root node (candidates (b) and (c)), both of which would be more costly repairs.[16] Due to a lack of space, candidates in which the violation of the co-occurrence restriction is skirted by changing the quality of the input /ø/ are omitted. Unrounding /ø/ to [e] would violate MAX[ROUND], lowering /ø/ to [a] would violate DEP[LO] (and MAX[ROUND]), and backing /ø/ to [o] would violate MAX[ANTERIOR] and DEP[DORSAL].

In the bottom half of tableau (34), *chatcheune*, in the feminine, satisfies MAX[NASAL] by the presence of a nasal consonant instead of nasality surfacing on the vowel. This is permitted because REALIZE-MORPHEME, the constraint requiring a distinction between the masculine and the feminine, outranks DEP-RT. Of course, candidates (e), (f), and (g) all differ from the masculine (d) and, consequently, satisfy REALIZE-MORPHEME. Candidate (f) is selected over candidates (e) and (g) because it best satisfies the rest of the constraint hierarchy. Importantly, *chatcheune*, unlike *chatchun*, respects the co-occurrence restriction

[16] Note that when /ø/ is nasal, as in candidate (d), it surfaces in classic allomorphic fashion as [œ̃].

and an oral vowel surfaces: the co-occurrence restriction is not violated if nasality can otherwise be realized. We have no explanation for why the final nasal surfaces here as a velar instead of the more usual coronal, other than it being a velar in the input. It is interesting, though, that other *-eune* forms also end in a velar nasal in VP – e.g., *breune* ‘brunette,’ *commeune* ‘common.feminine,’ *eune* ‘one.feminine,’ *forteune* ‘fortune,’ *leune* ‘moon,’ *neune pèrt* ‘nowhere,’ *rintcheune*, ‘grudge’ – and that many of these same words in Galician also exhibit velar nasals (cf. Colina to appear).

35 ONSET : Syllables must have onsets

36 MAX[HI] : Every occurrence of the feature [high] in the input must be present in the output

37 /i/ (lowering &) nasalization is preferred to [nasal] deletion; /i/ is not nasalized before N

/bazi^{n}/ ‘keysmith’s tool’	REALIZE MPHEME	MAX [NASAL]	*$_{[HI, NAS]}$V	ONSET	DEP-RT	*$_{[O]}$V $_{[N]}$C	MAX [HI]	DEPPATH [NASAL]
a. [bazi]		*!						
b. [bazin]					*!	*		*
c. [bazĩn]			*!		*			**
d. [bazĩ]			*!					*
☞ e. [bazɛ̃]							*	*
/bazi^{n} + ø/ ‘to use a *bazin*’	REALIZE MPHEME	MAX [NASAL]	*$_{[HI, NAS]}$V	ONSET	DEP-RT	*$_{[O]}$V $_{[N]}$C	MAX [HI]	DEPPATH [NASAL]
f. [bazi+ø]		*!		*				
☞ g. [bazin+ø]					*	*		*
h. [bazĩn+ø]			*!		*			**
i. [bazĩ+ø]			*!	*				*
j. [bazɛ̃+_]	*!						*	*
k. [bazɛ̃+ø]				*!				

In tableau (37), we compare *bazin* and *bazineu*. *Bazin* is a noun, the word for a tool used by keysmiths; *bazineu* is a verb derived from that noun. The morpheme in question, then, is not the feminine, but the verbal infinitive marker *-eu* (cf. French *-er*). Otherwise, the alternation proceeds in the same way as in the masculine~feminine illustrated in tableau (34). In the morphologically unmarked form (top half of tableau (37)), the requirements that nasality not be deleted and that root nodes not be inserted result, once again, in the nasality surfacing on the vowel. In this case, though, the relevant co-occurrence restriction, *$_{[HI,NAS]}$V, is ranked high enough that even it cannot be violated. Therefore, in order for the nasality to surface on the vowel, the vowel must surface as a non-high vowel. This results in a violation of MAX[HI] and candidate (e) is optimal.

In the morphologically marked form (bottom half of tableau (37)), the morpheme realization constraint is activated and, once again, a root node can be inserted. As a result, nasality can surface off of the vowel as a nasal consonant. In this case, there is no cause to nasalize the vowel, and it remains faithful to its input height specification: candidate (g) is optimal.

This, then, is how /i/s and /ø/s that precede floating nasals can be nasalized in spite of co-occurrence restrictions that otherwise block their nasalization. A question that arises is why only /i/ and /ø/ manifest this behavior; why don't /y/ and /u/ also pattern in this way? We hypothesize that a specific height faithfulness constraint for high round vowels (MAX[HI]/[ROUND] » MAX[HI]) results in the continued relevance of the co-occurrence restriction $*_{[\text{HI, NAS}]}$V.

Now that we have dealt with nasal and nasalized vowels, we return to the issue which largely motivated the preceding discussion of them. It should now be evident how non-alternating nasal vowels, too, could be derived from underlying /V^n/ sequences. Take a form like *vin* [vɛ̃] 'wine,' where the vowel is always and consistently [ɛ̃]. Assuming an underlying form of the type /V^n/, the constraint hierarchy established to this point – and, in particular, the requirements that nasality not be deleted and that root nodes not be inserted – would result in the floating nasal surfacing on the vowel: /vɛ^n/ → [vɛ̃]. It is this analysis of non-alternating nasal vowels that we assume, without further discussion, throughout the remainder of this paper. Thus, our assumptions about nasal vowels in VP very closely mirror those of Paradis & Prunet (2000) for French. This concludes the discussion of nasal(ized) vowels and we turn our attention back to the consonants.

4.2 Consonant nasalization, and the lack thereof

In this section, we discuss the behavior of consonants as they are subject to nasalization. We begin with the stops and conclude with the fricatives.

4.2.1 Stops

As indicated above, stops are nasalized in VP in response to a prohibition against voiced obstruents. The first issue that must be addressed is why voiced obstruents occur so frequently in VP if there is a prohibition against them in the language. The answer is that a faithfulness constraint outranks the prohibition constraint *VOICED OBSTRUENTS. Tableau (40) illustrates.

38 MAX[VOICE] : Every occurrence of the feature [voice] in the input must be present in the output

39 *VOICED OBSTRUENTS : Obstruents are not voiced

40 Voiced obstruents tolerated under ‘normal’ conditions

/tyb/ ‘pipe’	MAX [VOICE]	*VOICED OBSTRUENTS	MAX-SEG
a. [typ]	*!		
b. [ty_]	*!		*
☞ c. [tyb]		*	

Here, we see that voiced obstruents are tolerated under ‘normal’ conditions because the alternatives, devoicing (candidate (a)) or deleting them (candidate (b)), would be worse than leaving them alone: MAX[VOICE] » *VOICED OBSTRUENTS.

That said, voiced obstruents are subject to devoicing during voicing assimilation. This is shown in tableau (44). We follow Lombardi’s (1999) analysis of voicing assimilation and adopt her assimilation-triggering constraint AGREE[VOICE].[17] To show any effect, this constraint must outrank faithfulness for voicing: AGREE[VOICE] » MAX[VOICE], DEPPATH[VOICE]. We also see in this tableau that, still following Lombardi’s analysis, the regressive nature of voicing assimilation can be attributed to onset faithfulness. Thus, a positional faithfulness constraint, too, must outrank the context-free faithfulness constraint(s): AGREE[VOICE], DEPPATH[VOICE]/ONSET » MAX[VOICE], DEPPATH[VOICE].

17 While the problems with AGREE pointed out by McCarthy (2004b: 14-15) may require the adoption of an alternate assimilation-triggering constraint, AGREE is adequate for present illustration.

41 AGREE[VOICE] : Obstruent clusters must agree in voicing

42 DEPPATH[VOICE]/ONSET : Every path associating the feature [voice] to a root node syllabified as an onset in the output is present in the input (i.e. do not spread voicing to an onset)

43 DEPPATH[VOICE] : Every path associating the feature [voice] to a root node in the output is present in the input (i.e. do not spread voicing)

44 Devoicing okay in voicing assimilation

/dpi/ 'since'	AGREE [VOICE]	DEPPATH [VOICE] / ONSET	MAX [VOICE]	*VOICED OBSTRUENTS	DEPPATH [VOICE]	MAX-SEG
a. [d-pi]	*!			*		
b. [d-bi]		*!		**	*	
☞ c. [t-pi]			*			
d. [_pi]			*			*!

In tableau (44), candidate (a) suffers from a non-harmonic obstruent cluster, entailing a fatal violation of AGREE[VOICE]. Candidates (b), (c), and (d) represent three possible strategies for avoiding candidate (a)'s violation of AGREE[VOICE]. Candidate (b) satisfies AGREE[VOICE] by spreading voicing from the appendix (non-onset) [d] to the onset [b] (input /p/) in violation of positional faithfulness. Candidate (c), on the other hand, satisfies AGREE[VOICE] by violating the lower-ranked context-free faithfulness constraint MAX[VOICE], and this course of action proves to be optimal as candidate (d) simplifies the cluster, violating both MAX[VOICE] and MAX-SEG.

