LARYNGEAL NEUTRALIZATION IN BRETON: LOSS OF VOICE AND LOSS OF CONTRAST*

Daniel Currie Hall
University of Toronto

1. Introduction

The phenomenon of word-final obstruent devoicing is a potentially ambiguous one. In the most transparent interpretation, devoicing occurs because word-final obstruents are prohibited, by some constraint(s) or rule(s), from being voiced. For instance, Grijzenhout and Krämer's (1998: 13) constraint *[+VOICE])$_\omega$ penalizes word-final segments that have the feature value [+voice]. A more abstract interpretation exists, though, in which what is prohibited is not voicing *per se*, but rather voicing contrasts. For example, Steriade (1997) attributes both devoicing and assimilation to positional markedness constraints against maintaining voicing contrasts in auditorially unfavourable environments.

These two views are not necessarily distinct: for example, if voicing is represented by a monovalent feature [Voice], then the voicing contrast is marked merely by the presence or absence of this feature, as in the representations in (1).

(1) a. *voiceless* X b. *voiced* X — Voice

In such a system, a constraint (such as (2a)) or a rule (such as (2b)) that has the effect of deleting [Voice] word-finally will be equally compatible with both interpretations, there being no formal distinction between a voiceless obstruent and one that is unspecified for voicing (though cf. van Oostendorp (2006) on the possibility of distinguishing between absent [Voice] and unparsed [Voice]).

(2) a. *VOICE)$_\omega$ b. X — Voice #

Final devoicing in Île de Groix Breton (as described by Ternes (1970)), and in particular its interaction with external sandhi, provides evidence that in this language, at least, the two interpretations are distinct, and both are necessary: word-final obstruents are constrained both to be voiceless and to lack independent specification for voicing. This paper offers an alternative to the syllable-based analysis of devoicing and sandhi presented by Krämer (2000). Krämer's treatment of these phenomena relies on some assumptions about syllable structure that lack independent empirical support, as discussed below in section 5.1. Also *contra*

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Krämer, I will assume that features are privative, using a system of representations adapted from Avery (1996), and consistent with the view of contrastive specification outlined by Dresher (2009) and Hall (2007b). Much of the work in the analysis presented here is done by a featural anti-alignment constraint, similar to ones proposed by Hall (2007a). (See also Buckley (1998), Downing (1998), and Inkelas (1999) for other examples of anti-alignment constraints involving other levels of phonological structure.)

2. Data

2.1. Final devoicing

The basic pattern of Breton final devoicing is illustrated in (3) with data from Ternes (1970: 127), cited by Krämer (2000: 641). Stem-final voiced obstruents (3a,b) surface as voiced before the plural suffix /-ew/, but are voiceless in word-final position; stem-final voiceless obstruents (3c,d) are consistently voiceless.

(3)	a.	/poud/ ‘pot’:	sg. [pout],	pl. [poud+ew]
	b.	/korv/ ‘body’:	sg. [korf],	pl. [korv+ew]
	c.	/kurt/ ‘heart’:	sg. [kurt],	pl. [kurt+ew]
	d.	/ɡrek/ ‘coffee pot’:	sg. [ɡrek],	pl. [ɡrek+ew]

2.2. Regressive voicing

All obstruents are voiceless in absolute final position, or before a word-initial voiceless obstruent. Before word-initial voiced segments (including sonorants and vowels), however, word-final obstruents are voiced, regardless of their underlying value for voicing. The following data from Ternes (1970: 87, 79–80, 45) illustrate this pattern of regressive assimilatory voicing:

(4)	a.	[ərɥirijes]	‘the virgin’
	b.	[ərɥirijez ɡouxaŋ]	‘the eldest virgin’
	c.	[ərɥirijez vaːri]	‘the Virgin Mary’
(5)	a.	[ɥenek]	‘eleven’
	b.	[ɥeneɡ liːw]	‘eleven francs’
	c.	[ɥeneɡ øyr]	‘eleven o’clock’
(6)	a.	[kas]	‘send’
	b.	[kaz wel ərbaːɡew]	‘send all the boats’
	c.	[kas fətak+paːris]	‘send to Paris’
(7)	a.	[ʃuk+ed əzaj]	‘Sit down there!’ (pl.)
	b.	[ʃuɡ əzaj]	‘Sit down there!’ (sg.)

