Positional prominence and consonantal interactions in metaphony and post-tonic harmony

Rachel Walker
University of Southern California

1. Introduction

In this paper, I consider two types of vowel harmony controlled by the final vowel in Romance dialects of Italy. In metaphony, the vowel in the stressed syllable assimilates in height features to a post-tonic high vowel, classically an inflectional vowel in the final syllable. In post-tonic vowel harmony, vowels following the syllable with main stress assimilate for some or all features with the vowel in the final syllable. In some dialects, certain consonants block harmony. These patterns of consonantal interactions are studied to cast light on the nature of the harmony systems. Selective consonant blocking in post-tonic harmony is found to fall in line with the characteristics of blocked feature sharing in vowel-consonant-vowel contexts in diverse languages of the world. Specifically, consonants that are less similar to vowels are more prone to block feature sharing. On the other hand, patterns of consonant blocking in metaphony show distinct properties. The observation pursued here is that consonants are prone to block metaphony in contexts where they tend to reduce the robustness of perceptual cues in the target stressed position. Consonants that serve to support cues for the harmonizing features in the stressed position are more likely to allow the transmission of metaphony. These different properties of consonant blocking are in keeping with an understanding of metaphony as driven by positional licensing, in contrast to post-tonic harmony.

The organization of this paper is as follows. In §2, I outline the well-known systems of metaphony and post-tonic harmony in the dialect of Servigliano, and review a licensing-based account of their analysis, with metaphony analyzed as a positional licensing phenomenon and post-tonic harmony as a phenomenon of maximal licensing. In §3, I introduce related vowel harmonies, which show the additional complication of selective consonant blocking. The analysis of these phenomena is taken up in §4, dealing in turn with blocking consonants in post-tonic harmony and metaphony. In §5, an alternative approach to post-tonic harmony driven by positional licensing is considered and rejected. In §6, I present the conclusion.

2. Background: Harmony in Servigliano

The Marche dialect of Servigliano presents patterns of metaphony and post-tonic vowel harmony that have been widely studied. The phenomena are reported by Camilli (1929) and their interpretation is informed by numerous generative studies (Kaze 1989, Maiden 1995, Nibert 1998, Canalis 2009, Mascaró 2011, Walker 2011). In this section, the data and principal elements of Walker's (2011) analysis are reviewed to lay groundwork for related vowel patterns introduced in §3, which show consonantal interactions.

2.1 Metaphony

The dialects under study in this paper, including Servigliano, present vowels /i, e, ɛ, a, ɔ, o, u/, whose height feature values are shown in (1). Following Calabrese (1988), the contrast among /e, o/ versus /ɛ, ɔ/ is represented by [±ATR]. In unstressed syllables, this contrast is neutralized in favor of [e, o].

* For comments on this work I am grateful to Aaron Kaplan and an anonymous reviewer, and I owe thanks to Mario Saltarelli for assistance with the data. Any errors are my own.

(1) Height feature specifications for vowels of Servigliano and related dialects

	[i]	[e]	[ɛ]	[a]	[ɔ]	[o]	[u]
[high]	+	–	–	–	–	–	+
[low]	–	–	–	+	–	–	–
[ATR]	+	+	–	–	–	+	+

In the metaphony of Servigliano, post-tonic [i, u] trigger raising of a stressed mid vowel. The raising is gradual so that /e, o/ raise to [i, u], as in (2a), while /ɛ, ɔ/ raise to [e, o], as in (2b).

(2)	a.	ˈmett-o	ˈmitt-i	'I/you put'
		ˈpes-a	ˈpis-u	'heavy-F.SG/M.SG'
		ˈfjoɾ-e	ˈfjuɾ-i	'flower-M.SG/M.PL'
		ˈloŋg-a	ˈluŋg-u	'long-F.SG/M.SG'
	b.	ˈpɛtten-e	ˈpettin-i	'comb-M.SG/M.PL'
		tʃiˈlɛstɾ-a	tʃiˈlestɾ-u	'heavenly/pale blue-F.SG/M.SG'
		biɾiˈkɔkan-a	biɾiˈkokun-u	'apricot (tree)-F.SG/M.SG'
		ˈmɔʃ-a	ˈmoʃ-u	'dejected-F.SG/M.SG'

The data in (3) confirm that only mid stressed vowels undergo harmony. Stressed high and low vowels do not show height assimilation.

(3)	aˈmik-a	aˈmik-u	'friend-F.SG/M.SG'
	ˈditʃ-e	ˈditʃ-i	'he says/you say'
	ˈmut-a	ˈmut-i	'mute-F.SG/M.PL'
	ˈmuɾ-e	ˈmuɾ-u	No gloss-M.PL/M.SG
	ˈpatɾ-e	ˈpatɾ-i	'father-M.SG/M.PL'
	ˈpann-u	ˈpaŋŋ-i	No gloss-M.SG/M.PL

The analysis of Servigliano metaphony developed by Walker (2011) uses a positional licensing constraint, given in (4).[1] As used here, *positional licensing constraint* refers to a positional markedness constraint that assigns a penalty to a marked structure that lacks association with a specified prominent position. Such constraints prevent distinctive features that are realized solely in nonprominent positions.

(4) LICENSE([HEIGHT]/$\sigma_{\text{post-tonic}}$[+high], ˈσ)
Assign a violation to any height feature associated with a post-tonic high vowel that is not associated with the stressed syllable.[2]

Positional licensing constraints may single out features for licensing when they occur in contexts and/or feature combinations that are perceptually difficult. In (4), the structure subject to licensing is the set of height features {[high], [ATR], [low]} when they occur in a post-tonic high vowel. Post-tonic syllables are perceptually weak due to their reduced metrical prominence,

[1] Servigliano also displays harmony that raises pretonic vowels. The analysis presented here considers pretonic raising to be a distinct harmony process from metaphony.

[2] The definition in (4) provides a paraphrase for the formal definition of positional licensing constraints. To address licensing at a distance, the formal definition provided in Walker 2011 operates over feature chains, consisting of chains of corresponding features. Licensing at a distance will not be at issue for the patterns under study here, so for present purposes it is sufficient to refer to features alone.

and high vowels tend to be lower in amplitude and shorter in duration than lower vowels, which could make them less perceptible.[3] The licensing position is specified as the primary stressed syllable, which is maximally prominent in the metrical dimension. In order for metaphony to be driven by one constraint,[4] the licensing restriction operates over the class of height features: it is necessary to drive each of [+high] and [+ATR] to spread to the stressed syllable, and [HEIGHT] is the minimal class that contains both features (Padgett 2002).

As discussed by Walker (2005, 2011), positional licensing constraints can drive harmony for the specified feature(s) from a nonlicensing position to the prominent licensing position and they can drive harmony from the licensing position to a nonlicensing position. They also can drive patterns that eliminate the marked features in nonlicensing positions, without assimilation, or they can drive the specified features to flop to the licensing position. In cases where harmony operates from a nonlicensing position, it is necessary to consider the means of trigger control, that is, what determines that material in the nonlicensing position is preserved at the cost of that originating in the licensing position. The most common mechanism for achieving trigger control is a positional faithfulness constraint (Beckman 1997, 1998). In Servigliano, trigger control for harmony can be attributed to a faithfulness constraint for the final syllable (Hyman 1998, Curtin 2002, Krämer 2003, Walker 2005, 2011, Sasa 2009). For the data considered thus far, it is sufficient to define this constraint in general terms as operating over the vowel in the word-final syllable, as in (5); however, in the next section, this will be adjusted to the final syllable in the maximal prosodic word.

(5) IDENT-IO-σ_{Final}(high)
Let α be a segment in the word-final syllable in the output and β be a correspondent of α in the input. If α is [γhigh], then β is [γhigh].

Although unstressed final syllables are weak, as reflected by the positional licensing constraint in (4), which governs material in post-tonic syllables, they are not the weakest metrical position. Studies of vowel patterns in dialects of Italy support the prominence scale in (6), applicable to Servigliano and various other dialects (Maiden 1995, 1997, Canalis 2007, 2009, Walker 2011). In this scale, |x| signifies "the intrinsic prominence of x."

(6) Vocalic metrical prominence scale (e.g. Servigliano)
|primary stressed vowel| > |secondary stressed vowel| > |pretonic stem vowel| > |word-final unstressed vowel| > |post-tonic nonfinal vowel, unstressed clitic vowel|

In agreement with the positional licensing constraint, post-tonic vowels fall in the bottom range of the prominence scale. However, unstressed vowels in a final syllable have greater prominence than nonfinal post-tonic vowels. Studies on the prominence of final syllables have shown that they can exhibit mixed effects, with the potential for evidence of both strength and weakness (Barnes 2006, Walker 2011). It is their strength-based properties that enable final syllables to serve as a place where positional faithfulness is enforced. Following Kaplan (2015), I assume that any position that is not minimal in a prominence dimension is eligible to serve as a

[3] Despite these characteristics that could hinder perceptibility, high vowels have other properties that potentially render them more perceptible than mid vowels. As 'corner' vowels, high vowels improve dispersion in the inventory, and their focalization of acoustic energy could make them more salient. High and mid vowels (but not low /a/) thus each present properties that could make them less perceptible. Phonological patterns support a conclusion that the markedness of unstressed high and mid vowels is variable across languages (Walker 2011).
[4] See Calabrese (1985) for a unified view of the metaphony-driver in a rule-based framework.

designated position in a positional faithfulness constraint (see §5). Optimality Theory (Prince & Smolensky 2004) predicts that positional faithfulness constraints can be differently ranked with respect to each other across languages, so a faithfulness constraint for the final syllable could dominate a positional faithfulness constraint for a stressed syllable.