Although violations of *VOICED OBSTRUENTS are 'normally' tolerated as in tableau (40), they can be avoided when the voiced obstruent occurs in a nasal context (provided that the voiced obstruent is a stop (fricatives pose an interesting problem of their own, which will be discussed in §4.2.2)). Tableau (46) illustrates with a word-final coda, but it should be perfectly clear that word-internal codas (e.g., *ru<u>d</u>emint* 'roughly' (4c)) and initial appendices (e.g., *<u>d</u>mi* 'half' (4d)) will pattern in exactly the same manner.

45 DEP[SONORANT] : Every occurrence of the feature [sonorant] in the output must be present in the input

46 (Word-final) Stop nasalization

/repɔⁿ+d/ 'to answer'	MAX [VOICE]	*VOICED OBSTRUENTS	MAX-SEG	DEPPATH [NASAL]	DEP [SONORANT]
a. [repɔ̃d]		*!		*	
b. [repɔ̃t]	*!			*	
c. [repɔ̃_]	*!		*	*	
d. [repɔ̃d̃]		*!		**	
☞ e. [repɔ̃n]				**	*

The input to tableau (46) contains a voiced stop. Given that it is in a nasal environment, its violation of *VOICED OBSTRUENTS will prove to be avoidable, as the elimination of candidate (a) shows. Candidate (b) attempts avoidance by devoicing the /d/ to [t]; this, of course, results in a fatal violation of MAX[VOICE]. Candidate (c) attempts avoidance by deleting the segment altogether, resulting, again, in a fatal violation of MAX[VOICE]; here, we might expect that candidate (c)'s fatal violation should be its violation of MAX-SEG, but since there's no way to know where MAX-SEG is ranked with respect to *VOICED OBSTRUENTS (cf. tableau (40)), we rank it near the bottom of the constraint hierarchy (but above DEPPATH[NASAL] according to the ranking argument established in tableau (23)). Candidate (d) attempts avoidance by spreading nasality to the /d/, in violation of low-ranking DEPPATH[NASAL]. However, as the outcome of nasalization in this case is a nasal obstruent, the change has not solved the problem: this candidate continues to violate *VOICED OBSTRUENTS. Candidate (e) follows candidate (d)'s lead, only better: in this candidate, nasality spreads to /d/, again violating DEPPATH[NASAL], but DEP[SONORANT] is also violated, changing /d/ to a nasal sonorant, thereby successfully avoiding the costly violation of *VOICED OBSTRUENTS.

In tableau (48), we see that unlike codas and appendices, voiced onset stops are never nasalized. We saw the effect of onset faithfulness with respect to voicing assimilation in tableau (44), and we see here that it extends to nasal assimilation as well.

47 DEPPATH[NASAL]/ONSET : Every path associating the feature [nasal] to a root node syllabified as an onset in the output is present in the input (i.e., do not spread nasality to an onset)

48 Positional faithfulness blocks onset nasalization

/repɔ^n+d+y/ 'answered'	DEPPATH [NASAL] / ONSET	MAX [VOICE]	*VOICED OBSTRUENTS	DEPPATH [NASAL]	DEP [SONORANT]
☞ a. [re.pɔ̃.dy]			*	*	
b. [re.pɔ̃.ty]		*!		*	
c. [re.pɔ̃.ny]	*!			**	*

In tableau (48), unlike in tableau (46), candidate (a)'s violation of *VOICED OBSTRUENTS is tolerated because devoicing is not an option (candidate (b)) and because nasalizing the voiced obstruent violates positional faithfulness (candidate (c)).

The nasalization of voiced stops as a way of satisfying *VOICED OBSTRUENTS naturally raises the question of whether they can nasalize in an oral context for the same purpose. In other words, even though *VOICED OBSTRUENTS cannot motivate *tube* 'pipe'/tyb/ to surface as *[typ] (cf. tableau (40)), can it motivate /tyb/ to surface as [tym]? This is exactly the type of outcome that Steriade (to appear) suggests is unattested, and VP conforms to that prediction: /tyb/ does not surface as *[tym]. Thus, stop nasalization in VP conforms to the predictions of Steriade's (to appear) P-Map hypothesis, in spite of initial appearances to the contrary. Consequently, it may be that /b/ does not nasalize to [m] in *tube* 'pipe' because of the cross-linguistically inspired bases of the P-Map; nonetheless, here we call upon a narrower-focused, language-specific explanation. The difference between nasalizing a voiced stop in a word like *réponne* 'to answer' /repɔ^{n}d/ → [repɔ̃n] versus nasalizing a stop in a word like *tube* 'pipe' /tyb/ → *[tym] is that in the former nasality need only spread while in the latter nasality must be inserted: [repɔ̃n] violates low-ranking DEPPATH, *[tym] violates high-ranking DEP.

In the preceding discussion, we have presented the essence of our analysis of stop nasalization in VP: although there is a prohibition against them in the language, voiced obstruents are normally tolerated because of a higher-ranking voicing faithfulness requirement; however, in a nasal context, they do not have to be tolerated because they can turn into sonorant nasals in violation of low-ranking faithfulness constraints, DEPPATH[NASAL] and DEP[SONORANT]. This has only been explicitly illustrated with coda nasalization, but it should be clear that appendices are subject to the very same treatment. Stops in onset position, on the other hand, are never nasalized, due to a high ranking positional faithfulness constraint, DEPPATH[NASAL]/ONSET. Nor are stops (in any position) nasalized in an oral context because, here, nasality must be inserted, in violation of high-ranking DEP[NASAL]. There is one remaining issue that must be addressed with respect to the stops before turning to the problem posed by fricatives, and that is the (alleged) non-nasalization of /g/.

Although this is not a quantitative study of variation, it must be noted that there is – or at least that in Vasseur's (1998) description there appears to be – a hierarchy of stop nasalization in which /d/ is the most often and most readily nasalized of the voiced stops (though not categorically), followed by /b/, and then by /g/, which is not nasalized at all. After a quick search of Auger's oral corpus, however, we were able to find a few tokens in which /g/ is nasalized to [ŋ], as in *longue* [lɔ̃ŋ] 'long.feminine' and *langue* [lãŋ] 'language.' A possible explanation for the discrepancy between Vasseur's description and Auger's data with respect to /g/ is language change. Auger's data was recorded some 35 years after Vasseur's dictionary was originally published (the 1998 posthumous publication being, essentially, a reprint of the 1963 edition). It is possible that stop nasalization is generalizing from /d/ to /b/ to /g/. The examples presented in (49) are intended to illustrate this hierarchy of nasalization.

49 <u>Hierarchy of nasalization: /d/ > /b/ > /g/</u>

a	*granne*	/grand+fem/	[grãn]	'big.feminine' [18]
b	*chamme* / *chambe*	/ʃa^{n}br/	[ʃãm] / [ʃãb]	'bedroom'
c	*triangue*	/tria^{n}g/	[triãg]	'triangle'

We approach this hierarchy cautiously, though, because Pooley (1994: 231) found the same /d/ > /b/ > /g/ hierarchy of final devoicing in Roubaix Picard to be 'almost certainly due to the relative frequency of the three classes of sounds in relevant loci rather than to their more general phonological properties.' Therefore, while such a hierarchy can be inferred from Vasseur (1998), it is not impossible that it, too, might be due to the relative frequencies of these sounds in nasal contexts (which would not be to say, of course, that it is not real).

Given that /g/ is never nasalized, at least according to Vasseur's (1998) description of the language, some means of blocking the nasalization of this segment while still allowing the other voiced stops to undergo nasalization must be found. In other words, /g/ is like the high vowels and the front round vowels in that it belongs to a subset of segments that are normally targeted in nasalization, but that, itself, is not (or, at least, is not as much). Since the non-nasalization of /g/ is analogous to the non-nasalization of high vowels and front round vowels, a similar solution is adopted here as there: a co-occurrence restriction that specifically blocks the nasalization of this segment is called upon. We abbreviate this constraint as *[ŋ]. There is a further similarity between the solutions adopted for these two situations. Just as /u/ doesn't lower, /ø/ doesn't unround, and /y/ doesn't lower and unround

[18] Cf. *grandir* /grand + ir/ [grãdir] 'to become big (to grow)'

so as to be able to nasalize, /g/ doesn't change its place of articulation to labial or coronal so that it can nasalize. This is due to a high-ranking place-faithfulness constraint. Tableau (52) shows how stop nasalization is blocked in the case of /g/.

50 Max[dorsal] : Every occurrence of the feature [dorsal] in the input must be present in the output

51 *[ŋ] : No velar nasals

52 /g/ is not nasalized

/tria^{n}g/ 'triangle'	Max [dorsal]	Max [voice]	*[ŋ]	*Voiced Obstruents	DepPath [nasal]	Dep [sonorant]
a. [triãk]		*!			*	
b. [triãŋ]			*!		**	*
c. [triãn]	*!				**	*
☞ d. [triãg]				*	*	

In tableau (52), the /g/ in *triangue* violates *Voiced Obstruents. Of course, devoicing it (candidate (a)) is not an option; this means violating Max[voice]. Based upon the analysis just presented, it might be expected that nasality will spread to /g/, causing it to surface as [ŋ] (candidate (b)). However, this would mean violating the newly-introduced constraint against velar nasals. Nor can /g/ 'shift' its place of articulation in nasalization, thereby avoiding the constraint *[ŋ] (candidate (c)): this course of action violates the place faithfulness constraint Max[dorsal] (and Dep[coronal] (not shown)). Therefore, the faithful candidate (d) surfaces, and in this way /g/ nasalization is blocked. Of course, since we have observed some nasalization of /g/ in VP, this analysis of /g/'s resistance to nasalization will be subject to modification in §5, where we address the question of variation.