Of particular interest is the example in (7). The form in (7a) reveals that the consonant at the end of /ʃuk/ is underlyingly voiceless, because it surfaces as

[k] even when followed by a suffixal vowel. In (7b), though, the /k/ is realized as [g] when it is followed by a vowel belonging to the following word. This indicates that the voicing truly is assimilatory, rather than simply resulting from the non-application of final devoicing.

2.3. The picture so far

Thus far, the data suggest that final devoicing is elimination of contrast: word-final obstruents lose their underlying specification for voicing, and thereby become subject to assimilation to a following segment, or, if no segment follows, are realized as voiceless by default. In a derivational framework, this could be expressed by the sequence of rules in (8), in which word-final [Voice] is delinked (8a) and word-initial [Voice] spreads leftward (8b):

(8) a. X # → delink Voice

b. X # X → Voice spreads leftward

In Optimality Theory, a similar result could be obtained through a constraint ranking along the lines represented schematically in (9):

(9) Faithfulness to voicing in non-final positions ≫ Voicing agreement ≫ Default voicelessness ≫ Faithfulness to voicing in final position

Non-final obstruents will be realized faithfully; word-final obstruents will either agree in voicing with a following segment, if there is one, or be voiceless by default if there is not.

2.4. Progressive devoicing

However, the Breton facts are not quite so straightforward. There are some word-initial voiced stops that, when preceded by a word-final obstruent, become devoiced, rather than triggering regressive assimilatory voicing.

This can be seen in the data in (10)–(13), which are drawn from Ternes (1970: 79, 193, 86, 87, 190):

(10)	a.	[peamzek]	‘fifteen’
	b.	[daj]	‘day’
	c.	[peamzek taj]	‘fifteeen days’
(11)	a.	[peis]	‘peas’
	b.	[ɡriːs]	‘grey’
	c.	[peis kriːs]	‘grey peas’
(12)	a.	[beis]	‘finger’
	b.	[bəziɕet]	‘fingers’
	c.	[bijãn]	‘little’
	d.	[ər+beis pijãn]	‘the little finger’

(13)
a.	[ur+miːs]	‘a month’
b.	[miːz+jew]	‘months’
c.	[bənak]	‘any’
d.	[ur+miːs pənak]	‘any month’

A word-initial stop that is subject to progressive devoicing will be devoiced after any word-final obstruent, including ones that are underlyingly voiced, as in the examples in (12) and (13). (13b), for example, shows that the consonant at the end of /miːz/ (‘month’) is underlyingly /z/, but in (13d), the /z/ surfaces as [s] in word-final position and triggers assimilatory devoicing of the initial consonant of ‘any.’ The progressive assimilation data, and particularly examples like the ones in (12) and (13), thus indicate that final devoicing in Breton involves not only the elimination of underlying voicing specifications, but also the imposition of voicelessness.

As the data in (14) (from Ternes 1970: 88; quoted by Krämer 2000: 651) indicate, the application of progressive devoicing depends on (the initial consonant of) the second word, rather than on any property of the final consonant of the first word; the /b/ of /baːk/ triggers regressive voicing, but the /b/ of /bənak/ undergoes progressive devoicing:

(14)
a.	[unaʧypaʃ]	‘crew’
b.	[baːk]	‘boat’
c.	[bənak]	‘any’
d.	[unaʧypaʒ baːk]	‘crew of a boat’
e.	[unaʧypaʃ pənak]	‘any crew’

3. Representations

The contrast between (14d) and (14e) suggests that there must be three representationally distinct kinds of obstruents in Breton—non-alternating voiced obstruents like the initial /b/ of /baːk/, voiced obstruents that are subject to progressive devoicing, like the initial consonant of ‘any,’ and voiceless obstruents. Krämer (2000: 652) uses a binary feature [±voice], with archiphonemic underspecification as in Inkelas’s (1995) treatment of Turkish, to make the ternary distinction in (15):[1]