The constraint hierarchy for metaphony in Servigliano ranks the positional licensing constraint, LICENSE([HEIGHT]/$\sigma_{\text{post-tonic}}$[+high], ˈσ), over positional faithfulness constraints for [high] and [ATR] in the primary stressed syllable and their counterparts that are not position sensitive (i.e. nonpositional). In addition, IDENT-IO-σ_{Final}(high) dominates IDENT-IO-ˈσ(high) and IDENT-IO-ˈσ(ATR) to guarantee control of harmony by the final syllable. The workings of this hierarchy in a word where a mid vowel undergoes metaphonic raising to high are shown in (7).

Candidate (7a) is the winner. It spreads height features from the final post-tonic vowel to the stressed syllable, violating IDENT-IO-ˈσ(high). Candidate (7b), which does not show metaphony, violates the positional licensing constraint. In (7c), harmony operates from the stressed syllable, causing the post-tonic vowel to lower. This obeys positional licensing and stressed syllable faithfulness, but it is ruled out by positional faithfulness for the final syllable.

(7) Servigliano metaphony raising a mid [+ATR] vowel

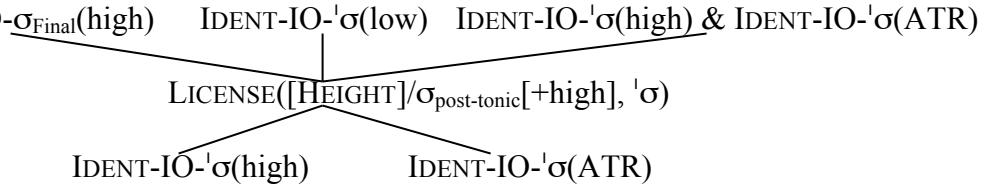
/pes-u/	IDENT-IO-σ_{Final}(high)	LIC([HEIGHT]/ $\sigma_{\text{post-tonic}}$[+high], ˈσ)	IDENT-IO-ˈσ(high)	IDENT-IO-ˈσ(ATR)
→ a. ˈpisu			*	
b. ˈpesu		*!		
c. ˈpeso	*!			

Although ranking IDENT-IO-ˈσ(ATR) below the positional licensing constraint is not required for the form considered in (7), because the stressed vowel is [+ATR] in the input, this ranking will be necessary for metaphony in forms where [–ATR] /ɛ, ɔ/ raise to [+ATR] [e, o].

Several other details are needed for the constraint hierarchy to capture Servigliano metaphony in full, discussed by Walker (2011). In overview, these include the following. The gradual raising of [–ATR] mid vowels to [+ATR] mid rather than to [+high] is obtained by a conjunction of faithfulness constraints for [high] and [ATR] in the stressed syllable: IDENT-IO-ˈσ(high) & IDENT-IO-ˈσ(ATR) (after Kirchner 1996). This conjunction will be violated by a vowel that alters both its [high] and [ATR] values, and it dominates the positional licensing constraint, limiting metaphony of a [–ATR] mid vowel so that it becomes [+ATR] but not high (i.e. /mɔʃ-u/ → [ˈmoʃu], not *[ˈmuʃu]). The failure of low vowels to undergo metaphonic raising is achieved by ranking IDENT-IO-ˈσ(low) over the positional licensing constraint (i.e. /pann-u/ → [ˈpannu], not *[ˈpennu] or *[ˈpinnu]). Lastly, IDENT-IO-σ_{Final}(high) dominates the positional licensing constraint, so that in word with a final high vowel and a stressed vowel that cannot raise to high, the final vowel will remain high rather than lower to [–high] as a means of satisfying the positional licensing constraint (i.e. /pann-u/ → [ˈpannu], not *[ˈpanno]).

The Hasse diagram in (8) summarizes the ranking of the position-sensitive constraints.

(8)



To review, this account references prominent positions using positional licensing

constraints and positional faithfulness constraints. Positional licensing constraints are markedness constraints that restrict material in nonprominent positions that lacks an association with a prominent licensing position. Metaphony is driven by a positional licensing constraint requiring height features in a post-tonic high vowel to be associated with the stressed syllable. Positional faithfulness constraints enforce identity in prominent positions. Positional faithfulness is responsible for preservation of height features in the final vowel, so that it controls metaphony.

2.2 Post-tonic vowel harmony

Post-tonic vowels in Servigliano exhibit regressive copy harmony, where harmony is enforced for all vowel features. Examples in (9a–c) show copy harmony triggered by a final stem vowel, and those in (9d) show a trigger in an enclitic. Copy harmony does not persist to stressed syllables or pretonic vowels. Some examples in (9) show metaphony in the stressed vowel. The vowel where metaphonic raising features originate may belong to a suffix (9a) or an enclitic (9d).

(9)	a.	ˈprɛdok-o	‘I preach’	
		ˈprɛdak-a	‘s/he preaches’	
		ˈpredik-i	‘you preach’	/ɛ/ → [ˈe] by metaphony
	b.	ˈstommuk-u	‘stomach-M.SG’[5]	
		ˈstommik-i	‘stomach-M.PL’	
	c.	doˈmennak-a	‘Sunday-F.SG’	
		doˈmennek-e	‘Sunday-F.PL’	
	d.	ˈmett-a=tʃa=la	‘put it-F.SG there’	cf. ˈmette ‘s/he puts’, tʃe ‘there’
		ˈmett-e=tʃe=le	‘put it F.PL there’	
		ˈmett-o=tʃo=lo	‘put it-MASS there’	
		ˈmitt-u=tʃu=lu	‘put it-M.SG there’	/e/ → [ˈi] by metaphony
		ˈmitt-i=tʃi=li	‘put it-M.PL there’	/e/ → [ˈi] by metaphony

Like metaphony, post-tonic harmony is triggered by the vowel in the final syllable, and trigger control is achieved by faithfulness to the final syllable. Walker (2011: 267–269) argues that Servigliano clitics are affixal and attach by adjunction at the level of prosodic word (PWd) to yield a nested PWd structure as in $[[[\text{ˈmitt-u}]_{PWd}=\text{tʃu}]_{PWd}=\text{lu}]_{PWd}$ (see also Loporcaro 2000). Therefore, the vowel that controls post-tonic harmony, and also metaphony, is final in the maximal PWd, that is, it is final in a PWd that is not dominated by a PWd (Itô and Mester 2009). This necessitates restricting the positional faithfulness constraint for final syllables (in (5)) to syllables that are final in PWd_{max}. In addition, the range of features to which final syllable faithfulness applies must be expanded to all of the vowel features relevant for Servigliano, except [ATR]. Faithfulness for [ATR] is not selectively enforced in the final syllable, because the [ATR] contrast among mid vowels is neutralized in all unstressed syllables. The set of final syllable faithfulness constraints needed to control post-tonic copy harmony will be referred to as $\text{IDENT-IO-}\sigma_{FinalPWdMax}$(high)/(low)/(COLOR), where COLOR refers to the set {[back], [round]}.

Unlike metaphony, post-tonic harmony does not spread to reach a prominent position. Instead, features spread in an unbounded fashion within the sequence of post-tonic syllables. Post-tonic harmony is proposed to be driven by a *maximal licensing constraint* (Walker 2011). Following Jiménez and Lloret (2007), unbounded harmony from a weak trigger is conceptualized as involving licensing to which every vowel contributes, not just those in a specific prominent position. When a specified feature or set of features is present in a word,

[5] Camilli (1929) gives both *stómmucu* ([ˈstommuku]) (p. 225) and *stòmmucu* ([ˈstɔmmuku]) (p. 269). The latter might have a typographical error, because it is unexpected given metaphony, or it could be a variable pronunciation.

sometimes specifically in a weak context, a maximal licensing constraint assigns a penalty to every vowel to which those features are not associated. The constraint for copy harmony operates over all vowel features in post-tonic vowels, as framed in (10). In this constraint, the weak context in which vowel features are subject to maximal licensing is post-tonic vowels, which corresponds to the bottom two steps on the metrical prominence scale in (6).[6]

(10) LICENSE([V-FEATURE]/$\sigma_{\text{post-tonic}}$, ∀V)
For each vowel feature associated with a post-tonic vowel, assign a violation to any vowel in the same prosodic word to which that feature is not associated.

To produce harmony for all features, the maximal licensing constraint must dominate nonpositional IDENT constraints for all vowel features, collapsed here as IDENT-IO(V-FEATURE). (Henceforth V-FEATURE is abbreviated to [V-F].) Although the stressed syllable undergoes raising in metaphony, it does not undergo copy harmony. Therefore, IDENT-IO-ˈσ(V-F) dominates the maximal licensing constraint.[7] IDENT-IO-$\sigma_{\text{FinalPWdMax}}$(high)/(low)/(COLOR) will also dominate the maximal licensing constraint to prevent the stressed syllable from serving as the trigger for harmony. The rankings are illustrated in (11). To avoid clutter in this and later tableaux, a single violation is shown for each unfaithful vowel and for each set of features in a post-tonic vowel that lacks association to a licensing position. This simplification does not alter the selection for the candidates considered.

(11) Post-tonic copy harmony

/mett-e=tʃe=la/	IDENT-$\sigma_{\text{FinalPWdMax}}$ (high)/(low)/(COLOR)	IDENT-ˈσ(V-F)	LICENSE([V-F]/ $\sigma_{\text{post-tonic}}$, ∀V)	IDENT(V-F)
→ a. ˈmett-a=tʃa=la			*	**
b. ˈmett-e=tʃe=le	*!			*
c. ˈmatt-a=tʃa=la		*!		***
d. ˈmett-e=tʃe=la			*, *!**	

The winning candidate, in (11a), displays copy harmony among the post-tonic vowels. This incurs violations of the nonpositional IDENT constraint, for lowering of two post-tonic /e/s to [a], and it violates the maximal licensing constraint, because [a]'s features [+back], [+low], and [–ATR] fail to spread to the stressed vowel. Candidate (11b) shows copy harmony among all vowels in the word, with the stressed vowel serving as the trigger. This satisfies the maximal licensing constraint, but it is ruled out by its violation of final syllable faithfulness. Candidate (11c) also shows copy harmony among all vowels, but with trigger control by the final vowel. This candidate is ruled out by its violation of stressed syllable faithfulness. Finally, candidate (11d) does not enforce IDENT-violating harmony. This incurs violations for the three vowels to which features of post-tonic [a] are not associated and for the single vowel to which features of post-tonic [e] are not associated. Violations for post-tonic [e] are minimized assuming that the sequence of syllables containing /e/ share features in this output.