A word of caution is in order. It should not be assumed that the constraint *[ŋ] necessarily bans all occurrences of [ŋ] in the language. In fact, we've already seen that [ŋ] does occur, albeit rarely, in VP. Just as [œ̃]s can surface in spite of the co-occurrence restriction banning front round vowels, so can [ŋ]s surface in spite of the co-occurrence restriction *[ŋ]. The key in both cases is that Max[nasal] prevents underlying nasal specifications from being deleted. Tableau (53) illustrates.

53 (Underlying) [ŋ]s are allowed in spite of *[ŋ]

/løŋ/ 'moon'	MAX [NASAL]	MAX [DORSAL]	$*_{[\text{ANT, RND, NAS}]}$V	*[ŋ]	MAX [VOICE]	*VCD OBST	$*_{[\text{O}]}$V $_{[\text{N}]}$C	DEPPATH [NASAL]
a. [løg]	*!					*		
b. [løk]	*!				*			
c. [løn]		*!					*	
d. [lø̃n]		*!	*					*
☞ e. [løŋ]				*			*	
f. [lø̃ŋ]			*!	*				*

Here, there is a velar nasal in the input. Denasalizing it so as to satisfy the constraint against velar nasals (candidate (a)) violates MAX[NASAL] and creates a violation of *VOICED OBSTRUENTS. Of course, this newly-created violation of *VOICED OBSTRUENTS can be avoided if /ŋ/ is denasalized as [k] (candidate (b)). This, though, doesn't help: MAX[NASAL] is still violated, and a violation of MAX[VOICE] adds insult to injury. 'De-velarizing' the /ŋ/ so as to satisfy the constraint against velar nasals (candidates (c) & (d)) violates MAX[DORSAL] (and DEP[CORONAL] (not shown)). Therefore, the underlying velar nasal is allowed to surface faithfully in spite of the resulting violation of *[ŋ]; candidate (e) is selected over candidate (f) because front round vowels should not be nasalized unless the feature [nasal] cannot otherwise surface (MAX[NASAL] » $*_{[\text{ANT, RND, NAS}]}$V » $*_{[\text{ORAL}]}$V $_{[\text{NASAL}]}$C).

Except for the question of variation, deferred until §5, this concludes the discussion of stop nasalization, and the lack thereof. We can now turn to the problem posed by the other voiced obstruents: fricatives.

4.2.2 Fricatives

Unlike voiced stops, voiced fricatives are not subject to nasalization. This is because a voiced nasal fricative (e.g., [z̃], [ʒ̃]) does not cease to be a voiced obstruent, meaning that the change would be ineffective at minimizing *VOICED OBSTRUENT violations; alternatively, the change from a fricative to a sonorant nasal violates MAX[CONTINUANT]. Perhaps more importantly, though, the constraint ranking established to this point offers a less-costly repair than fricative nasalization, but a repair that we don't want to occur. The current constraint hierarchy predicts the unattested phenomenon of (voiced coronal) fricative 'liquification.' That is, /z/ is predicted to 'liquify,' to surface as a liquid: [l] or [r]. This is because DEP[SONORANT] is low-ranking: a necessary condition if voiced obstruent stops are going to be able to surface as sonorant nasals (cf. tableau (46)). Consequently, 'changing' /z/ to [l] or to [r] merely entails a violation of low-ranking DEP[SONORANT]. (The same is not true for the other voiced fricatives, /v/ and /ʒ/, which have different places of articulation than the liquids. With /z/, only DEP[SONORANT] has to be violated during ‘liquification,’ but with /v/ or /ʒ/ presumably high-ranking place faithfulness must also be violated.) Also, /z/ is predicted to ‘liquify’ in both oral contexts and nasal contexts. Tableaux (54) and (55), respectively, illustrate. In these tableaux, as always, the pointing fingers indicate the candidates selected as optimal; the frowning faces mark the attested candidates, the candidates that ‘wanted’ to win but that didn’t (and that, as a result, are sad).

54 Voiced (coronal) fricatives in an oral context

/vaz/ ‘vase’	MAX [VOICE]	*VOICED OBSTRUENTS	DEP [SONORANT]
a. [vas]	*!	[v]	
☹ b. [vaz]		[v][z]!	
☞ c. [var]		[v]	*
☞ d. [val]		[v]	*

Given a voiced fricative in an oral context, as in tableau (54), devoicing it (candidate (a)) results in the now-familiar violation of MAX[VOICE].[19] Candidate (b) is the attested candidate, but the ranking *VOICED OBSTRUENTS » DEP[SONORANT] incorrectly eliminates this candidate to the preference of candidates (c) and (d). The (incorrect) result is /z/ ‘liquification.’

55 Voiced (coronal) fricatives in a nasal context

/ʧɛ^{n}z/ ‘fifteen’	MAX [VOICE]	*VOICED OBSTRUENTS	MAX [CONTINUANT]	DEPPATH [NASAL]	DEP [SONORANT]
a. [ʧɛ̃s]	*!			*	
b. [ʧɛ̃z̃]		*!		**	
c. [ʧɛ̃n]			*!	**	*
☹ d. [ʧɛ̃z]		*!		*	
☞ e. [ʧɛ̃r]				*	*
☞ f. [ʧɛ̃l]				*	*

Likewise, given a voiced fricative in a nasal context, as in tableau (55), devoicing (candidate (a)) is not an option; the resulting fatal violation of MAX[VOICE] has been

19 The voiced fricative of interest in tableau (54) is the coronal /z/. Violations of *VOICED OBSTRUENTS for [v] are included, but all candidates tie on this point.

encountered in numerous tableaux already. Candidates (b) and (c) attempt the strategy of nasalization observed with voiced stops: candidate (b)'s approach to nasalization fails to satisfy *VOICED OBSTRUENTS; candidate (c)'s does, but this results in a fatal violation of MAX[CONTINUANT]. Candidate (d) should surface; this is the attested form. Its violation of *VOICED OBSTRUENTS should be tolerable. However, the ranking *VOICED OBSTRUENTS » DEP[SONORANT] incorrectly eliminates this candidate to the preference of candidates (e) and (f). Again, the (incorrect) result is /z/ 'liquification.'

Therefore, some way of preventing /z/ 'liquification' must be found. A solution to this problem can be found in a pre-OT paper on underspecification by Steriade (1987). She argues that in languages without laterally-released obstruents, there is only 'one class of segments with which the feature [lateral] can freely associate: the consonantal non-nasal sonorants, also known as liquids' (p. 351). In other words, liquids – and only liquids – are specified for the feature [lateral] in such languages: [l] is [+lateral] and [r] is [-lateral]. According to Steriade, this explains why /r/ blocks liquid dissimilation in Latin while none of the other non-laterals do: the rule targets the feature [lateral]. Latin liquid dissimilation is a process in which /l/.../l/ sequences are transformed into [l]...[r] sequences. Thus, *sol-alis* becomes *solaris* 'solar,' *reticul-alis* becomes *reticularis* 'of the net.' However, an intervening /r/ blocks liquid dissimilation; thus *flor-alis* remains *floralis* 'floral,' *litor-alis* remains *litoralis* 'of the shore.' No other segments, e.g., /t/, block liquid dissimilation, though; thus *milit-alis* becomes *militaris* 'military, soldierly.' Steriade's conclusion is that *litoralis* does not violate the OCP-type constraint that is responsible for liquid dissimilation, while *militalis* does (*litoralis* is [+lateral] [-lateral] [+lateral]; *militalis* is [+lateral] [+lateral]). Based upon Steriade's arguments, we posit that DEP[LATERAL] rules out /z/ 'liquification.' This is shown in tableau (57).

56 DEP[LATERAL] : Every occurrence of the feature [lateral] in the output must be present in the input

57 DEP[LATERAL] blocks /z/ 'liquification'

/tʃɛ^{n}z/ 'fifteen'	DEP [LATERAL]	MAX [VOICE]	*VOICED OBSTRUENTS	MAX [CONTIN]	DEPPATH [NASAL]	DEP [SON]
a. [tʃɛ̃s]		*!			*	
b. [tʃɛ̃z̃]			*		**!	
c. [tʃɛ̃n]				*	**!	*
☞ d. [tʃɛ̃z]			*		*	
e. [tʃɛ̃r]	*!				*	*
f. [tʃɛ̃l]	*!				*	*

Tableau (57) is identical to tableau (55) except that we have added the constraint DEP[LATERAL] and its violations to the constraint hierarchy. This allows us to eliminate the previously incorrectly-selected candidates (e) and (f): candidate (e) violates DEP[LATERAL] because [r] is [-lateral]; candidate (f) violates DEP[LATERAL] because [l] is [+lateral].[20] Therefore, candidate (d) is correctly selected as optimal. In the same way, DEP[LATERAL] eliminates the previously incorrectly-selected candidates (c) and (d) in tableau (54) and we have solved the problem of fricative 'liquification.' Of course, borrowing from the solution to one problem in one language in order to solve another problem in another language must be done cautiously; but we believe that the direct ancestry between Latin and VP validates invoking DEP[LATERAL] to rule out fricative 'liquification' in VP: if, as argued by Steriade (1987), the liquids were the sole class of segments where both values of the feature [lateral] were allowed in Latin, Picard's parent language, then it is plausible that this remained to be the case in VP.

