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NONMYOPIC HARMONY AND THE  
NATURE OF DERIVATIONS

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Unbounded harmony caused by feature spreading is typically myopic (Wilson 2003, 2006). This means that whether spreading proceeds to a neighboring element is not sensitive to whether a segment beyond the neighboring element can undergo harmony. To illustrate, suppose that a language has a regressive harmony for some feature and a sequence of segments [. . .  $\alpha$   $\beta$   $\gamma$  . . .]. Whether spreading proceeds from  $\gamma$  to  $\beta$  is not sensitive to whether spreading can continue on to  $\alpha$ . In other words, the operation of myopic harmony is determined by local factors, not global ones. Although myopia follows from the iterative application of an assimilation rule that spreads a feature to a single adjacent target, studies by Wilson (2003, 2006) and McCarthy (2003, 2004, 2009) have demonstrated that it presents difficulty for the classic framework of Optimality Theory (OT) (Prince and Smolensky 2004) under conventional assumptions about featural representations and the harmony-driving constraints.

This work focuses on a complementary issue. The first point to be established is that nonmyopic bounded harmony exists: patterns where adjacent segments undergo assimilation only when a nonlocal viable target is present for a bounded harmony process. The theoretical argument to be made about these systems is that while they are straightforwardly handled within classic OT, they pose a problem for a proposal to restrict the magnitude of change that can occur in a single step of a derivation, as in certain serialist approaches in OT, such as OT with candidate chains (OT-CC) (McCarthy 2007).

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### 1 Nonmyopic Harmony in Romance Metaphony

Minor Romance languages or “dialects” spoken in the central Veneto region and on the island of Grado show a type of vowel harmony referred to as metaphony in which a posttonic vowel triggers raising of a preceding mid vowel in a syllable that receives main stress. The particulars of the raising patterns in these regions are chiefly the same. I will demonstrate that metaphony is nonmyopic in these systems, and I have included examples from both regions to strengthen the basis of support for this claim. The data are drawn primarily from Walker 2005, with additional examples from Cortelazzo 1978, Tarlao 1983, and Brunelli 2000.

In stressed syllables, the dialects of central Veneto (CV) and Grado contrast [i, e, ε, a, ə, o, u]; in unstressed syllables, only [i, e, a, o, u] occur. In metaphony, a posttonic high vowel causes /e/ and /o/ to raise to [i] and [u], respectively, in a syllable assigned main stress. Examples are provided in (1).<sup>1</sup> The trigger vowel in these examples is /i/. These languages lack /u/ in their inflectional system, and no data were found where /u/ occurred in a stem in a context to trigger harmony. Given, however, that /u/ can trigger metaphonic raising in certain other Romance languages (Hualde 1989, Maiden 1991), it is reasonable (but not crucial) to generalize that triggers are high vowels.

(1) *Central Veneto*

kals- <u>é</u> -o	kals- <u>í</u> -i	‘sock (m sg/pl)’
kant- <u>é</u> -se	kant- <u>í</u> -si-mo	‘sing (1sg/1pl impf. subj.)’
mó <u>v</u> -o	mú <u>v</u> -i	‘move (1sg/2sg)’
bot <u>ón</u>	bot <u>ún</u> -i	‘button (m sg/pl)’
<i>Grado</i>		
kr <u>é</u> -e	kr <u>í</u> -i	‘believe (3sg/2sg)’
bened <u>é</u> -o	bened <u>í</u> -i	‘blessed (m sg/pl)’
róm <u>p</u> -o	rúm <u>p</u> -i	‘break (1sg/2sg)’
albor- <u>é</u> -o	albor- <u>í</u> -i	‘tree (m sg/pl dim.)’

In addition to alternations that occur under suffixation, noninflectional posttonic stem vowels can trigger metaphony. This is apparent in [gúm(b)i-o] ‘elbow (m sg)’ (CV), for which speakers who show variable metaphony have an alternate form [góm(b)i-o], and in [súri]f-o] ‘mouse (m sg)’ (Grado), which is *sórcio* in Standard Italian.

A key observation for the issues under focus is that the harmony can be initiated by a high vowel in a syllable that is not adjacent to the stressed syllable. This can occur in words with antepenultimate

<sup>1</sup> Not included here are examples that show raising of pretonic vowels, which is a much more variable phenomenon in these languages and has been argued to be driven by a separate harmony imperative (Walker 2005).

stress in which the penult and antepenult contain /e/ or /o/. For speakers who show this pattern, vowels in both syllables undergo raising.

- (2) *Central Veneto*  
 órden-o úrdin-i 'order (1sg/2sg)'  
*Grado*  
 ênzen-e ínzin-i 'shin (m sg/pl)'  
 zóven-e zúvin-i 'young man (sg/pl)'

Although a mid vowel in an unstressed penult can raise when the preceding stressed syllable undergoes raising, such vowels do not raise otherwise. Elsewhere (Walker 2005), I establish that metaphony does not affect /e, a, o/ (e.g., CV: [gát-o]/[gát-i] 'cat (m sg/pl)'; Grado: [bél-o]/[bél-i] 'beautiful (m sg/pl)'). When one of these vowels is in a stressed antepenult, a mid unstressed penult does not raise.