An overview of the rankings involved in post-tonic copy harmony is given in (12).

[6] Unstressed proclitics are also included on this low end of the prominence scale, and consistent with their projected weakness, they also display copy harmony in Servigliano. Because the focus here is on harmony controlled by the final syllable, harmony among proclitics is not discussed.

[7] In words like [doˈmenneke], where final and stressed vowels are underlying identical, copy harmony still does not persist to pretonic syllables. See Walker (2011: 275) for a proposal to restrict harmony using a crisp edge constraint for a maximal metrical foot.

(12) IDENT-IO-$\sigma_{FinalPWdMax}$(high)/(low)/(COLOR) IDENT-IO-$^{\prime}\sigma$(V-F)

LICENSE([V-F]/$\sigma_{post\text{-}tonic}$, ∀V)

IDENT-IO(V-F)

The rankings for post-tonic copy harmony and metaphony can be integrated. Final syllable faithfulness is enforced in both patterns, placing IDENT-IO-$\sigma_{FinalPWdMax}$(high)/(low)/(COLOR) in the top tier. The positional licensing constraint that drives metaphony dominates faithfulness constraints for [high] and [ATR] in the stressed syllable. These are among the stressed syllable faithfulness constraints that dominate the maximal licensing constraint which drives vowel copy. The operation of the combined hierarchies over a form with post-tonic harmony and metaphony is illustrated in (13). The function of each constraint or constraint cluster in the pattern is identified at the top of each column.

(13) Metaphony and post-tonic copy harmony

	Final σ faith	*Metaphony*	*ˈσ faith*	*Vowel copy*	*Nonpositional faith*
/mett-e=tʃe=lu/	IDENT-$\sigma_{FinalPWdMax}$ (high)/(low)/ (COLOR)	LICENSE ([HEIGHT]/ $\sigma_{p\text{-}t}$[+hi], ˈσ)	IDENT-ˈσ (high)/ (ATR)	LICENSE ([V-F]/ $\sigma_{p\text{-}t}$, ∀V)	IDENT (V-F)
→ a. ˈmitt-u=tʃu=lu			*	*	***
b. ˈmett-u=tʃu=lu		*!		*	**
c. ˈmett-e=tʃe=le	*!				*
d. ˈmett-e=tʃe=lu		*!		*, ***	

The input in (13) contains a final high vowel and a mid [+ATR] vowel in the syllable that receives stress. The winning candidate is (13a), with copy harmony among post-tonic vowels and metaphonic raising of the stressed vowel. Candidate (13b) shows post-tonic copy harmony but not metaphony, violating the positional licensing constraint. In (13c), the stressed vowel controls copy harmony among all vowels, violating final syllable faithfulness. Candidate (13d) obeys IDENT constraints, although we may assume that features are shared across the sequence of syllables containing [e]. This candidate violates both of the harmony-driving constraints.

In summary, post-tonic vowel harmony involves a maximal licensing constraint that reflects the weakness of post-tonic vowels. As with metaphony, harmony is controlled by the vowel in the final syllable, through the activity of a final syllable faithfulness constraint. However, while metaphony must reach the stressed syllable, faithfulness to the stressed position acts a limiter on satisfaction of the maximal licensing constraint, so that copy harmony does not persist beyond the post-tonic vowels. Final vowels show a mix of strength and weakness in both harmonies. They serve as the trigger for each harmony, obtained by ranking IDENT constraints for this position in the top tier. Yet final syllables pattern with other post-tonic syllables in being subject to licensing constraints that single out weak elements.

3. Consonantal interactions with post-tonic harmony and metaphony

In Servigliano, metaphony and post-tonic harmony do not show sensitivity to intervening consonants. However, in some dialects, certain consonants block harmony, opening new vantage points on harmonies controlled by the final vowel and the constraints that shape them.

In the Lazio dialect of Sant'Oreste, intervening liquids, [l] and [r], permit copy harmony from the vowel in the final syllable to nonfinal post-tonic vowels, as shown in (14a) (Elwert 1958, Maiden 1995, 1997, Cimarra 1998, Canalis 2009). When another consonant intervenes, a nonfinal post-tonic vowel is neutralized to [i], as in (14b). Historical reconstructions provided by Maiden (1995) and cognates show evidence of the regressive direction of assimilation and neutralization of vowel quality. Pretonic vowels do not show such extreme neutralizations, although [o] is often raised to [u] (14c).

(14)	a.	biʃˈʃɔkala	< *beˈstjɔkkola	'lizard'
		biʃˈʃɔkele	< *beˈstjɔkkole	'lizards'
		ˈrandala	Ital. taˈrantola	'tarantula'
		ˈarbulu	< *ˈarberu	'tree'
		ˈdukulu	Ital. ˈɛdukalo	'educate him'
		ˈarbili	< *ˈarberi	'trees'
		ˈɔmmara	Ital. ˈombra	'shade'
		ˈennara	Ital. ˈedera	'ivy'
		setˈtɛmmere	Ital. setˈtɛmbre	'September'
		noˈɛmmere	Ital. noˈvɛmbre	'November'
		ˈsiguru	Ital. ˈsigaro	'cigar'
		ˈsigiri	Ital. ˈsigari	'cigars'
	b.	ˈtrapinu	< *ˈtrapanu	'drill'
		ˈʃtɛfine	< *ˈstɛfanu	'Stephen'
		ˈdʒakimu	< *ˈdʒakomo	'James'
		ˈsabbiṭu	Ital. ˈsabato	'Saturday'
		ˈskɔmmida	Ital. ˈskɔmoda	'uncomfortable-F'
		ˈʃimiʃu	Ital. ˈtʃimitʃe	'bug'
		ˈstɔmmiku	Ital. ˈstɔmako	'stomach'
		ˈʃtrɔliku		'astrologer, fortune teller'
	c.	affilaˈrati	< *affilaˈrati	'in a row'
		pekuˈraru	< *pekoˈraru	'shepherd'
		lavanˈnara	< *lavanˈdara	'washerwoman'
		kapuˈmilla	Ital. kamoˈmilla	'chamomile'

Examples in Elwert (1958) show post-tonic harmony controlled by final [i, e, a, u]. He does not provide examples with harmony from final [o]; however, there is not reason to expect that [o] would not trigger copy harmony. Final unstressed [o] does occur in Sant'Oreste, e.g. *bollino* 'postage stamp', *ceppo* 'base of a plow', *ciamorrito* 'to make cold (PST PTCP)', but it may be infrequent because of the tendency for unstressed /o/ to raise to [u].

A similar pattern is found in the dialect of Umbertide, with copy harmony from the final vowel across liquids to a nonfinal post-tonic vowel, e.g. [ˈfragwala]/[ˈfragwele] 'strawberry-SG/PL', [ˈsigoro] 'cigar' (Canalis 2009). As in Sant'Oreste, when a nonliquid consonant blocks post-tonic harmony, a nonfinal post-tonic vowel is neutralized to [i], e.g. [ˈstɔmbiko] 'stomach', [ˈmonika] 'nun', [ˈpettine] 'comb'.

In some dialects, post-tonic harmony is limited to specific features. In a dialect spoken in some localities of Garfagnana, harmony among post-tonic vowels causes raising only, as shown in (15). This harmony, which is again controlled by the final vowel, apparently operates only across liquids (Venturelli 1974, Maiden 1991a, 1997, Canalis 2009). Venturelli (1974: 104)

explicitly identifies [l] and [r] as part of the context for post-tonic harmony, though he does not provide examples that show blocking by nonliquid consonants in post-tonic syllables.[8]

(15)	ˈkavul-i	ˈkavol-o	‘cabbage-PL/SG’
	ˈruttsuli	ˈruttsolo	‘fragment of firewood to burn-PL/SG’
	ˈandʒil-i	ˈandʒel-o	‘angel-PL/SG’
	kuˈnijjur-i	kuˈnijjor-o	‘rabbit-PL/SG’
	balˈluttʃiur-i	balˈluttʃior-o	‘boiled chestnut-PL/SG’
	ˈalbir-i	ˈalber-o	‘tree-PL/SG’

Additional cases of post-tonic raising harmony, without full copy, are noted by Maiden (1988a).

An interesting aspect of the Garfagnana dialect described by Venturelli is that it shows raising harmony in various parts of the word, with different properties depending on the vowel’s metrical prominence. In pretonic syllables, mid vowels raise to high when preceding a high vowel (Venturelli 1974, Maiden 1988a, 1991a). Examples in (16) show that in pretonic syllables, raising harmony is not restricted to transliquid contexts.

(16)	viˈstito	‘suit’	veˈstaʎʎa	‘dressing gown’
	durˈmi	‘to sleep’	dorˈmjan	‘we sleep’
	sinˈtuto	‘felt (PST.PTCP)’	senˈtjan	‘we feel’
	dunˈnina	‘little woman’	donˈnona	‘big woman’
	ruviˈna	‘ruin’	Ital. *rovina*	
	tilivisiˈon	‘television’	Ital. *televisione*	
	addumistiˈkato	‘domesticated’	Ital. *addomesticato*	
	rapiruntsuˈlin	‘little radish’	Ital. *raperonzolino*	
	sittiˈmana	‘week’	Ital. *settimana*	
	umbrilˈlin	‘parasol’	Ital. *ombrellino*	
	vilˈluto	‘velvet’	Ital. *velluto*	
	munuˈmento	‘monument’	Ital. *monumento*	

Furthermore, this Garfagnana dialect exhibits a metaphony that raises /ɛ/ to [e] in a stressed syllable before final [i] (Venturelli 1974, Maiden 1987, Giannelli 1997).[9] This harmony is not restricted by the intervening consonant, as shown in (17).