The analysis of vowel and stop nasalization in VP is now complete. Before turning to the question of variation in §5, an unresolved issue for future research is introduced in the next section: the question of domains of application, which the preceding presentation has abstracted away from.

4.3 A Problem for future research

Although it was never explicitly stated, the assumption here has been that nasalization is a word-level process in VP, where 'word-level' can tentatively be loosely interpreted as a word+clitic 'domain.' For instance, when the preposition /d/ 'of, from' is cliticized to a grammatical word, it is subject to nasalization, as in *coup* [n]*'main* 'helping hand' (cf. a faithful /d/ in *coup* [d]*'langue* 'gossip (noun)' and a devoiced /d/ in *coup* [t]*'poing* 'punch (noun)'). There are two main pieces of evidence that nasalization is a 'word-level' process. First, neither vowels nor stops are nasalized across word boundaries, as we see in (58)-(59). Second, word-final stops are often – though not always – nasalized even when *enchaînement* 'pulls' them into the onset of a following vowel-initial word, as we see in (60)-(62).

58	*ch'est min* [ʃe mɛ̃] *grand-pére à mi* [a mi]	'that's my grandfather'
59	*l'diabe n'est* [l-djab nɛ] *poé pire*	?? lit: 'the Devil's [Hell's] not worse'
60	*j'ai peu vir et pis intènne ein* [ɛ̃tɛ̃.nɛ̃] *molè*	'I could see and hear a little'
61	*l'monne est* [mɔ̃.nɛ] *piot*	'the world is small'
62	*tout l'monde est* [mɔ̃.dɛ] *parti*	'everybody left'

20 If the difference between /l/ and /r/ is not that these are [+lateral] and [-lateral], respectively, but that /l/ is [lateral] while /r/ is [rhotic], for example (cf. Steriade 1995: 154), then candidate (e) in tableau (57) could be eliminated on the grounds that it violates DEP[RHOTIC]. (Candidate (f) would continue to be ruled out for violating DEP[LATERAL].)

If nasalization was not a ‘word’-level process, then in the expression *rond d’pieud* (the word for a tool used by blacksmiths) we would expect nasality to spread progressively from [ɔ̃] across a word boundary to /d/. Tableau (63) illustrates.

63 Nasalization is less costly than devoicing

/rɔnd d pjø/ ‘blacksmith’s tool’	AGREE [VOICE]	MAX [VOICE]	*VOICED OBSTRUENTS	DEPPATH [NASAL]	DEP [SONORANT]
a. [rɔ̃ d pjø]	*!		*	*	
☞ b. [rɔ̃ n pjø]				**	*
☹ c. [rɔ̃ t pjø]		*!		*	

Candidate (a) fatally violates the voicing assimilation constraint; candidate (b) satisfies this constraint by making it inapplicable (since AGREE[VOICE] applies only to obstruent clusters) and candidate (c) satisfies it by devoicing /d/ to [t]. As MAX[VOICE] outranks DEPPATH[NASAL] and DEP[SONORANT], candidate (c) is incorrectly eliminated and candidate (b) is incorrectly selected as optimal in tableau (63).

Since, all else being equal, nasalization violates lower ranked constraints than devoicing, as illustrated in tableau (63), all else must not be equal. It would seem that spreading nasality into the clitic+word domain violates a high-ranking faithfulness constraint that devoicing within that domain does not violate. The effect of this domain-specific faithfulness constraint is depicted in tableau (65), where curly brackets { } mark off domain boundaries.

64 DEPPATH[NASAL]$_{\text{DOMAIN}}$: Every path associating the feature [nasal] to a root node in the relevant domain in the output is present in the input (i.e., do not spread nasality from one domain into the relevant domain)

65 No spreading nasality from one domain to another

/rɔnd d pjø/ ‘blacksmith’s tool’	DEPPATH [NASAL]$_{\text{DOMAIN}}$	AGR [VCE]	MAX [VCE]	*VOICED OBSTRUENTS	DEPPATH [NASAL]	DEP [SON]
a. [{rɔ̃}#{d pjø}]		*!		*	*	
b. [{rɔ̃}#{n pjø}]	*!				**	*
☞ c. [{rɔ̃}#{t pjø}]			*		*	

In this tableau, candidate (a) continues to be eliminated for its non-harmonic obstruent cluster. The newly-introduced faithfulness constraint allows us to capture the observation that the nasal feature which spreads to the preposition /d/ in candidate (b) resides outside of the relevant domain. Thus, candidate (c) is retained as the optimal candidate and we observe voicing assimilation instead of nasal assimilation.

Although we have posited that the domain in question be loosely-interpreted as a word-level domain, the question of precisely what it is and how it should be defined is left aside for future research.

5 Accounting for Variation

In this section, the preceding analysis is modified ever so slightly in order to account for variability in nasalization. Since this is not a quantitative study of variation, it is not possible to say to what extent each of the voiced stops is or is not nasalized. What is certain, though, is that none of them exhibits categorical behavior, in spite of the analysis presented in §4, where /b/ and /d/ are predicted to surface categorically as [m] and [n] in nasal environments and where /g/ is predicted never to surface as [ŋ], even in a nasal environment. This is definitely not the case: sometimes /b/ and /d/ surface as [m] and [n], other times as [b] and [d]; sometimes /g/ surfaces as [g], other times as [ŋ]. While the following treatment of variation is necessarily limited to not predicting categorical outputs, this will be done in a manner consistent with the /d/ > /b/ > /g/ hierarchy introduced in §4.2.1 (cf. (49)).

In order to allow these multiple outputs, a constraint favoring faithfulness must on occasion outrank and on occasion be outranked by a constraint favoring nasalization. For example, the non-nasalization of /g/ is achieved by the ranking *[ŋ] » *VOICED OBSTRUENTS established in tableau (52), and the nasalization of /g/ to [ŋ] would be allowed by reversing this ranking: *VOICED OBSTRUENTS » *[ŋ] (to be illustrated in tableau (66)). Of course, in 'traditional' OT such a situation is forbidden: constraint rankings are fixed on a language-specific basis, meaning that if a constraint, C1, outranks another constraint, C2, then C2 cannot ever outrank C1 (but cf. Hammond 1994, 2000 for a view of allowing multiple outputs in such a system). Fortunately, it has been proposed that this tenet needs to be relaxed precisely to account for matters of variation and related acquisitional issues.

One means of achieving variable constraint rankings is via floating constraints (Nagy & Reynolds 1997, Reynolds 1994). If a constraint F 'floats' with respect to the constraint subhierarchy A » B » C, then four possible constraint rankings emerge:

[F] » A » B » C
A » [F] » B » C
A » B » [F] » C
A » B » C » [F]

Thus, the floating constraint F can both outrank and be outranked by each of the constraints A, B, and C.

A second means of achieving variable constraint rankings is via crucial nonrankings

(Anttila 1997). If 3 constraints, A, B, and C, are crucially unranked, then 3! (=6) constraint rankings emerge:

A » B » C
A » C » B
B » A » C
B » C » A
C » A » B
C » B » A

Thus, each of the three constraints can both outrank and be outranked by each of the other two constraints. Anttila (1997: 48) notes that the possibility of this type of situation is acknowledged by Prince and Smolensky (1993/2002) themselves.

A third means of achieving variable constraint rankings is via overlapping constraints (Boersma 1998, Boersma & Hayes 2001, Hayes 2000, Hayes & MacEachern 1998). If constraints are ranked on a continuous scale, as opposed to a discrete ordinal scale, and if the ranking values of the constraints are perturbed by a certain amount of 'noise' at evaluation time, then constraints will span ranges.[21] Constraints that are sufficiently far from each other on the ranking scale will exhibit discrete rankings in spite of the ranges that they span, as in traditional OT, while those that are close enough to each other will have overlapping ranges, as in stochastic OT. Overlapping constraints might 'switch' places on the ranking scale for a given evaluation based upon the specific values selected from the delimited ranges. This is illustrated in Figure 1. Here, the symbols ■, ●, and ▲ represent the specific 'values' assigned to Constraints A, B, and C, respectively, at the time of evaluation from within their ranges of possible values. (Specific ranking values are randomly selected from within their delimited ranges, yielding normal distributions: values in the body of the range near the constraint's 'pure' ranking value will be selected more often than values in the tails. Ideally, our illustration in Figures 1 and 2 should reflect this and show overlapping Bell curves (cf. Boersma & Hayes 2001), however, due to technical limitations we simplify our illustrative model.) Clearly, the specific ranking value assigned to constraint A is without consequence; this constraint always outranks both constraints B and C. (Actually, given normal distributions, with their infinitely-extending tails, even constraint A overlaps with constraints B and C. Thus, the rankings A » B and A » C, too, are theoretically reversible; but the probability that the ranking A » B or A » C will be reversed is 'vanishingly low' (Boersma & Hayes 2001: 50).) Constraints B and C, however, overlap – represented by the cross-hatched zone – and when both of the constraints are evaluated within this overlapping zone, it is possible (as in Figure 1.F), but not required (as in Figure 1.E), that the basic constraint ranking will be reversed.