(15)
		Absolute initial position	Following word-final /k/
/b/	[+voice]	[b]	[g # b]
/B/	[∅voice]	[b]	[k # p]
/p/	[−voice]	[p]	[k # p]

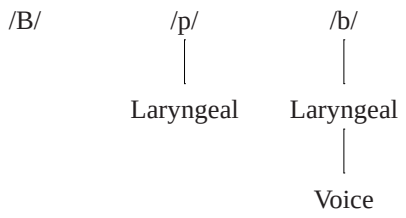
Krämer (2000: 660–661) argues that a system of privative features would not permit a satisfactory account of the Breton voicing system. A single monovalent feature would, of course, be inadequate, as it would permit only a two-way

[1] Krämer uses /P/ to represent the underspecified alternating initial segments; I will use /B/, simply to reflect the fact that in the default case these segments are realized as voiced.

distinction, and Krämer claims that a system with two monovalent features would predict too wide a range of phonetic realizations. For example, if /b/ has the feature [Voice], /B/ is unspecified, and /p/ has the feature [Spread Glottis], this would imply that Breton has contrasts in both voicing and aspiration, but there is no evidence of any phonetic contrast in aspiration at the surface.

However, Krämer does not consider the possibility of privative representations like the ones in (16), in which the feature [Voice] is a dependent of a [Laryngeal] node:

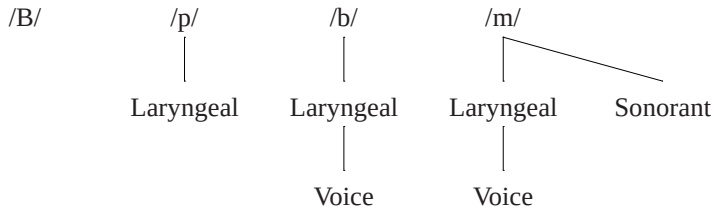
(16)



The representations in (16) are based on Avery's (1996) typological examination of voicing systems. In Avery's terms, the Breton obstruent system (like those of Dutch and Turkish) represents a mixture of a Laryngeal Voice system and a Contextual Voice system.

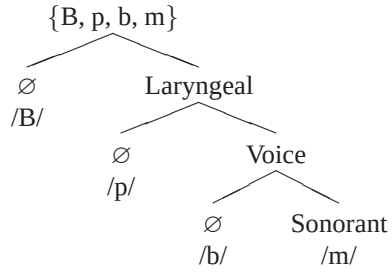
If assimilation of word-final obstruents to following voiced obstruents and sonorants is to be represented as a unified phenomenon, then sonorants (including vowels) must also be specified with the feature [Voice] (*contra* Avery's (1996: 77–78) Lar-SV Constraint). This leads to the set of representations shown in (17):

(17)



These representations have an appearance of redundancy, in that the presence of [Voice] is logically predictable from the presence of [Sonorant]. They are, however, entirely compatible with the version of contrastive specification put forward by Dresher, Piggott, and Rice (1994), Dresher (1998, 2009), and Hall (2007b), in which the contrastiveness of a feature depends on its scope relative to other features. The representations in (17) are consistent with a contrastive hierarchy in which [Sonorant] has unusually narrow scope, as illustrated by the branching diagram in (18):

(18)



The tree in (18) shows a sequence of monovalent features dividing the relevant subsets of the Breton inventory, schematized here by the representative segments /B/, /p/, /b/, and /m/. The absence of [Laryngeal] distinguishes the segments that are subject to progressive devoicing from those that are not. Among segments with [Laryngeal], [Voice] distinguishes voiced segments, and among segments bearing [Voice], [Sonorant] distinguishes the vowels and sonorant consonants. While [Voice] would not be contrastive within the set of sonorant segments, [Sonorant] is contrastive within the set of voiced segments; giving [Voice] scope over [Sonorant] in the hierarchy thus yields the representations in (17).

4. Constraints

Given these representations, final devoicing and regressive and progressive assimilation can be accounted for by the following constraints, ranked in the order in which they are listed:

MAX[SON] – If a segment is associated with the feature [Sonorant] in the input, then the corresponding output segment (if any) is also associated with [Sonorant].