(17)	ˈtemp-i	ˈtɛmp-o	‘time-PL/SG’
	ˈdent-i	ˈdɛnt-e	‘tooth-PL/SG’
	spaˈvent-i	spaˈvɛnt-o	‘fright-PL/SG’
	ˈpetts-i	ˈpɛtts-o	‘piece-PL/SG’
	omˈbrell-i	omˈbrɛll-o	‘umbrella-PL/SG’
	raˈstell-i	raˈstɛll-o	‘rake-PL/SG’

Metaphony can show sensitivity to intervening consonants. This tends to be evidenced in contexts where metaphony is less favored in the typology, that is, in contexts where it is more

[8] Venturelli (1974) does not provide data to indicate the behavior of post-tonic nonfinal /a/ in raising harmony.

[9] Metaphony restricted to a mid [–ATR] vowel target is relatively rare in metaphonic dialects (Maiden 1987). See Calabrese (1985) for discussion of a difficulty that [–ATR] vowels present for metaphony in relation to the markedness constraint *[+high, –ATR].

restricted, such as when the stressed syllable is closed, when the triggering vowel is back (/u/) instead of front (/i/), and when the underlying vowel in the stressed syllable is lower in height (Maiden 1987, 1988b, 1991b). In some dialects, metaphony operates in closed syllables only if the intervening consonant is palatal or /ll/, and this restriction may be narrowed to contexts where there are multiple conditions present where metaphony is less favored.[10] To illustrate, Maiden (1987) points to the remnants of metaphony of /ɛ/ in the Valsesia dialect described by Spoerri (1918). Traces of metaphonic raising of /ɛ/ by /u/ occur only in the reflex of the suffix [*–ˈɛllu] as [ˈel], as in (18a) (cf. [–ˈɛlla] < [*–ˈɛlla]), or before a palatal consonant, as in (18b).

(18)	a.	iˈtʃ-el	‘bird’	b.	letʃ	<*ˈlɛkt-u	‘bed-M’
		murˈf-el	‘child’s mucus’		petʃ	<*ˈpɛkt-u	‘breast-M’
		cf. takuˈr-ɛlla	‘padlock’		vetʃ	<*ˈvɛkl-u	‘old-M’
		aˈɲ-ɛlla	‘ewe lamb’		cf. ˈvɛdʒ-a	<*ˈvɛkl-a	‘old-F’

Further evidence that palatals and /ll/ can selectively enable metaphony comes from the Ticinese dialect of Olivone, where the stressed syllable deriving from the reflexes of [*–ˈɛllu] or [*–ˈɛlli] is singled out for metaphony, as in [serˈv-il], [fraˈd-il] (Sganzini 1928). Maiden (1988b) also points to metaphonic alternations such as [ˈvej-u]/[ˈvɛj-a] ‘old-M/F’ < *[ˈvɛkkj-u]/[ˈvɛkkj-a] in regions of northeastern Italy situated outside areas that normally display metaphony. Maiden characterizes the intervening consonants that permit metaphony as those that “entail raising of the tongue body” (1988b: 25). That palatals involve tongue body raising is uncontroversial. Maiden (1987) notes evidence from Rohlfs (1966) showing that palatalization of /l/ and /ll/ to consonants such as [ʎ] and [j] occurred before /u/ in several dialects of Italy, suggesting that /ll/ is at least somewhat palatalized in those contexts where it enables raising of a preceding vowel.

The inhibition of metaphony in closed syllables might itself be considered a kind of consonant blocking effect. The phenomenon is illustrated by Maiden (1988b) based on Melillo’s (1926) description of metaphonic raising in the Gargano promontory in the dialect of Apricena. Post-tonic /i/ triggers raising of stressed /e/ and /o/ in open and closed syllables, but /u/ triggers metaphony only when the stressed syllable is open, as shown in (19). Unstressed vowel reduction has obscured the quality of the triggering vowel in the modern dialect, but historical reconstructions reveal the phonological differences among the triggers.

(19)	a.	ˈtisə	ˈtisə	<*ˈtes-i/-u	‘taut-M.PL/M.SG’
		cf. ˈtesə	ˈtesə	<*ˈtes-e/-a	F.PL/F.SG
	b.	skəˈfusə	skəˈfusə	<*skiˈfos-i/-u	‘unpleasant-M.PL/M.SG’
		cf. skəˈfosə	skəˈfosə	<*skiˈfos-e/-a	F.PL/F.SG
	c.	ˈfriddə	ˈfreddə	<*ˈfredd-i/-u	‘cold-M.PL/M.SG’
		cf. ˈfreddə	ˈfreddə	<*ˈfredd-e/-a	F.PL/F.SG
	d.	ˈfuŋŋə	ˈfoŋŋə	<*ˈfong-i/-u	‘mushroom-M.PL/M.SG’

In summary, post-tonic harmony in dialects of Italy includes copy harmony and raising harmony, and is controlled by the vowel in the final syllable. While some dialects display post-tonic harmony across all consonants, in others, post-tonic harmony is restricted to transliquid contexts, with merger in post-tonic nonfinal syllables to a vowel such as [i] when harmony is blocked. In a Garfagnana dialect, raising harmony apparently operates only across liquids to

[10] In other dialects, metaphony may not operate under a less favored condition at all, or metaphony may not show an asymmetry in the conditions under which it operates.

reach post-tonic vowels, but it operates across all consonants to reach pretonic vowels, and likewise metaphony is not subject to restrictions on the intervening consonant. Yet in some dialects, metaphony is restricted in contexts where a coda consonant is present, and in some cases, metaphony shows sensitivity to the quality of an intervening consonant, operating only across palatal consonants in contexts where metaphony is less favored in the crossdialectal typology.

4. Analysis

The dialects discussed in §3 differ from Servigliano in exhibiting blocking of harmony by certain consonants. This section presents the analysis of selective consonant blocking. I first address blocking by liquids in post-tonic harmony and vowel merger in contexts where nonliquid consonants block harmony. I then turn to blocking by consonants in metaphony.

In this account, positional faithfulness constraints continue to achieve position-sensitive blocking and trigger control of harmony, and I assume that in dialects with blocking by consonants, harmony is driven by the same kinds of constraints as in Servigliano, that is, metaphony is driven by a positional licensing constraint and post-tonic harmony by a maximal licensing constraint. While some minor specifics of the harmony-driving constraints may have evolved differently across dialects, I hypothesize that the prime motivations remain the same.

4.1 Blocking consonants in post-tonic harmony

The dialect of Sant'Oreste is a case that displays post-tonic harmony across liquid consonants only. In general, consonants are not expected to block vowel harmony, because vowels in adjacent syllables are articulatorily adjacent and vocalic articulations overlap so-called "intervening" consonants that lack an opposing distinctive secondary vocalic articulation (Gafos 1996, Ní Chiosáin & Padgett 2001). I propose that nonliquid consonants block vowel harmony through the action of a constraint that prohibits features shared across dissimilar segments. Several studies have noted that similar segments are more prone to share features (e.g. Itô, Mester & Padgett 1995, McCarthy 1998, Gafos & Lombardi 1999). Gestural uniformity constraints provide a means of implementing this preference. These constraints penalize structures where features are associated across dissimilar segments. In previous work they have been used for vowel harmony restricted to similar vowels (Kaun 1995, 2004, with related proposals by Cole & Kisseberth 1995, Majors 1998). Extending the approach to consonant intervention, the constraint appropriate for nonliquid consonant blocking is given in (20), in the formalism of Walker (2011).

(20) GESTURALUNIFORMITY([V-F], [approx])
For each vowel feature, assign a violation to any pair of adjacent segments that differ in specification for [approximant] to which the same token of that vowel feature is linked.

This constraint restricts vowel harmony to operating only among approximants, namely, vowels, glides and liquids. The inclusion of glides is not necessarily problematic. They are not listed among the consonants that Elwert (1958) identifies as blocking post-tonic harmony, and it is not clear whether they occur in intervocalic context between post-tonic vowels.

In general, an approach to consonant blocking in vowel harmony that uses gestural uniformity constraints predicts that the less similar consonants are to vowels, the more likely they are to block harmony. This is because the set of blocking segments is identified as those with a different specification for a feature from the segment from which spreading could potentially occur. This prediction conforms with observations by McCarthy (1998) about vowel harmonies that operate across only a subset of consonants. For instance, McCarthy finds that

there are languages where only liquids [l, r] do not block harmony, others where it is only coronal continuants [l, r, s] (e.g. Makassarese), and yet another where only coronal sonorants [l, r, n] (plus gutturals) permit feature sharing in VCV contexts (Bedouin Arabic). Liquids agree with vowels in their values for [approximant], [sonorant], and [continuant], continuants agree with vowels in their value for [continuant], and sonorants agree with vowels in their value for [sonorant]. Each of these patterns can be obtained using gestural uniformity constraints, while an apparently unattested pattern where, for example, only [n, s] do not block vowel harmony, but coronal liquids do, is not predicted.