---

21 Boersma & Hayes (2001) are very explicit in stating that the noise factor is a constant. Consequently, all constraints span equal-sized ranges; it is not possible for one constraint to be more spread out, so to speak, than another. This, they argue, is exactly what would be required in order to achieve the results of floating constraints, therefore they reject floating constraints. More on this, though, in footnote 23.

Figure 1: Overlapping & Non-Overlapping Constraints, with Evaluation Points

Figure 1.A: Both B & C evaluated in the middle of their respective spans : B » C

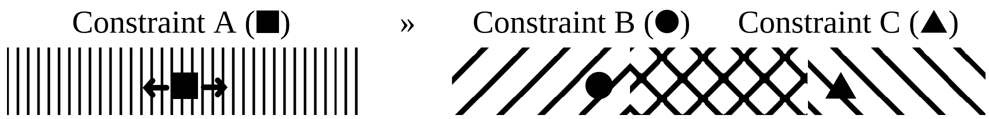


Figure 1.B: Both B & C evaluated at the high end of their respective spans : B » C

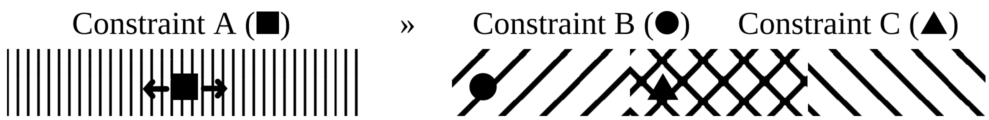


Figure 1.C: Both B & C evaluated at the low end of their respective spans : B » C

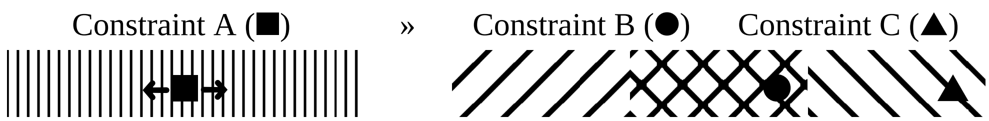


Figure 1.D: B at the high end of its span with C at the low end of its span : B » C

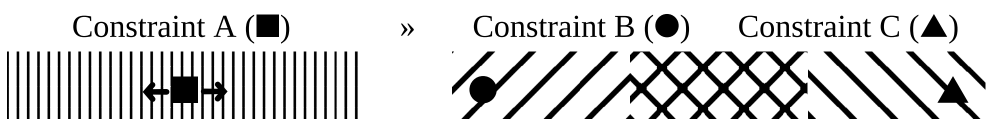


Figure 1.E: B at the lower end of its span with C at the higher end of its span : B » C

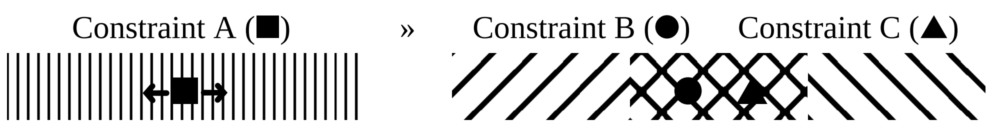
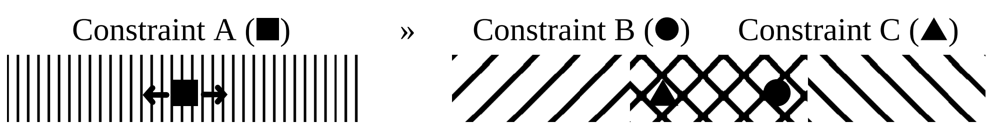


Figure 1.F: B in the lowest end of its span with C in the highest end of its span : C » B



Thus, a constraint (e.g., B) can both outrank and be outranked by another constraint (e.g., C). The relative probability of the ranking B » C vs C » B will depend on precisely how close to each other on the ranking scale the two (or three or four...) relevant constraints are. The closer they are, the more they will overlap and the easier it will be for the basic ranking (e.g., B » C) to be reversed. In Figure 1, constraints B and C overlap fairly little, making the reversed ranking of C » B fairly rare.

It is this third approach to variation which is adopted here. The reason for this is that, more than the other two approaches, it allows for fine-grained probabilistic predictions, which, although we are not presently concerned with these, we may be at some future point.[22]

We begin our treatment of variation with the velar stop, /g/. In the analysis presented in §4.2.1, the nasalization of this segment was categorically blocked by the ranking *[ŋ] » *VOICED OBSTRUENTS. Therefore, in order to allow /g/ to be nasalized on occasion, the nasalization-triggering constraint *VOICED OBSTRUENTS and the faithfulness-to-g constraint *[ŋ] must be in the type of overlapping relationship illustrated for constraints B and C in Figure 1 above. When *[ŋ] outranks *VOICED OBSTRUENTS, /g/ surfaces faithfully as [g]; when *VOICED OBSTRUENTS outranks *[ŋ], /g/ is nasalized to [ŋ]. Tableau (66) illustrates.

66 Variation in /g/ nasalization

/la^{n}g/ 'language'	*[ŋ]	*VOICED OBSTRUENTS	DEPPATH [NASAL]	DEP [SONORANT]
☞ a. [lãg]		*	*	
b. [lãŋ]	*!		**	*

/la^{n}g/ 'language'	*VOICED OBSTRUENTS	*[ŋ]	DEPPATH [NASAL]	DEP [SONORANT]
a. [lãg]	*!		*	
☞ b. [lãŋ]		*	**	*

Similarly, in order to account for the less-than-categorical nature of /b/ nasalization, the nasalization-triggering constraint *VOICED OBSTRUENTS and a faithfulness-to-b constraint must overlap. Following the model of *[ŋ], we abbreviate the relevant

22 This is not to say that the frequency one variant will occur over another cannot be predicted using floating constraints or crucially unranked constraints. Quite to the contrary. For instance, given the four rankings that emerge from constraint F floating over constraints A » B » C, a variant that relies on the ranking F » A is predicted to surface 25% of the time (1 ranking out of 4) whereas a variant that relies on the ranking A » F is predicted to surface 75% of the time (3 rankings out of 4). Similarly, a variant that relies on F » B should surface 50% of the time (2 rankings out of 4) and a variant that relies on B » F should surface 50% of the time (2 rankings out of 4). Likewise, given the six rankings that result from constraints A, B, and C being crucially unranked, a variant that requires the ranking A » B is predicted to surface 50% of the time (3 rankings out of 6), and a variant that requires constraint C to be outranked by both constraints A and B is predicted to surface 33% of the time (2 rankings out of 6). However, the precision of the predictions in each of these two frameworks is directly limited by the number of constraints involved. The same is not true in the overlapping constraints framework where the predictions can be very precise regardless of how many constraints are involved, even if it's only two.

faithfulness-to-b constraint as *[m]. Tableau (68) illustrates.

67 *[m] : No labial nasals

68 Variation in /b/ nasalization

/ tɔ^{n}b / ‘(he) falls’	*[ŋ]	*[m]	*VOICED OBSTRUENTS	DEPPATH [NASAL]	DEP [SONORANT]
☞ a. [tɔ̃b]			*	*	
b. [tɔ̃m]		*!		**	*

/ tɔ^{n}b / ‘(he) falls’	*[ŋ]	*VOICED OBSTRUENTS	*[m]	DEPPATH [NASAL]	DEP [SONORANT]
a. [tɔ̃b]		*!		*	
☞ b. [tɔ̃m]			*	**	*

Finally, in order to account for the less-than-categorical nature of /d/ nasalization, the nasalization-triggering constraint *VOICED OBSTRUENTS and a faithfulness-to-d constraint must overlap. Again following the model of *[ŋ] and *[m], we abbreviate the relevant faithfulness-to-d constraint as *[n]. Tableau (70) illustrates.