SONORANT VOICING (SV) – If an output segment is associated with [Sonorant], then it is also voiced (i.e., it is associated with a [Laryngeal] node bearing [Voice]).

MAX[LAR]/ONSET – If the input correspondent of an output segment in an syllable onset is associated with a [Laryngeal] node, then the output segment is associated with a featurally identical [Laryngeal] node.

(That is, if the input segment has a bare [Laryngeal] node, the output segment must also have a bare [Laryngeal] node; if the input segment has a [Laryngeal] node bearing [Voice], the output segment must also have a [Laryngeal] node bearing [Voice]; but if the input segment is not associated with a [Laryngeal] node, the constraint is satisfied vacuously.)

DISALIGN-R(ω, LAR) – The right edge of a word should not be aligned with the right edge of the scope of a [Laryngeal] node.

FINAL DEVOICING (FINDEV) – A word-final segment should be associated with a bare [Laryngeal] node.

MAX[LAR] – If the input correspondent of an output segment is associated with a [Laryngeal] node, then the output segment is associated with a featurally identical [Laryngeal] node.

DEFAULT VOICING (DEFVOI) – Output segments should be voiced.

The featural anti-alignment constraint DISALIGN-R(ω, LAR) embodies the notion of word-final neutralization of voicing contrast—it says, in effect, that a word-final segment should not have a voicing specification that is independent of the segment to its right.[2] This constraint drives not only regressive assimilation, but also progressive assimilation. However, the FINAL DEVOICING constraint is also necessary, to ensure that a word-final obstruent followed by an underlyingly underspecified segment does not end up voiced (in cases such as (12d) and (13d)).

The tableaux in (19)–(23) illustrate the effects of these constraints for various types of inputs:

(19)

/z # d/ (Lar–Voi, Lar–Voi)	*MAX[LAR]/ONS*	*DISALIGN*	*FINDEV*	*MAX[LAR]*	*DEFVOI*
☞ [z # d] (Lar–Voi)			*		
[z # d] (Lar–Voi, Lar–Voi)		*!	*		
[s # d] (Lar, Lar–Voi)		*!		*	*
[s # t] (Lar)	*!			**	**

[2] This aspect of the analysis has some affinity with Itô, Mester, and Padgett's (1995) treatment of Japanese, in which the feature [voice] is not generally licit on nasals, but can be licensed by being associated with a following obstruent as well. I depart from Itô, Mester, and Padgett, however, in assuming that, at least in Breton, all surface segments are fully specified for voicing features. If surface underspecification is not ruled out by GEN, then the absence of *[B] in outputs in Breton could be attributed to a high-ranking constraint requiring segments to bear the feature [Laryngeal].

(19) shows that two input voiced obstruents separated by a word boundary will surface sharing a single [Laryngeal] node specified with [Voice]; that is, there will be phonetically vacuous assimilation, as in /miːz dy/ [miz dy] ‘December’ (lit. ‘black month’).

The tableau in (20) shows the application of final/assimilatory devoicing when an underlyingly voiced word-final obstruent is followed by a voiceless word-initial segment, as in /miːz kalãgwaŋ/ [mis kalãgwaŋ] ‘the month of November’:

(20)

/z # k/ (Lar Lar; Voi)	*MAX[LAR]/ONS*	*DISALIGN*	*FINDEV*	*MAX[LAR]*	*DEFVOI*
☞ [s # k] (Lar)				*	**
[s # k] (Lar Lar)		*!		*	**
[z # k] (Lar Lar; Voi)		*!	*		*
[z # g] (Lar; Voi)	*!		*	*	

In (21), final devoicing effectively feeds progressive devoicing. An underlyingly voiced word-final obstruent not only surfaces as voiceless itself, but also causes assimilatory devoicing of an underlyingly underspecified word-initial obstruent, as in /ur+miːz Bənak/ [ur+miːs pənak] ‘any month’ (10n):

(21)