In languages with selective blocking of vowel harmony by consonants, the blocking consonants can also be determined by their place of articulation. Transconsonantal harmony may be restricted to laryngeals, or more generally the class of gutturals, and also to coronals. Such place restrictions have been analyzed using hierarchies of place markedness constraints for complex consonants specified for consonant place and a vowel feature (McCarthy 1994, 1998, Gafos & Lombardi 1999), and they are thus independent in source from the similarity based restrictions enforced by gestural uniformity.[11]

In dialects where post-tonic harmony is blocked by nonliquid consonants, GESTURAL UNIFORMITY([V-F], [approx]) will dominate the maximal licensing constraint that drives post-tonic harmony. This is the key difference distinguishing Sant'Oreste, where post-tonic copy harmony operates across liquids only, from Servigliano, with post-tonic copy harmony across all consonants.

Languages where post-tonic harmony is blocked by nonliquid consonants and metaphony is not blocked by any consonants can be captured with a ranking structure where the metaphony-driving constraint dominates GESTURALUNIFORMITY([V-F], [approx]), which in turn dominates the constraint that drives post-tonic harmony. This is illustrated in (21) with hypothetical forms. The role of each constraint is labeled in the first row. As in Servigliano, a top-tier constraint enforcing faithfulness to [high], [low] and color features in the final syllable will guarantee trigger control in post-tonic harmony and metaphony by the final syllable, but for reasons of space it is not shown here.

(21) Nonliquid consonant blocking in post-tonic harmony but not metaphony

		Metaphony	*Gestural uniformity*	*ˈσ faith*	*Vowel copy*	*Nonpositional faith*
Input	Output	LIC([HEIGHT]/ $\sigma_{p\text{-}t}$[+high], ˈσ)	GESTUNI ([V-F], [approx])	IDENT-ˈσ (high)/(ATR)	LIC([V-F]/ $\sigma_{p\text{-}t}$, ∀V)	IDENT (V-F)
i. /ʃulela/	→ a. ˈʃulala				*	*
	b. ˈʃulela				**!, **	
	c. ˈʃalala			*!		**
ii. /ʃunina/	→ a. ˈʃunina				**, **	
	b. ˈʃunana		*!*		*	*
iii. /ʃeni/	→ a. ˈʃini		**	*		*
	b. ˈʃeni	*!			*	

[11] This larger typological picture presents a problem for an alternative account of transliquid harmony which attributes liquids' lack of blocking to their contrast-sensitive underspecification for place (Canalis 2009). Nasals [m] and [n] contrast in place in Bedouin Arabic, but [n] permits feature sharing in VCV contexts, e.g. /ʃanag/ → [ʃanag] 'he beheaded', while [m] does not, e.g. /taga:samaw/ → [tiga:simaw] 'they shared' (McCarthy 1994). In McCarthy's analysis, raising of /a/ → [i] in nonfinal open syllables is blocked when /a/ shares [pharyngeal] with a following [a] and the intervening consonant. Because [n] contrasts with [m], it is not expected to be underspecified for place.

Both intervocalic consonants in (21i) are liquids. The selected output, in (21ia), shows copy harmony among the post-tonic vowels. This obeys GESTURALUNIFORMITY([V-F], [approx]), but it violates the maximal licensing constraint for the nonharmonizing stressed vowel. Candidate (21ib), which shows no harmony, is ruled out by the constraint that drives vowel copy. In (21ic), there is copy harmony from the final vowel to all preceding vowels; however, this violates stressed syllable faithfulness. In (21ii), both intervocalic consonants are nasals. In (21iia), post-tonic harmony does not operate across the nasal, resulting in violations of the maximal licensing constraint for two vowels that do not harmonize with either post-tonic vowel. The alternative with post-tonic harmony in (21iib) violates the higher-ranked GESTURAL UNIFORMITY constraint. Violations are earned both for the [an] sequence and for the [na] sequence, across which vowel features are linked. In conformity with this paper's practice of simplifying the tally of violations, two violation marks are recorded, one for each pair of segments sharing features, though in fact, a violation will be earned each time a feature is shared across a given pair. The input in (21iii) provides a context for metaphony across a nasal consonant, and the winning output in (21iiia) shows raising in the stressed syllable, violating stressed syllable faithfulness and GESTURALUNIFORMITY. The faithful nonharmonizing candidate in (21iiib) is ruled out by the positional licensing constraint that enforces metaphony.

In a dialect of Garfagnana, raising harmony has been generalized so that it operates regressively to all unstressed vowels. This is driven by a precedence-sensitive maximal licensing constraint that lacks a contextual restriction on the feature subject to licensing (Walker 2011).

(22) LICENSE([+high], $\forall V_{Left}$)
For each token of [+high] associated with a vowel, assign a violation to any preceding vowel in the same prosodic word to which that feature is not associated.

LICENSE([+high], $\forall V_{Left}$) causes all high vowels to be potential triggers for regressive raising harmony. Among unstressed targets, only harmony in post-tonic syllables is apparently restricted to transliquid contexts. This can be achieved by restricting GESTURALUNIFORMITY to the post-tonic domain (Mascaró 2011). GESTURALUNIFORMITY([V-F], [approx])$_{post\text{-}tonic}$ is interpreted such that for each vowel feature, a violation is assigned to any pair of adjacent post-tonic segments that differ in value for [approximant] to which the same token of that vowel feature is linked. The ranking, GESTURALUNIFORMITY([V-F], [approx])$_{post\text{-}tonic}$ >> LICENSE([+high], $\forall V_{Left}$) >> IDENT-IO(high), will enforce raising harmony across all consonants to pretonic syllables but only across liquids in post-tonic contexts. The apparent restriction of metaphony in this dialect to raising /ɛ/ to [ˈe] before [i] signals that stressed syllable faithfulness also dominates LICENSE([+high], $\forall V_{Left}$) to prevent raising of stressed vowels to high.

LICENSE([+high], $\forall V_{Left}$) does not guarantee leftward raising harmony without a means of achieving trigger control for a [+high] vowel. An alternative way to satisfy this constraint is lowering a high vowel, i.e. /… e • i…/ → […e • e…]. In a sequence of two post-tonic syllables or in a sequence of a pretonic vowel and a stressed syllable, control of harmony by the rightmost vowel can be achieved using final or stressed positional faithfulness. However, it is not expected that positional faithfulness would protect the rightmost pretonic high vowel. Unstressed high vowels could remain faithful because of resistance to deriving nonhigh vowels in an unstressed syllable, which falls in line with minimizing the prominence of unstressed syllables. See Walker (2005) for an approach to trigger control along these lines.

4.2 Vowel merger

Post-tonic vowels in nonfinal syllables are subject to merger when harmony from the final vowel

does not reach them. Focusing on the case of Sant'Oreste, it is necessary for something to drive the merger of nonharmonizing post-tonic vowels to [i]. I propose that these are featural markedness constraints. Sant'Oreste shows transliquid copy harmony among post-tonic vowels, and it apparently can generate any of the five unstressed vowel qualities. This harmony is enforced by the same constraint as in Servigliano, LICENSE([V-F]/$\sigma_{post\text{-}tonic}$, ∀V). Control of post-tonic harmony by the final vowel is likewise achieved by IDENT-IO-σ_{Final}(high)/(low)/(COLOR). Neutralization of nonharmonizing post-tonic vowels to a high vowel can be achieved by a constraint that minimizes the sonority of a syllable nucleus in a metrically weak position (de Lacy 2007). I follow Crosswhite (2004) in referencing the category "unstressed syllable."

(23) *$\sigma_{unstressed}$/a,ɛ•ɔ,e•o
Assign a violation to a mid or low peripheral vowel in an unstressed syllable.

Positional faithfulness constraints for height in pretonic syllables will limit the scope of reduction in pretonic syllables, although I will not elaborate the details here.[12]

The sonority reduction constraint in (23) will drive raising of post-tonic vowels, but it will not penalize [u]. This does not appear to be sonority-related, as there is not clear evidence that front vowels are less sonorous than back vowels (Howe & Pulleyblank 2004). The absence of post-tonic nonfinal [u] in nonharmonizing syllables can be attributed to the markedness constraint *[+round]. Since, unround back vowels are not permissible in Sant'Oreste, this constraint will cause /u/ to become [i]. Round vowels are permitted in other contexts, so *[+round] will be dominated by positional faithfulness constraints for metrically stronger positions.

The hierarchy responsible for post-tonic nonfinal vowel neutralization is illustrated in (24) with two mergers: /a/ → [i] and /u/ → [i]. The latter is illustrated with a schematic form showing only the vowels and a consonant that blocks post-tonic harmony, since a historical or related form with nonfinal post-tonic /u/ is not included in Elwert's (1958) exemplification of the mergers. The top tier of the hierarchy contains GESTURALUNIFORMITY([V-F], [approx]), which enforces blocking by nonliquid consonants, and final syllable faithfulness (IDENT-IO-σ_{Final}(high)/(low)/ (COLOR)). Harmony-driving LICENSE([V-F]/$\sigma_{post\text{-}tonic}$, ∀V) is ranked below GESTURALUNIFORMITY, since the latter limits harmony. Merger-driving *$\sigma_{unstressed}$/a,ɛ•ɔ,e•o and *[+round] are ranked below the maximal licensing constraint, because harmony can derive vowels that are nonhigh and/or round. IDENT-IO(V-F) is ranked below the constraints that drive the mergers.

(24) Neutralization in nonharmonizing vowels in a post-tonic nonfinal syllable

Input	Output	GESTUNI IDENT-IO-σ_{Final}	LICENSE ([V-F]/$\sigma_{p\text{-}t}$, ∀V)	*σ_{unstr}/ a,ɛ•ɔ,e•o	*[+rd]	IDENT (V-F)
i. /ʃtɛfane/	→ a. ˈʃtɛfine		**, **	*		*
	b. ˈʃtɛfane		**, **	**!		
	c. ˈʃtɛfene	*!*(GESTUNI)	*	**		*
	d. ˈʃtɛfini	*!(IDENTσ_{Final})	**, **			**
ii. /e • uka/	→ a. ˈe • ika		**, **	*		*
	b. ˈe • uka		**, **	*	*!	