69 *[n] : No coronal nasals

70 Variation in /d/ nasalization

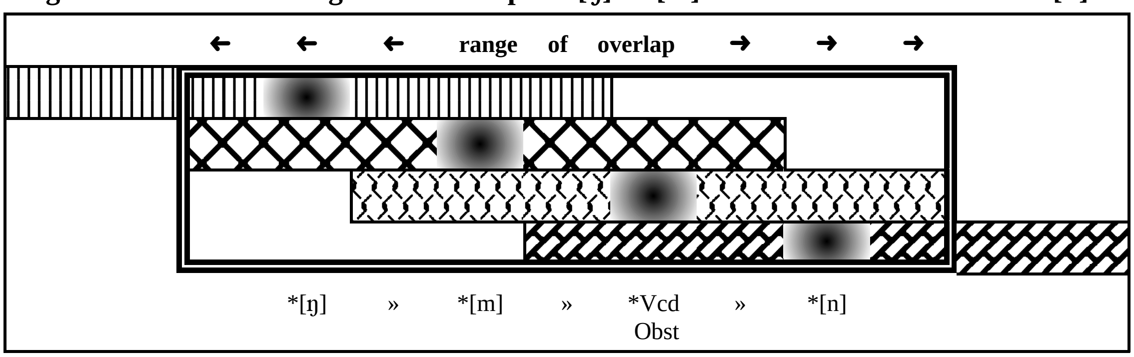
/mɔ^{n}d/ ‘world’	*[ŋ]	*[m]	*[n]	*VOICED OBSTRUENTS	DEPPATH [NASAL]	DEP [SONORANT]
☞ a. [mɔ̃d]				*	*	
b. [mɔ̃n]			*!		**	*

/mɔ^{n}d/ ‘world’	*[ŋ]	*[m]	*VOICED OBSTRUENTS	*[n]	DEPPATH [NASAL]	DEP [SONORANT]
a. [mɔ̃d]			*!		*	
☞ b. [mɔ̃n]				*	**	*

To summarize, in order to account for variation in stop nasalization, we rely upon overlapping (‘stochastic’) constraint rankings between the constraint responsible for triggering stop nasalization, *VOICED OBSTRUENTS, and a series of markedness constraints that militate against this nasalization, *[ŋ], *[m], and *[n]. In one ranking, *VOICED OBSTRUENTS » *[N], voiced stops are nasalized in order to avoid violating the prohibition against voiced obstruents; in the other ranking, *[N] » *VOICED OBSTRUENTS, they surface faithfully because the prohibition against them is less important. What we have, then, is a situation in which four constraints are close enough to each other on the ranking scale such that the noise factor introduced at evaluation time can result in any of these constraints outranking or being outranked by any other of them.[23]

Figure 2 schematizes the overlapping ranges of these four constraints. The 'black hole' at the center of each constraint range represents the 'pure' ranking value of that constraint in the hierarchy. Its actual value for any given evaluation, of course, can be selected from anywhere within its range. Here, the basic ranking assumed is *[ŋ] » *[m] » *VOICED OBSTRUENTS » *[n], but this is not required; these four constraints can have any basic ranking and the possible outcomes will be the same. Also, the four constraints are assumed to be equally 'spaced,' but this is not required, either. (It's very important here not to confuse the spacing, or the distance, between constraints with the ranges that they span.) The only thing that modifying the basic ranking or the distance between constraints in that ranking will change is the probability of nasalization vs non-nasalization of any given stop in any given case. The ranking assumed here merely reflects the /d/ > /b/ > /g/ hierarchy of nasalization described by Vasseur (1998).

Figure 2: Constraint ranges and overlap in *[ŋ] » *[m] » *VOICED OBSTRUENTS » *[n]



---

23 As is clear from examining tableaux (66), (68), and (70), the situation resulting from overlap between *[ŋ], *[m], *VOICED OBSTRUENTS, and *[n] looks virtually identical to what it would look like if *VOICED OBSTRUENTS floated with respect to *[ŋ] » *[m] » *[n]. Therefore, we have to wonder if the arguments that Boersma & Hayes (2001) provide against floating constraints are the right ones (cf. footnote 21). This is not to suggest, of course, that floating constraints and overlapping constraints have the same theoretical status. For instance, it is possible (albeit very unlikely) to get [dmãŋ] from hypothetical /dma^{n}g/, where /g/ nasalizes but /d/ doesn't, if *[ŋ] » *[m] » *VOICED OBSTRUENTS » *[n] all span overlapping ranges; but it is not possible to get this output if *VOICED OBSTRUENTS floats with respect to *[ŋ] » *[m] » *[n].

6 Conclusion

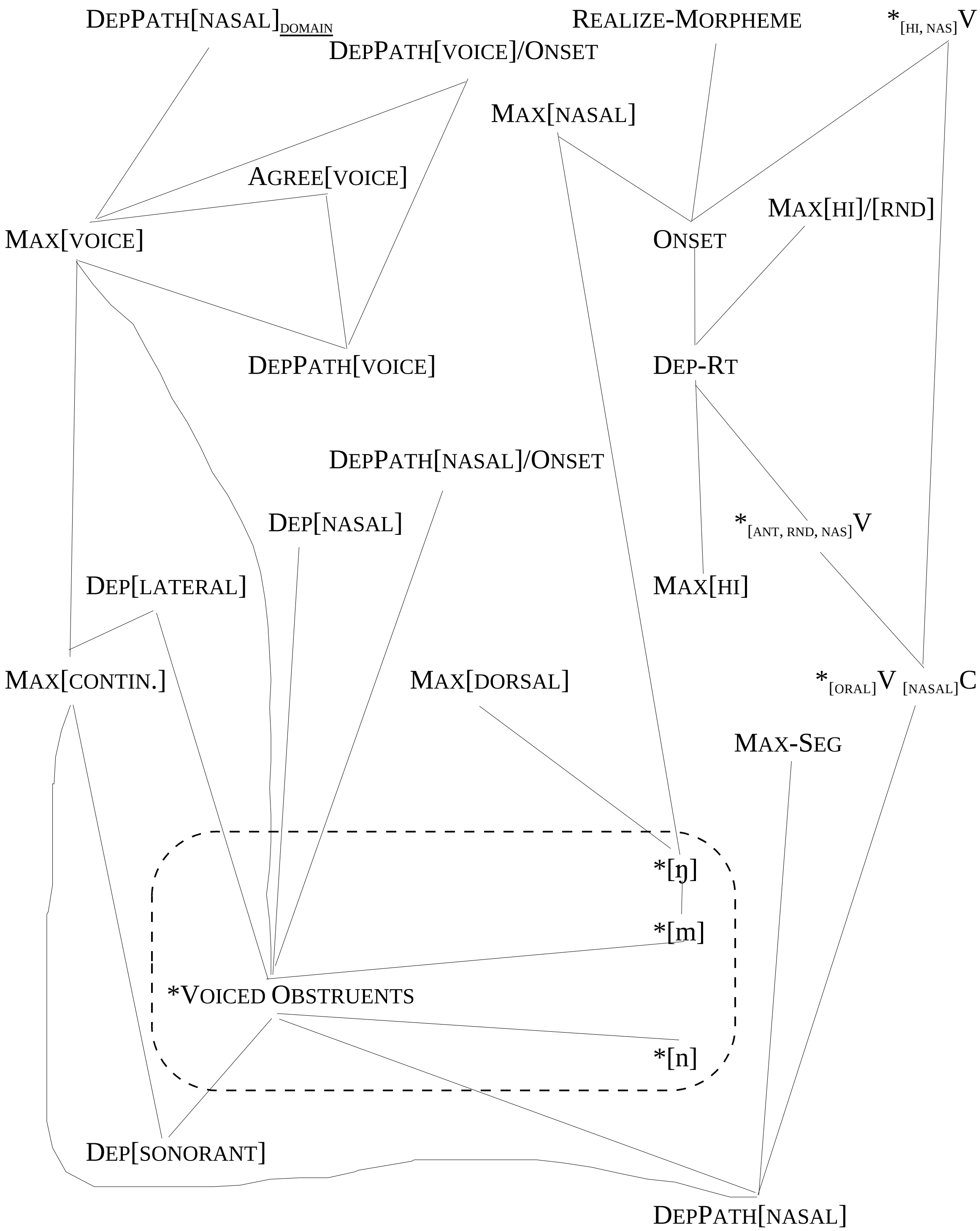
In this paper, the nasalization of voiced stops in VP has been analyzed as resulting from a constraint against voiced obstruents, a constraint which is most often responsible for obstruent devoicing. In a nasal environment, nasality can spread to voiced stops, turning them into nasals and ultimately satisfying the constraint against voiced obstruents. Variation observed in this phenomenon is attributed to overlapping, stochastic constraint rankings. Under 'normal' conditions, or when they're in onset position, however, voiced obstruents are tolerated because of higher-ranking faithfulness requirements. This analysis straightforwardly accounts for why only voiced stops – and not voiceless stops, liquids, or glides – are targeted in nasalization. An undesirable outcome of the analysis is that voiced (coronal) fricatives are predicted to surface as liquids in order to avoid violating the constraint against voiced obstruents. However, by following Steriade (1987) and assuming that liquids – and only liquids – are specified for the feature [lateral], this problem can be solved easily with the constraint DEP[LATERAL].