/z # B/ Lar Voi	MAX[LAR]/ONS	DISALIGN	FINDEV	MAX[LAR]	DEFVOI
☞ [s # p] Lar				*	**
[z # b] Lar Voi			*!		
[s # b] Lar Lar Voi		*!		*	*

(22) shows assimilation to /m/, as in /trizek mi:z/ [trizeg mi:s] ‘13 months’:

(22)

/k # m/ Lar Lar Son Voi	MAX[SON]	SV	MAX[LAR]/ONS	DISALIGN	FINDEV	MAX[LAR]
☞ [g # m] Lar Son Voi					*	*
[k # m] Lar Lar Son Voi				*!		
[k # m] Lar Son		*!	*			*
[k # p] Lar	*!		*			*

The constraints MAX[SON] and SONORANT VOICING ensure that sonorants will not be devoiced, even when they are word-final and followed by a voiceless obstruent, as in /təjal kãprein/ [təjal kãprein] ‘you can understand’:

(23)

/l # k/ Son Lar Lar Voi	*MAX[SON]*	*SV*	*MAX[LAR]/ONS*	*DISALIGN*	*FINDEV*	*MAX[LAR]*
☞ [l # k] Son Lar Lar Voi				*	*	
[l # g] Son Lar Voi			*!		*	*
[l # k] Son Lar		*!				*
[ɬ # k] Lar	*!					*

5. Evaluation

5.1. Syllable structure and word-internal clusters

In the account presented here, voicing assimilation across word boundaries is driven by featural anti-alignment. This differs from the analysis presented by Krämer (2000), in which voicing assimilation between and within words is driven by constraints on syllable structure. In Krämer’s account, assimilation to voiced obstruents is driven by the syllable contact constraint COCO, which penalizes any coda consonant that is less sonorous than an immediately following onset consonant. Assimilation to sonorants is achieved by parsing the word-final obstruent into the onset of the following syllable, where it is subject to a local conjunction of an alignment constraint with the constraint responsible for default voicing of underspecified onsets. The tableau in (24) illustrates how this works in the form /trizek miːz/ [trizeg miːs] ‘thirteen months’ (Krämer 2000: 658).

(24)

/trizek # miːz/	IDENT[SON]	A&OV	CoCo	IDENTONS[VOICE]	ALIGNL
☞ [tri.ze.(g#miːs]				*	*
[tri.zek.(#miːs]			*!		
[tri.ze.(k#miːs]		*!			*
[tri.zeŋ.(#miːs]	*!				

In Krämer's account, the fully faithful candidate [tri.zek.(#miːs] is ruled out by CoCo, because the [k] in the coda is less sonorous than the [m] in the following onset. IDENT[SON] eliminates the possibility of repairing the contact by realizing the underlying /k/ as [ŋ]. Instead, the /k/ is parsed into the onset of the following syllable. However, if it is realized faithfully in the onset, as in [tri.ze.(k#miːs], this will violate the constraint A&OV, which is a local conjunction of ALIGNL(STEM, PWD) and ONSETVOICING. ONSETVOICING is the markedness constraint that causes underspecified onset consonants such as /B/ to be realized as voiced in the default case; ALIGNL(STEM, PWD) penalizes mismatches between the left edges of morphological and prosodic words. The [k] in [tri.ze.(k#miːs] violates both of these constraints, because it is a voiceless onset that intervenes between the left edge of the prosodic word and the left edge of the stem. The grammar thus prefers [tri.ze.(g#miːs], in which the misaligned consonant is realized as voiced.

This analysis relies on the assumption that [gm] and similar sequences can be parsed as onsets. However, the comprehensive lists of word-internal and -initial consonant clusters given by Ternes (1970, 1992) offer no independent evidence that plosive–nasal sequences are possible onsets in Breton. In obstruent–sonorant sequences that do not cross a word boundary, the sonorant is always either a liquid or a glide.

One potential advantage of Krämer's analysis over the one presented in the preceding sections is that it accounts not only for external sandhi phenomena, but also for voicing agreement in word-internal obstruent clusters. For Krämer (2000: 651), assimilation of obstruents to obstruents both within and between words is driven by the constraint in (25):

(25) SURFACE-IDENTITY[voice]:
Let α be an obstruent in a string and β be any adjacent obstruent in that string. If α is [γvoice] then β is [γvoice], and vice versa.