[12] The constraint in (23) could drive the raising of /o/ to [u] that often occurs in pretonic syllables in Sant'Oreste, but this will require structuring its interaction with other constraints so as to limit its force to reducing /o/ only.

Candidate (24ia) is the winner for the input /ʃtɛfane/. Intervocalic [n] blocks post-tonic harmony, resulting in two vowels whose features produce violations of the licensing constraint. The final vowel remains faithful, violating the unstressed vowel reduction constraint, but the nonfinal unstressed vowel raises to [i], violating nonpositional IDENT. The faithful candidate in (24ib) does not show neutralization in the nonfinal unstressed vowel, earning a fatal second violation of the vowel reduction constraint. In (24ic), copy harmony operates across [n], violating GESTURALUNIFORMITY. In (24id), both post-tonic vowels are reduced to [i]. In the intended representation for this candidate, the post-tonic vowels do not share features across [n], respecting gestural uniformity. This candidate is ruled out by faithfulness to the final syllable. For the second input, the winner is (24iia), with post-tonic nonfinal /u/ becoming [i]. This violates nonpositional IDENT, but satisfies higher-ranked *[+round], which is violated by the faithful candidate in (24iib).

Where the post-tonic vowels are separated by a liquid consonant, copy harmony is enforced over merger to [i], as shown in (25). Candidate (25a) shows copy harmony from final [u] to the preceding vowel. This candidate obeys final syllable faithfulness and minimizes violations of maximal licensing by spreading among the post-tonic vowels, which incurs two violations of *[+round]. Candidate (25b) is faithful, but incurs a fatal violation of the licensing constraint. Candidate (25c) shows no copy harmony, but the penultimate vowel reduces to [i], again incurring a fatal violation of the licensing constraint. In (25d), both post-tonic vowels are reduced to [i] and they share features across the liquid, but this is ruled out by final syllable faithfulness.

(25) Post-tonic harmony trumps merger

/arbelu/	GESTUNI IDENT-IO-σ_{Final}	LICENSE ([V-F]/$\sigma_{p\text{-}t}$, ∀V)	*σ_{unstr}/ a,ɛ•ɔ,e•o	*[+rd]	IDENT (V-F)
→ a. ˈarbulu		*		**	*
b. ˈarbelu		**!,**	*	*	
c. ˈarbilu		**!,**		*	*
d. ˈarbili	*!(IDENTσ_{Final})	*			**

In words where a nonliquid consonant blocks post-tonic harmony, a nonfinal post-tonic vowel must be prevented from harmonizing with the stressed vowel in transliquid contexts, as a means of minimizing violations of the maximal licensing constraint. For instance, for a hypothetical input /traline/, an output [ˈtralane] better satisfies LICENSE([V-F]/$\sigma_{post\text{-}tonic}$, ∀V) than [ˈtraline], because features in the first post-tonic vowel fail to be associated only with the final vowel rather than with both the final and stressed vowels. Blocking of transliquid harmony in this context is seen in [ˈʃtrɔliku] ‘astrologer, fortune teller’, which does not harmonize as [ˈʃtrɔloku] to reduce violations of maximal licensing for [±round] and [±high], etc. (Harmony for [-ATR] is not expected, because mid [–ATR] vowels do not occur in unstressed syllables.)

To prevent harmony in this context between the stressed vowel and a post-tonic vowel, I suggest a version of a gestural uniformity constraint that prohibits structures where features are associated across vowels that exceed a minimum difference in magnitude of metrical prominence.

(26) GESTURALUNIFORMITY([V-F], $|V|_{\Delta>1}$)
For each vowel feature, assign a violation to every pair of vowels whose difference in metrical prominence is greater than one step apart on the metrical prominence scale when a single token of that feature is associated to both vowels.

The constraint in (26) will permit vowel features to be shared across post-tonic vowels that are final and nonfinal, since they are adjacent on the metrical prominence scale in (6), but it will be violated when features are shared across a stressed vowel and a post-tonic vowel. GESTURAL UNIFORMITY([V-F], $|V|_{\Delta>1}$) will dominate LICENSE([V-F]/$\sigma_{\text{post-tonic}}$, ∀V), to prevent nonfinal post-tonic vowels from harmonizing with the stressed vowel across a liquid in a form like [ˈʃtrɔliku]. Note that in dialects that show metaphony, which involves harmony that spans stressed and post-tonic vowels, the metaphony-driving constraint will dominate GESTURAL UNIFORMITY([V-F], $|V|_{\Delta>1}$).

This constraint has the potential to define pretonic and post-tonic domains, separate from the primary stressed syllable, for certain processes in languages with a metrical prominence hierarchy like that in (6). Drawing on various vowel patterns in dialects of Italy, Maiden (1995) argues that pretonic syllables (all material preceding the main stress) and post-tonic syllables (all material following the main stress) serve as distinct prosodic domains (see also Mascaró 2011).

A conceivable alternative to the constraint in (26) would be to invoke a crisp edge constraint (Itô & Mester 1999, Walker 2001, 2011, Kawahara 2008) in a version that prevents features from spanning the boundaries of a stressed syllable. However, stressed vowels trigger harmony in pretonic syllables in some dialects of Italy. When the stressed vowel triggers pretonic harmony, violating the crisp edge constraint, it could then also potentially share those features with a nonfinal post-tonic vowel (when harmony from the final syllable is blocked), which is an unwanted prediction. This problem could perhaps be remedied by revising how crisp edge constraints are formalized, so that they are sensitive to the edge at which a violation occurs. Note that both the prominence-sensitive gestural uniformity constraint and a crisp edge constraint for stressed syllables would partially overlap in labor with positional faithfulness for the stressed syllable in their potential to capture blocking effects by stressed positions. Investigating the fuller typological implications of these alternatives is an area for future study.

4.3 Blocking consonants in metaphony

The consonant blocking phenomena in metaphony discussed in §3 show differences from blocking in post-tonic harmony. The absence of metaphony in closed stressed syllables displays blocking that varies according to the consonant's role in the syllable. In addition, patterns that permit metaphony in closed syllables only when the intervening consonant is palatal or palatalized do not show conditioning by gestural uniformity, where harmonizing features are restricted to associating across segments that match in other specified features. Palatal consonants are plausibly specified for the same vocalic height features as high vowels: [+high, -low, +ATR]. However, these are the very features that spread in metaphony, and they could be expected to overlap with tautosyllabic onset consonants in general, including geminates, so any intervening onset or geminate consonant could share these features with a following high vowel, whether they are characterized as "palatal" or not (Browman & Goldstein 1988).

I propose that these consonant blocking effects in metaphony arise from positional licensing constraints with restrictions that select licensing positions that are maximally peceptually robust for the harmonizing features (Walker 2005). Crosslinguistically, targeting of closed syllables in metaphony implies targeting of open syllables ($[ˈV]_\sigma$), but not the reverse (Maiden 1987, 1991b). In metaphonic dialects of Italy, vowels in open syllables are likely longer than in closed syllables, as has been shown for Italian (D'Imperio & Rosenthall 1999). Constraints that restrict the licensing position to $[ˈV]_\sigma$ plausibly single out a more perceptually robust context for licensing of vocalic features than $ˈ\sigma$, which includes closed stressed syllables. Metaphonic raising in the dialect of Apricena, where /u/ triggers metaphony only in open syllables, can thus be achieved using the constraint, LICENSE([HEIGHT]/$\sigma_{\text{post-tonic}}$[+high, +back], $[ˈV]_\sigma$), where height features in post-tonic /u/ must be licensed by a vowel in a stressed open

syllable, which enforces licensing only where there is a form of maximal perceptual benefit.

Dialects where metaphony in closed syllables operates only across palatalized consonants can be understood in a similar light. While stressed open syllables plausibly provide particularly robust targets in the form of longer vowels and a purely vocalic rime, a tautosyllabic sequence of a stressed vowel and a palatal consonant provides especially robust cues to the harmonizing features, [+high, –low, +ATR]. This is because in addition to the cues in the harmonizing stressed vowel, the palatal consonant offers supporting cues to the perception of a high advanced tongue posture that are relatively robust among consonants. Moreover, it appears that many of the nonblocking palatal consonants were released into the following vowel at least at some stage in the historical development in these patterns, offering the additional benefit of release cues.[13] Metaphony patterns (or subpatterns) where harmony operates across all consonants to stressed open syllables and only across palatalized consonants to closed syllables can be driven by a constraint of the kind: LICENSE([HEIGHT]/$\sigma_{\text{post-tonic}}$[+high], $^{\text{l}}\sigma_{\text{robustcues}}$), where stressed syllables with robust cues for the harmonizing features include open syllables and syllables where the stressed vowel is followed by a palatal consonant.

Positional licensing constraints that are sensitive to robust cues predict not only that syllables with robust cues could be a target for harmony, but also that syllables lacking robust cues could be a context for neutralization. For example, vocalic contrasts could be reduced in closed syllables. This prediction is borne out in some localities of Italy, where [ATR] contrasts between mid vowels that are usually restricted to stressed syllables are neutralized in closed stressed syllables (Maiden 1997). Examples are found in Canosa di Puglia. Neutralization occurs in closed stressed syllables, as in (27a–b), but contrasts are maintained in open syllables, as in (27c–d).

(27)	a.	ˈverdə	< *ˈverde	‘green’
		sett	< *ˈsɛtte	‘seven’
	b.	ˈfɔrtə	< *ˈfɔrte	‘strong’
		rɔss	< *ˈrossa	‘red’
	c.	kaˈtai̯nə	< *kaˈtena	‘chain’
		ˈfɛlə	< *ˈfɛle	‘gall’
	d.	ˈsau̯lə	< *ˈsole	‘alone’
		ˈkɔrə	< *ˈkɔre	‘heart’

For fuller discussion of the typological predictions of positional licensing constraints, see Walker 2011.