This analysis might, at first, seem at odds with Steriade's (to appear) P-Map hypothesis and associated claim that nasalization is unattested as a response to voicing restrictions. While our data does require reevaluating the claim about nasalization being an unattested reaction to voicing restrictions, it is not in conflict with the P-Map hypothesis. First, VP /tyb/ surfaces faithfully as [tyb] (*tube* 'pipe'), and not as *[tym], just as Steriade predicts /tœb/ should never surface as *[tœm]. Second, we suspect that Steriade would agree that in some contexts – particularly in a nasal environment – the degree of 'confusability' of [b] and [m] might be higher than that of [b] and [p], the degree of 'confusability' of [d] and [n] might be higher than that of [d] and [t]. Consider, for example, the process of nasal flapping in English, where words such as *county*, *Donder* (as in Santa's reindeer), *hunter*, and *internet* are frequently pronounced approximately as [kaʊni], [danɚ], [hʌnɚ], and [ɪnɚnɛt], respectively, and where the phrase *plant it* is pronounced the same as the word *planet*. It seems reasonable to posit that in such cases, T/D and N would be judged as – and would have to be considered – more similar to each other than would T and D.

In this paper the nasalization of vowels has also been addressed. They are nasalized in VP because of a constraint specifically prohibiting oral vowels from immediately preceding a nasal consonant. Perhaps the most interesting aspect of vowel nasalization in VP is that although higher-ranking co-occurrence restrictions block the nasalization of high vowels and front round vowels, (some of) these segments can, nonetheless, be nasalized under certain conditions. Specifically, /i/ and /ø/ can be nasalized when the only way for an underlying [nasal] feature to be realized is for it to surface on the vowel. In the case of /i/, the underlying height specification is lost and the vowel surfaces as a mid nasal vowel, thereby respecting the co-occurrence restriction against high nasal vowels. The nasalization of /i/ and /ø/ in spite of relevant co-occurrence restrictions, a result attested in [Ṽ] ~ [VN] alternations, benefits from feature-based faithfulness and relies crucially on the postulation of floating nasals in underlying /V^n/ sequences. This representation is extended to non-alternating nasal vowels as well; thus, the unfaithful mapping of /V^n/ → [Ṽ] posited for non-alternating nasal vowels takes a 'free ride' (McCarthy 2004a) on what is required for [Ṽ] ~ [VN] alternations. While McCarthy's (2004a) concern is those cases where such a generalization is required in order for learners to construct the correct grammar, it is likely that in the case of VP this generalization is not a requirement in the same way. Thus, it may constitute what McCarthy (2004a: 11-16) calls a free ride to nowhere. Nonetheless, a free ride is posited here for the sake of representational consistency.

Figure 3 summarizes the constraint rankings established in the preceding analysis. High-ranking constraints appear at or near the top of the figure and low-ranking constraints appear at or near the bottom of it. Strict domination – based upon the 'pure' ranking values of all constraints – is indicated by the links connecting one constraint to another. Whether a link attaches to the top or the bottom of a constraint indicates whether it is dominated by or dominates the other constraint(s). Normally, this goes without saying; however, some of the constraints are particularly close to each other and the line indicating their dominance relations is nearly horizontal. In these cases, it is important to look at precisely how one constraint is connected to the other. So, MAX[NASAL], near the top center of the figure, outranks *[ŋ] and ONSET. By transitivity, then, MAX[NASAL] also outranks *[m], *VOICED OBSTRUENTS, DEP[SONORANT], DEPPATH[NASAL], and *[n]; DEP-RT, MAX[HI], $*_{[\text{ANT, RND, NAS}]}$V, $*_{[\text{ORAL}]}$V $_{[\text{NASAL}]}$C, and DEPPATH[NASAL] (again). Considered alternatively, ONSET, for example, is outranked by MAX[NASAL], REALIZE-MORPHEME, and $*_{[\text{HI,NAS}]}$V. Constraints for which a ranking relationship could not be determined (e.g., DEPPATH[VOICE]/ONSET and AGREE[VOICE]; MAX[VOICE] and MAX-SEG; among many others) are left unconnected in the figure. The figure should not be interpreted to be 'to scale' in that the vertical proximity of any two constraints in the figure does not necessarily indicate their relative proximity to each other on the ranking scale; however, those constraints that are close enough to each other to overlap, as discussed in §5, are intentionally positioned fairly close to each other in the figure. These are 'circled' with a broken line. Once again, the ranking of these four overlapping constraints that we assume (but have not proven) is: *[ŋ] » *[m] » *VOICED OBSTRUENTS » *[n] .

Figure 3 : Constraint Rankings



References

Anttila, Arto (1997). Deriving variation from grammar. In Frans Hinskens, Roeland van Hout, and W. Leo Wetzels (eds.). *Variation, Change, and Phonological Theory*. Amsterdam: John Benjamins. 35-68.

Auger, Julie (2001). Phonological variation and Optimality Theory: Evidence from word-initial vowel epenthesis in Vimeu Picard. *Language Variation and Change* **13**. 253-303.

Beckman, Jill (1999). *Positional Faithfulness: An Optimality Theoretic treatment of phonological asymmetries*. New York: Garland. (Rutgers Optimality Archive #234, http://roa.rutgers.edu/.)

Beddor, Patrice Speeter (1993). The perception of nasal vowels. In Huffman, Marie K. and Rena A. Krakow (eds.). *Phonetics and Phonology, Volume 5: Nasals, Nasalization, and the Velum*. San Diego: Academic Press. 171-196.

Bhatt, Parth and Emmanuel Nikiema (2000). Le Statut de la nasalité en créole de Sainte-Lucie. *Revue Québécoise de Linguistique* **28**. 23-45.

Boersma, Paul (1998). *Functional Phonology: Formalizing the Interactions between Articulatory and Perceptual Drives*. PhD dissertation, University of Amsterdam.

Boersma, Paul and Bruce Hayes (2001). Empirical tests of the Gradual Learning Algorithm. *LI* **32**. 45-86.

Booij, Geert (1983/1984). French C/Ø alternation, extrasyllabicity and lexical phonology. *The Linguistic Review* **3**. 181-207.

Cassimjee, Farida and Charles Kisseberth (1998). Optimality Domains Theory and Bantu tonology: A Case study from Isizhosa and Shingazidja. In Larry Hyman and Charles & Kisseberth (eds.). *Theoretical aspects of Bantu tone*. Stanford: CSLI. 33-132.

Clements, George N. and Samuel J. Keyser (1983). *CV Phonology: A generative theory of the syllable.* Cambridge: The MIT Press.

Colina, Sonia (to appear). Syllabic affiliation of intervocalic velar nasals in Galician. In Julie Auger, J. Clancy Clements, and Barbara Vance (eds.). *Contemporary Approaches to Romance Linguistics: Selected Papers from the 33rd Linguistic Symposium on Romance Languages (LSRL), Bloomington, Ind., April 2003*.

Dauby, Jean (1979). *Le Livre du "Rouchi" : Parler Picard de Valenciennes*. Amiens: Musée de Picardie.

Davis, Stuart (2000). The Flowering of Optimality Theory: Ponapean nasal substitution and the problem of intermediate forms. *Studies in Phonetics, Phonology and Morphology* **6**. 249-305.

Dawson, Alain (2002). *Le "chtimi" de poche: Parler du Nord et du Pas-de-Calais*. Chennevières-sur-Marne: Assimil.

Dekkers, Joost, Frank van der Leeuw, and Jeroen van de Weijer (eds.) (2000). *Optimality Theory: Phonology, Syntax, and Acquisition*. Oxford: Oxford University Press.

Dell, François and Elisabeth Selkirk. (1978). On a morphologically governed vowel alternation in French. In Samuel Keyser (ed.). *Recent Transformational Studies in*

European Languages. Cambridge: MIT Press. 1-51.
Downing, Laura J. (2000). Morphological and prosodic constraints on Kinande verbal reduplication. *Phonology* **17**. 1-38.
Encrevé, Pierre (1983). La Liaison sans enchaînement. *Actes de la recherche en sciences sociales* **46**. 39-66.
Féry, Caroline (2003). Markedness, faithfulness, vowel quality and syllable structure in French. *French Language Studies* **13**. 247-280.
Francard, Michel (1984). Phénomènes de sandhi dans le wallon de Tenneville: Une Règle de dévoisement en finale de syllabe dans les pronoms personnels clitiques? *Cahiers de l'Institut Linguistique de Louvain* **8**. 139-151.
Hajek, John (1993). Old French nasalization and universals of sound change. *French Language Studies* **3**. 145-164.
Hammond, Michael (1994). An OT account of variability in Walmatjari stress. Ms, University of Arizona. Rutgers Optimality Archive #20, http://roa.rutgers.edu/.
Hammond, Michael (2000). The logic of Optimality Theory. *Proceedings of the Western Conference on Linguistics* **28**. 146-162. (Rutgers Optimality Archive #390, http://roa.rutgers.edu/.)
Hanson, Kristin and Sharon Inkelas (eds.) (to appear). *The Nature of the Word: Essays in Honor of Paul Kiparsky*. Cambridge: The MIT Press.
Hayes, Bruce (2000). Gradient well-formedness in Optimality Theory. In Dekkers, van der Leeuw, and van de Weijer (2000). 88-120.
Hayes, Bruce. and Margaret MacEachern (1998). Quatrain form in English folk verse. *Lg* **74**. 473-507.
Hyman, Larry (1985). *A Theory of Phonological Weight*. Dordrecht: Foris.
Inkelas, Sharon and Young-mee Yu Cho (1993). Inalterability as prespecification. *Lg* **69**. 529-574.
Iskrova, Iskra and Albert Valdman (2001). An Optimality Theoretic Account of Nasality in Haitian Creole. Paper presented at the Annual Meeting of the Society for Pidgin and Creole Linguistics, San Francisco. 5 January.
Itô, Junko, Armin Mester, and Jaye Padgett (1995). Licensing and underspecification in Optimality Theory. *LI* **26**. 571-613.
Kurisu, Kazutaka (2001). *The Phonology of morpheme realization*. PhD dissertation, University of California, Santa Cruz. (Rutgers Optimality Archive #490, http://roa.rutgers.edu/.)
Ledieu, Alcius (1909). *Petite Grammaire du Patois Picard*. Paris: H. Welter. (Reprinted 2003 by Bouhet: La Decouvrance.)
Lombardi, Linda (1999). Positional faithfulness and voicing assimilation in Optimality Theory. *NLLT* **17**. 267-302.
Lombardi, Linda (2001a). Why place and voice are different: Constraint-specific alternations in Optimality Theory. In Lombardi (2001b). 13-45.
Lombardi, Linda (ed.) (2001b). *Segmental Phonology in Optimality Theory: Constraints and Representations*. Cambridge: Cambridge University Press.