All word-internal obstruent clusters in Breton do, in fact, satisfy this constraint. However, word-internal obstruent clusters appear to be subject to considerably stricter requirements than those governing clusters that span a word boundary. Ternes (1970) gives an exhaustive list of word-internal obstruent clusters, which is summarized in (26). Not only do they all agree in voicing, they are nearly all

voiceless, the lone exception being [gz], of which all of Ternes's examples appear in borrowings from French (e.g., /egzaktəmãt/ 'exactly'). There also appears to be some sort of constraint on place of articulation in word-internal obstruent clusters; at least one segment in each such cluster is coronal.

(26) Word-internal obstruent clusters:

sp	sf	st		sk
		ʃt		ʃʧ
		kt	ks	
			gz	

These additional restrictions suggest that the constraints governing word-internal obstruent clusters are distinct from the constraints that apply at word edges.

5.2. Underspecification, contrast, and faithfulness

The analysis presented in sections 3 and 4 incorporates some assumptions about segmental representations and the constraints that refer to them. The purpose of this section is to make those assumptions explicit, and to discuss the degree to which they are important to the analysis.

The tree in (18) assumes that there is such a thing as an underlying inventory, and shows how a sequence of distinctive features can divide it into subinventories. The Optimality Theoretic principle of Richness of the Base (Prince and Smolensky 1993: §9.3), on the other hand, rejects the notion of language-specific input inventories. However, the representations in (17) are not incompatible with Richness of the Base; the tree in (18) merely shows that they are also compatible with the approach to contrastive specification instantiated in the Successive Division Algorithm.

Regardless of whether the set of input segments constitutes something to be thought of as an inventory, it must include underspecified segments such as /B/. Inkelas (1995) has demonstrated that Alternant Optimization, a refined version of Prince and Smolensky's Lexicon Optimization, will allow for such underspecified segments to appear in the lexicon where necessary, even though these segments never surface entirely faithfully. Richness of the Base predicts that, if underspecified segments are possible inputs at all, there can be no language-specific restrictions on where they occur; segments such as /B/ should be present in inputs not only in initial position, where they are attested in words like /Bənak/ ('any'), but also elsewhere in the word. There is, however, no obvious way of testing this prediction. As Krämer (2000: 656) points out, an unspecified segment in word-final position would not behave any differently from an underlyingly voiced segment. Word-internal underspecified obstruents would also pattern together with underlyingly voiced obstruents, surfacing as voiced (except perhaps in clusters, which are generally voiceless, as mentioned above).

The view of faithfulness assumed in the present analysis does not require correspondence relations between features, but only between segments. Note that

the faithfulness constraint MAX[LAR] says only that the output correspondent of an input segment bearing a [Laryngeal] node must have **a** featurally identical [Laryngeal] node, not that it must have **the same** [Laryngeal] node. The identity of output features does not matter; only their existence does.[3] Although MAX[LAR] is crucial to the analysis, there is no empirical need for its counterpart DEP[LAR] here; all output segments are specified as to voicing, and MAX[LAR] as formulated here incorporates DEP[VOICE]. There is, however, a need for DEP[SONORANT] or some constraint or constraints equivalent to it, to ensure that underlying obstruents do not surface as sonorants; this could be accomplished by a markedness constraint *SONORANT ranked below MAX[SON].

5.3. Conclusions

The analysis presented in this paper offers a way of accounting for final devoicing and voicing assimilation across word boundaries in Breton, using monovalent features in a constraint-based framework. It avoids the need to parse sequences such as /ɡm/ as onsets. Most importantly, though, it sheds some light on the dual nature of final devoicing; active constraints crucially mandate both that final obstruents be voiceless (FINDEV) and that they not have independent voicing specifications (DISALIGN-R(ω, LAR)). Final devoicing in Breton involves both a loss of voicing and a loss of contrast.

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[3] Compare Struijke's (2002) Existential Faithfulness, and see also Causley (1999).

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