4.4 Summary

The analysis of consonantal blocking in these harmony systems posits two distinct sources for blocking, each with different typological properties. Blocking by nonliquid consonants, as seen in a number of post-tonic harmony patterns, is attributed to a lack of similarity between the blocking consonants and vocalic triggers, formalized using gestural uniformity constraints. This type of blocking falls in line with many other patterns of selective consonant blocking in vowel harmony and feature sharing in the world’s languages, and it is predicted to potentially occur in any pattern that involves feature sharing among vowels across intervening consonants. In contrast, blocking by some or all coda consonants in metaphony is analyzed as an effect of

[13] Other work on phonological patterns shaped by robustness of perceptual cues includes Steriade (1995, 1999), Côté (2000) and Wright (2004), among others.

constraints that restrict positional licensing to contexts that offer especially robust cues for the harmonizing height features issuing from a high vowel, such as stressed open syllables and stressed syllables where the vowel is followed by a palatal consonant. This kind of blocking based on target insufficiency is not expected in harmony driven by maximal licensing constraints, where every vowel in the word (or perhaps even every segment) contributes to licensing, rather than specifying a specific licensing position. Under this approach, blocking effects in harmony driven by maximal licensing are not due to requirements on the target but rather constraints that are general to aspects of featural markedness, such as feature cooccurrence constraints or gestural uniformity constraints.[14]

5. Positional licensing alternative for post-tonic harmony

An alternative approach to assimilation and neutralization in post-tonic vowels employs a positional licensing constraint: one that requires a marked feature combination in a post-tonic vowel to be licensed by association with the final syllable. Such a constraint could drive a post-tonic nonfinal vowel to assimilate to the final vowel. When an intervening nonliquid consonant prevents harmony, and therefore blocks licensing by the final syllable, neutralization to an unmarked feature combination (i.e. [i]) would occur. The neutralization would serve to satisfy the positional licensing constraint by eliminating the marked features subject to licensing in a post-tonic nonfinal syllable. Under this analysis, both metaphony and post-tonic vowel harmony would be driven by positional licensing constraints, and it has the appeal of driving post-tonic vowel harmony and neutralization with a single constraint.

Nevertheless, there is reason to reject this understanding of what drives post-tonic harmony. A positional licensing account of post-tonic harmony would require the final syllable to serve as a privileged position for a positional licensing constraint (to drive harmony) and for a positional faithfulness constraint (to guarantee trigger control by the final syllable). Yet some dialects with post-tonic vowel harmony also display metaphony (e.g. Servigliano), indicating that various height features in post-tonic syllables must be licensed by the stressed syllable. If the final syllable were indeed a position that licenses height features (among others), it is incongruous that those same features in a final syllable should require licensing by another position.[15]

Kaplan (2015) makes a proposal about possible licensors that helps to address this issue. Based on surveys of positional privilege phenomena in phonology (e.g. Beckman 1998, Barnes 2006, Walker 2011), Kaplan observes that positional licensing constraints and positional faithfulness constraints differ in the scope of prominent positions that they reference. To illustrate, two sample prominence hierarchies are given in (28). These are for general illustration only. As discussed in §2.1, the metrical hierarchy for dialects of Italy is more nuanced.

[14] Whether selective blocking by coda consonants occurs in vowel harmony other than that driven by positional licensing is not a settled question. Selective consonant blocking of harmony in Yucatec Maya and Assamese has variously been interpreted as showing blocking by moraic consonants (Krämer 2001 for Yucatec Maya, Mahanta 2007 for Assamese) or showing blocking sensitive to the number of intervening consonants, independent of syllabic position (Nevins 2010). The understanding of these blocking patterns and their analysis merits further scrutiny.

[15] Servigliano provides a further reason to reject a positional licensing account for post-tonic copy harmony. In Servigliano, copy harmony operates not only among post-tonic vowels, but also among proclitics, where it is controlled by the proclitic nearest to the stem. It is reasonable to suppose that copy harmony in both domains is driven by the same constraint (Mascaró 2011, Walker 2011), but there is no evidence to indicate that the stem-adjacent proclitic resides in a prominent position. This favors a maximal licensing approach to copy harmony in Servigliano, and by extension to similar post-tonic harmonies in other dialects of Italy, rather than an account based in positional licensing.

(28) a. Metrical prominence: |primary stress| > |secondary stress| > |unstressed|
b. Sequential prominence: |initial syllable| > |final syllable| > |medial syllable|

Kaplan finds that patterns driven by positional licensing constraints appear to privilege only positions that are *maximal* in prominence in some dimension. For instance, in the dimension of metrical prominence, only positions that are assigned primary stress function as licensors in positional licensing patterns. Likewise, in the dimension of sequential prominence, initial syllables are the only positions singled out by positional licensing. However, the positions accessed by positional faithfulness constraints appear to include any position that is *nonminimal* in its prominence dimension. For instance, positional faithfulness phenomena that privilege final syllables are attested (see §2.1), even though final syllables are not maximally prominent on the sequential prominence scale.

To incorporate this insight, Kaplan proposes to modify the schema for positional licensing constraints so that the set of possible licensors is defined as consisting of positions that are maximal in a prominence hierarchy. At the same time, he modifies the schema for positional faithfulness constraints so that they may reference positions that are nonminimal in a prominence hierarchy. Kaplan's proposed revision to the set of possible licensors excludes the alternative positional licensing analysis for post-tonic vowel harmony, because it relies on the final syllable functioning as the licensor. Since the final syllable is not maximal on a prominence hierarchy, it is not available in this capacity. It is noteworthy also that Kaplan's proposal rules out incongruous licensing patterns, where positions that serve as licensors for material in weaker positions in turn require their own content to be licensed by a more prominent position in their prominence scale.[16]

In closing, while some properties of post-tonic vowel harmony might at first appear amenable to an analysis based on positional licensing, such an approach is undesirable. A positional licensing account is faced with the problem of an inconsistent understanding of licensing strength in languages where the final position holds trigger control for both post-tonic harmony and metaphony in the stressed syllable. Moreover, an account with positional licensing by the final syllable would open up unwanted typological predictions. Kaplan's study has shown that a constrained typology of positional privilege derives from a formalism where the licensing positions singled out by positional licensing constrants are solely those that are maximally prominent. Further, the concept of maximally prominent licensors for positional licensing constraints is reinforced by patterns of consonant blocking seen in some patterns of metaphony, where only the stressed syllables that offer maximally robust perceptual cues for the harmonizing features are singled out as licensors. Yet this understanding of such blocking effects also suggests that the maximally prominent positions that can serve as licensors can be restricted to contexts where they offer especially robust cues for the features subject to licensing.

6. Conclusion

The patterns of consonant blocking examined in this paper are in keeping with an analysis where metaphony and post-tonic harmony are driven by distinct types of constraints, positional licensing and maximal licensing, respectively. Understanding metaphony as motivated by positional licensing is consistent with the insight that the consonants that are prone to block metaphony are those that are likely to reduce perceptual cues for the harmonizing features in the

[16] However, this theory does not exclude apparently unattested patterns where a position that is maximally prominent in one scale (e.g. a syllable with primary stress) serves as a licensor for features in weaker positions on its scale, but whose content is in turn subject to licensing by a position that is maximally prominent on another scale (e.g. an initial syllable). Patterns of this kind will need further attention.

target stressed syllable. In contrast, consonant blocking in post-tonic harmony shows a similarity effect, a typological characteristic more general to feature sharing in vowel-consonant-vowel contexts – without reference to positional prominence – which is amenable to analysis in terms of gestural unformity constraints. The treatment of these harmonies using distinct constraints permits them to be separately ranked, allowing the possibility that blocking by nonliquids is enforced in post-tonic harmony but not in metaphony. This study also bears on the nature of prominence in different positions. The final syllable in these dialects shows strength in wielding trigger control for both metaphony and post-tonic harmony, which is captured using positional faithfulness constraints for this position. However, the final syllable patterns with weak post-tonic syllables in being a context where features are subject to a licensing restriction. This sets it apart from the stressed syllable, which has the capacity to serve as a licensor in positional licensing constraints in addition to showing positional faithfulness effects, consistent with the typological findings of Kaplan (2015). The connections drawn between the respective roles of different prominent positions and scalar positional prominence hierarchies thus provide valuable insight into properties of these vowel harmony systems.

References

Barnes, Jonathan. 2006. *Strength and weakness at the interface: Positional neutralization in phonetics and phonology*. Berlin: Mouton de Gruyter.

Beckman, Jill. 1997. Positional faithfulness, positional neutralization and Shona vowel harmony. *Phonology* 14. 1–46.

Beckman, Jill. 1998. *Positional faithfulness.* Amherst, MA: University of Massachusetts, Amherst dissertation. (Published New York: Garland, 1999.)

Browman, Catherine & Louis Goldstein. 1988. Some notes on syllable structure in Articulatory Phonology. *Phonetica* 45. 140–155.

Calabrese, Andrea. 1985. Metaphony in Salentino. *Rivista di Grammatica Generativa* 9–10. 1-40.

Calabrese, Andrea. 1988. *Towards a theory of phonological alphabets*. Cambridge, MA: MIT dissertation.

Camilli, Amerindo. 1929. Il dialetto di Servigliano. *Archivum Romanicum* 13. 220–271.

Canalis, Stefano. 2007. Total vowel harmony in two Romance dialects. Handout of paper presented at Phonetics and Phonology in Iberia, Universidade do Minho, Braga, June 25-26, 2007.

Canalis, Stefano. 2009. Post-tonic vowel harmony in some dialects of central Italy: The role of prosodic structure, contrast and consonants. In Marina Vigário, Sónia Frota & M. João Freitas (eds.), *Phonetics and phonology: Interactions and interrelations*, 247–266. Amsterdam: John Benjamins.