Mahieu, Paul (1984). *El Patois d'ichi et comint qu'in s'in sert: Notes de grammaire sur le patois picard de Tournai et des environs.* Tournai: Section dialectale de la Maison de la Culture de Tournai.

McCarthy, John J. (1997). Process-specific constraints in Optimality Theory. *LI* **28**. 231-251.

McCarthy, John J. (2000). Faithfulness and Prosodic Circumscription. In Dekkers, van der Leeuw, and van de Weijer (2000). 151–189. (Rutgers Optimality Archive #201, http://roa.rutgers.edu/)

McCarthy, John J. (2002). *A Thematic guide to Optimality Theory*. Cambridge: Cambridge University Press.

McCarthy, John J. (2004a). Taking a free ride in morphophonemic learning. Ms, University of Massachusetts, Amherst. Rutgers Optimality Archive #683, http://roa.rutgers.edu/.

McCarthy, John J. (2004b). Headed spans and autosegmental spreading. Ms, University of Massachusetts, Amherst. Rutgers Optimality Archive #685, http://roa.rutgers.edu/.

McCarthy, John J. and Alan S. Prince (1994). The Emergence of the unmarked: Optimality in Prosodic Morphology. *NELS* **24**. 333-379.

McCarthy, John J. and Alan S. Prince (1995). Faithfulness and reduplicative identity. *University of Massachusetts Occasional Papers in Linguistics* **18**. 249-384.

McCarthy, John J. and Alan S. Prince (1999). Faithfulness and identity in Prosodic Morphology. In Harry van der Hulst, René Kager, and Wim Zonneveld (eds.). *The Prosody-Morphology Interface*. Cambridge: Cambridge University Press. 218-309.

Morin, Y. (1971). Computer experiments in generative phonology: Low-level French phonology. Natural Language Studies no. 11, Phonetics Laboratory, University of Michigan, Ann Arbor.

Nagy, Naomi and Bill Reynolds (1997). Optimality Theory and variable word-final deletion in Faetar. *Language Variation and Change* **9**. 37-55.

Paradis, Carole and Fatimazohra El Fenne (1995). French verbal inflection revisited: Constraints, repairs and floating consonants. *Lingua* **95**. 169-204.

Paradis, Carole and Jean-François Prunet (2000). Nasal vowels as two segments: Evidence from borrowings. *Language* **76**. 324-357.

Pooley, Timothy (1994). Word-final consonant devoicing in a variety of working-class French: A case of language contact? *French Language Studies* **4**. 215-233.

Pooley, Timohy (1996). *Chtimi: The Urban Vernaculars of Northern France*. Clevedon: Multilinguial Matters.

Posner, Rebecca (1995). Contact, social variants, parameter setting, and pragmatic function: An Example from the history of French syntax. In Jacek Fisiak (ed.). *Language Change Under Contact Conditions*. Berlin: Mouton de Gruyter. 217-236.

Prince, Alan and Paul Smolensky (1993/2002). *Optimality Theory: Constraint Interaction in Generative Grammar*. Ms, Rutgers University & University of Colorado, Boulder/Johns Hopkins University. Rutgers Optimality Archive #537, http://roa.rutgers.edu/.

Prunet, Jean-François (1992). *Spreading and Locality Domains in Phonology*. New York: Garland.

Pulleyblank, Douglas (1996). Neutral vowels in Optimality Theory: A Comparison of Yoruba and Wolof. *Canadian Journal of Linguistics / Revue canadienne de linguistique* **41**. 295-347.

Pulleyblank, Douglas (to appear-a). Patterns of reduplication in Yoruba. In Hanson and Inkelas (to appear).

Pulleyblank, Douglas (to appear-b). Harmony drivers: No disagreement allowed. *BLS* **28**.

Reynolds, Bill (1994). *Variation and Phonological Theory*. PhD dissertation, University of Pennsylvania.

Schane, Sanford (1968). *French Phonology and Morphology*. Cambridge: MIT Press.

Schourup, Lawrence C. (1973). A Cross-language study of vowel nasalization. *Working Papers in Linguistics* **15**. Columbus: The Ohio State University. 190-221.

Steele, Jeffrey and Julie Auger (2002). A Constraint-based analysis of intraspeaker variation: Vocalic epenthesis in Vimeu Picard. In Teresa Satterfield, Christina M. Tortora, and Diana Cresti (eds.). *Current Issues in Romance Languages: Selected Papers from the 29th Linguistic Symposium on Romance Languages (LSRL), Ann Arbor, 8-11 April 1999*. Amsterdam: John Benjamins. 317-335.

Steriade, Donca (1987). Redundant values. *CLS* **23**: 2. 339-362.

Steriade, Donca (1995). Underspecification and markedness. In John Goldsmith (ed.). *The Handbook of Phonological Theory*. Oxford: Blackwell. 114-174.

Steriade, Donca (to appear). The Phonology of Perceptibility Effects: the P-map and its consequences for constraint organization. In Hanson and Inkelas (to appear).

Temple, Rosalind (2000). Now and then: The Evolution of male-female differences in the voicing of consonants in two varieties of French. *Leeds Working Papers in Linguistics* **8**. 193-204.

Tranel, Bernard (1981). *Concreteness in Generative Phonology: Evidence from French*. Berkeley: University of California Press.

Tranel, Bernard (1996a). French liaison and elision revisited: A unified account within Optimality Theory. In Claudia Parodi, Carlos Quicoli, Mario Saltarelli, and María Luisa Zubizarreta (eds.). *Aspects of Romance Linguistics: Selected Papers from the Linguistic Symposium on Romance Languages XXIV March 10-13, 1994*. Washington, DC: Georgetown University Press. 433-455.

Tranel, Bernard (1996b). Exceptionality in Optimality Theory and final consonants in French. In Zagona (1996). 275-291.

Vasseur, Gaston (1950). *Lexique serrurier du Vimeu*. Abbeville: F. Paillart.

Vasseur, Gaston (1963). *Dictionnaire des parlers picards du Vimeu (Somme)*. Amiens: Société de linguistique picarde.

Vasseur, Gaston (1996). *Grammaire des parlers picards du Vimeu (Somme) avec considération spéciale du dialecte de Nibas*. Abbeville: F. Paillart.

Vasseur, Gaston (1998). *Dictionnaire des parlers picards du Vimeu (Somme) avec considération spéciale du dialecte de Nibas. Nouvelle Édition augmentée d'un index* *français-picard*. Fontenay-sous-Bois: Sides.

Vergnaud, Jean-Roger (1982). On the foundations of phonology. Paper presented at the VIIIth GLOW Colloquium, Paris.

Vilespy, Anne-Marie (1971). Le français parlé à Toulouse. *Studia Romanica Posnaniensia* **1**. 45-50.

Walker, Douglas C. (1987). Automatic versus morphophonemic rules: Some Old French evidence. *Linguistics* **25**. 915-923.

Walker, Rachel (2000). *Nasalization, Neutral Segments, and Opacity Effects*. New York: Garland. (Rutgers Optimality Archive #405, http://roa.rutgers.edu/)

Walker, Rachel (2003). Reinterpreting transparency in nasal harmony. In Jeroen van de Weijer, Vincent J. van Heuven, and Harry van der Hulst. *The Phonological Spectrum. Volume I: Segmental Structure*. Amsterdam: John Benjamins. 37-72.

Zagona, Karen (ed.) (1996). *Grammatical Theory and Romance Languages: Selected Papers from the 25th Linguistic Symposium on Romance Languages (LSRL XXV) Seattle, 2-4 March 1995*. Amsterdam: John Benjamins.

Zoll, Cheryl (1994). Ghost segments and optimality. *WCCFL* **12**. 183-199.

Zoll, Cheryl (1998). *Parsing Below the Segment in a Constraint-Based Framework*. Stanford: CSLI Publications.

Zoll, Cheryl (2001). Constraints and representations in subsegmental phonology. In Lombardi (2001b). 46-78.