Cimarra, Luigi (ed.). 1998. *Il dialetto di Sant'Oreste: richerche e materiali; con un saggio di W. Theodor Elwert*. Sant'Oreste (Roma): Apeiron.

Cole, Jennifer & Charles Kisseberth. 1995. Restricting multi-level constraint evaluation: Opaque rule interaction in Yawelmani vowel harmony. In Keiichiro Suzuki & Dirk Elzinga (eds.), *Proceedings of the South Western Optimality Theory Workshop*. 18–38. University of Arizona Coyote Papers.

Côté, Marie-Hélène. 2000. *Consonant cluster phonotactics: A perceptual approach*. Cambridge, MA: MIT dissertation.

Crosswhite, Katherine. 2004. Vowel reduction. In Bruce Hayes, Robert Kirchner & Donca Steriade (eds.), *Phonetically driven phonology*, 191–231. Cambridge University Press.

Curtin, Suzanne. 2002. *Representational richness in phonological development*. Los Angeles, CA: University of Southern California dissertation.

de Lacy, Paul. 2007. The interaction of tone, sonority, and prosodic structure. In Paul de Lacy (ed.), *The Cambridge handbook of phonology*, 281–307. Cambridge University Press.
D'Imperio, Mariapaola & Sam Rosenthall. 1999. Phonetics and phonology of main stress in Italian. *Phonology* 16. 1–28.
Elwert, W. Theodor. 1958. Die Mundart von S. Oreste. *Romanica. Festschrift für Gerhard Rohlfs*, 121–158. Halle: Niemeyer.
Gafos, Adamantios. 1996. *The articulatory basis of locality in phonology*. Baltimore, MD: Johns Hopkins University dissertation. (Published New York: Garland, 1999.)
Gafos, Adamantios & Linda Lombardi. 1999. Consonant transparency and vowel echo. *Proceedings of the North East Linguistic Society* 29. 81–96.
Giannelli, Luciano. 1997. Tuscany. In Martin Maiden & Mair Perry (eds.), *The dialects of Italy*, 287–302. New York: Routledge.
Howe, Darin & Douglas Pulleyblank. 2004. Harmonic scales as faithfulness. *Canadian Journal of Linguistics* 49. 1–49.
Hyman, Larry. 1998. Positional prominence and the 'prosodic trough' in Yaka. *Phonology* 15. 41–75.
Itô, Junko & Armin Mester, 1999. Realignment. In René Kager, Harry van der Hulst & Wim Zonneveld (eds), *The prosody-morphology interface*, 188–217. Cambridge University Press.
Itô, Junko & Armin Mester. 2009. The onset of the prosodic word. In Steve Parker (ed.), *Phonological argumentation : Essays on evidence and motivation*, 227–260. London: Equinox.
Itô, Junko, Armin Mester & Jaye Padgett. 1995. Licensing and underspecification in Optimality Theory. *Linguistic Inquiry* 26. 571–613.
Jiménez, Jesús & Maria-Rosa Lloret. 2007. Andalusian vowel harmony: Weak triggers and perceptibility. Handout of paper presented at the fourth Old World Conference in Phonology, Workshop on Harmony in the Languages of the Mediterranean. Rhodes, January 18–21, 2007.
Kaplan, Aaron. 2015. Maximal prominence and a theory of possible licensors. *Natural Language and Linguistic Theory* 33. 1235–1270.
Kawahara, Shigeto. 2008. On the proper treatment of non-crisp edges. *Japanese/Korean Linguistics* 13. 55–67. Stanford: CSLI Publications.
Kaun, Abigail. 1995. *The typology of rounding harmony: An optimality theoretic approach*. Los Angeles, CA: UCLA dissertation.
Kaun, Abigail. 2004. The typology of rounding harmony. In Bruce Hayes, Robert Kirchner & Donca Steriade (eds.), *Phonetically driven phonology*, 87–116. Cambridge University Press.
Kaze, Jeffery. 1989. *Metaphony in Spanish and Italian dialects revisited.* Urbana-Champaign, IL: University of Illinois, Urbana-Champaign dissertation.
Kirchner, Robert. 1996. Synchronic chain shifts in Optimality Theory. *Linguistic Inquiry* 27. 341–349.
Krämer, Martin. 2001. Yucatec Maya vowel alternations: Harmony as syntagmatic identity. *Zeitschrift für Sprachwissenschaft* 20. 175–217.
Krämer, Martin. 2003. *Vowel harmony and correspondence theory.* Studies in Generative Grammar 66. Berlin: Mouton de Gruyter.
Loporcaro, Michele. 2000. Stress stability under cliticization and the prosodic status of Romance clitics. In Lori Repetti (ed.), *Phonological theory and the dialects of Italy*, 137–168. Amsterdam: John Benjamins.
Mahanta, Shakuntala. 2007. *Directionality and locality in vowel harmony with special reference to Assamese*. Utrecht: Utrecht University dissertation.
Maiden, Martin. 1987. New perspectives on the genesis of Italian metaphony. *Transactions of*

the Philological Society 85. 38–73.
Maiden, Martin. 1988a. Armonia regressiva di vocali atone nell'Italia meridonale. *L'Italia dialettale* 51. 111–139.
Maiden, Martin. 1988b. On the dynamics of low mid vowel diphthongization in Tuscan and Gallo-Italian. *Canadian Journal of Italian Studies* 11. 1–37.
Maiden, Martin. 1991a. Armonia regressiva di vocali atone nell'Italia centromeridionale: la sua importanza per la teoria della fonologia prosodica. In Luciano Giannelli, Nicoletta Maraschio, Teresa Poggi Salani & Massimo Vedovelli (eds.), *Tra rinascimento e strutture attuali. Saggi di linguistica italiana*, 233–239. Torino: Rosenberg and Sellier.
Maiden, Martin. 1991b. *Interactive morphonology: Metaphony in Italy*. New York: Routledge.
Maiden, Martin. 1995. Evidence from the Italian dialects for the internal structure of prosodic domains. In John Charles Smith & Martin Maiden (eds.), *Linguistic theory and the Romance languages*, 115–131. Amsterdam: John Benjamins.
Maiden, Martin. 1997. Vowel systems. In Martin Maiden & Mair Perry (eds.), *The dialects of Italy*, 7–14. New York: Routledge.
Majors, Tivoli. 1998. *Stress-dependent harmony*. Austin, TX: University of Texas, Austin dissertation.
Mascaró, Joan. 2011. An analysis of stress-dependent harmony in Servigliano. *Probus* 23. 21-55.
McCarthy, John J. 1994. On coronal 'transparency'. Paper presented at the Trilateral Phonology Weekend, University of California, Santa Cruz, January 22, 1994.
McCarthy, John J. 1998. Morpheme structure constraints and paradigm occultation. In M. Catherine Gruber, Derrick Higgins, Kenneth Olson & Tamra Wysocki (eds.), *Proceedings of the Chicago Linguistic Society 32, Part 2: The Panels*. 123–150. Chicago, IL: Chicago Linguistic Society.
Melillo, Giacomo. 1926. *I dialetti del Gargano: saggio fonetico*. Pisa: Simoncini.
Nevins, Andrew. 2010. *Locality in vowel harmony*. Cambridge, MA: MIT Press.
Ní Chiosáin, Máire & Jaye Padgett. 2001. Markedness, segment realization and locality in spreading. In Linda Lombardi (ed.), *Segmental phonology in Optimality Theory*, 118–156. Cambridge University Press.
Nibert, Holly. 1998. Processes of vowel harmony in the Servigliano dialect of Italian: A comparison of two non-linear proposals for the representation of vowel height. *Probus* 10. 67–101.
Padgett, Jaye. 2002. Feature classes in phonology. *Language* 78. 81–110.
Prince, Alan, & Paul Smolensky. 2004 [1993]. *Optimality Theory: Constraint interaction in generative grammar*. Oxford: Blackwell. (Revision of 1993 technical report, Rutgers University Center for Cognitive Science.)
Rohlfs. Gerhard. 1966. *Grammatica storica della lingua italiana e dei suoi dialetti*, Vol. I, II. Turin: Einaudi.
Sasa, Tomosasa. 2009. *Treatments of vowel harmony in Optimality Theory*. Iowa City, IA: University of Iowa dissertation.
Sganzini, Silvio. 1928. Osservazioni sul vocalismo dei dialetti della Valle de Blenio. *L'Italia dialettale* 4. 150–167.
Spoerri, Teofilo. 1918. Il dialetto della Valsesia. *Rendiconti del reale Istituto lombardo di scienze e lettere* II 51. 391–409, 683–698; 732–752.
Steriade, Donca. 1995. Positional neutralization. Ms., UCLA.
Steriade, Donca. 1999. Phonetics in phonology: The case of laryngeal neutralization. *UCLA Working Papers in Linguistics* 2. 25–146.
Venturelli, Gastone. 1974. Varietà di armonizzazioni vocaliche nella Garfagnana centro-meridionale. *Atti del XIV Congresso internazionale de linguistica romanza* 3. 101–104.

Naples: Macchiaroli and Amsterdam: John Benjamins.
Walker, Rachel. 2001. Round licensing, harmony, and bisyllabic triggers in Altaic. *Natural Language and Linguistic Theory* 19. 827–878.
Walker, Rachel. 2005. Weak triggers in vowel harmony. *Natural Language and Linguistic Theory* 23. 917–989.
Walker, Rachel. 2011. *Vowel patterns in language*. Cambridge University Press.
Wright, Richard. 2004. A review of perceptual cues and cue robustness. In Bruce Hayes, Robert Kirchner & Donca Steriade (eds.), *Phonetically driven phonology*, 34–57. Cambridge University Press.