- (3) *Central Veneto*  
 pérseg-o pérseg-i 'peach (fruit) (m sg/pl)'  
 ázen-o ázen-i 'donkey (m sg/pl)'  
 ángol-o ángol-i 'angle (m sg/pl)'  
*Grado*  
 bodzánteni 'crab right before it becomes without a shell (m pl)'

Observe in (4) that high penult vowels are not generally prevented after a nonhigh stressed vowel (but posttonic [u] is infrequent because of its absence in inflections). This suggests that it is the viability of the stressed target that determines whether an intervening mid vowel raises.

- (4) *Central Veneto*  
 ezérsjt-o ezérsjt-i 'army (m sg/pl)'  
 návig-o 'navigate (1sg)'  
*Grado*  
 simistérijó 'cemetery (m sg)'  
 frábica 'building, factory (f sg)'

To summarize, metaphonic raising, affecting a stressed vowel, can be initiated by a high vowel in a nonadjacent syllable. In the course of raising the stressed vowel, an intervening unstressed mid vowel is also raised. However, when a mid vowel intervenes between a high vowel and a stressed vowel that is not subject to raising, the mid vowel does not raise. Whether harmony occurs locally is therefore determined by long-distance information, producing a nonmyopic pattern. As metaphonic raising is bounded by the stressed syllable, these data do not dispute the claim that unbounded harmony is myopic.

It is noteworthy that when a trigger and a stressed target are not in adjacent syllables, particular dialects show a different solution, with raising in a stressed antepenult across an unaffected penult, as in the dialect of Ascrea (Fanti 1938–1940, Maiden 1991).

(5) *Ascrea*

[t<sub>ó</sub>re<sub>u</sub>-a] [t<sub>ú</sub>re<sub>u</sub>-u] ‘cloudy (f sg/m sg)’  
 cf. raising of /e/ → [i] in [v<sub>é</sub>ʃt-e]/[v<sub>í</sub>ʃt-i] ‘this (f pl/m pl)’

Nonlocal metaphonies like this have been analyzed using gapped representations (Hualde 1989) or feature copying (Walker 2004).

In contrast, harmony never skips a vowel in the dialects under study. An intervening mid vowel undergoes raising, but /a/ blocks harmony in CV when it occurs between a final high vowel and a stressed target mid vowel, as in (6). No examples with the relevant conditions were found to test /a/ blocking in the Grado dialect.

(6) *Central Veneto*

la(v)<sub>ó</sub>r-a-v-a la(v)<sub>ó</sub>r-a-v-i ‘worked, was working  
 (1sg/2sg impf. ind.)’

Blocking by /a/ suggests that although harmony can be initiated by a high vowel in a nonadjacent syllable, assimilation in the CV dialect must transmit through adjacent syllables, a scenario also expected for Grado given the raising of intervening mid vowels. The transparency and blocking phenomena in metaphony will be relevant in assessing implications for a theory of gradualness in derivations.

## 2 Nonmyopia in Classic Optimality Theory

The existence of a nonmyopic system, where global factors in the word affect whether local harmony occurs, is predicted under a standard model of OT. In the analysis proposed in Walker 2005, metaphony is driven by LICENSE([+high]<sub>posttonic</sub>, *ó*), a constraint requiring that a [+high] feature in a posttonic syllable have an association to the stressed syllable. If the licensing constraint dominates IDENT<sub>IO</sub>(high) (McCarthy and Prince 1995), assimilation between a posttonic high vowel and a stressed vowel is predicted. The pattern of Grado and CV, where an intervening unstressed mid vowel also undergoes assimilation, is obtained if a constraint that restricts assimilation to adjacent syllables also dominates IDENT<sub>IO</sub>(high). I will refer to this constraint as *LOCALITY*; it could stand for a NOGAP constraint on feature associations, or for PROXIMITY in the case of copied features. It is placed in the top tier of the constraint hierarchy here. A case of nonmyopic assimilation is shown in (7a).<sup>2</sup> Assuming that [ɛ, a, ɔ] are [−ATR] and [i, e, o, u] are [+ATR] (Calabrese 1988), ranking IDENT<sub>IO</sub>(ATR) over the licensing constraint prevents /e, a, ɔ/ from undergoing harmony. When the stressed vowel does not raise, an intervening mid vowel is not predicted to undergo raising (7b), because absent raising

<sup>2</sup> See Walker 2005 for analysis of assimilation by the stressed vowel rather than the posttonic high vowel and of the retention of [+high] when licensing does not succeed.

in the stressed syllable, the candidate does not improve in its satisfaction of the licensing constraint. I assume that undominated \*[i, u] prevents raising to [–ATR] high vowels.

(7) *Nonmyopic harmony*

Input	Output	Id(ATR)	Loc	Lic([+high])	Id(high)
a. /orden-i/	úrđini				**
	órđeni			*!	
	úrđeni		*!		*
b. /perseg-i/	pérsegi			*	
	píršigi	*!			**
	pérsigi			*	*!

This ranking also obtains blocking by /a/ in CV. IDENT(ATR) prevents /a/ from raising and LOCALITY prevents /a/ from being skipped, at the cost of a LICENSE violation.

(8) *Blocking by /a/*

/lavor-a-v-i/	Id(ATR)	Loc	Lic([+high])	Id(high)
lavóravi			*	
lavúriivi	*!			**
lavúravi		*!		*

Nonmyopia in the metaphony pattern under study thus receives a straightforward treatment in classic OT, as does the blocking effect by intervening /a/.

### 3 Implications for the Formalisms of Optimality Theory with Candidate Chains

With inspiration from Harmonic Serialism (Prince and Smolensky 2004), the framework of OT-CC (McCarthy 2007) incorporates derivations, an architecture that largely originated in order to address problems of opacity. More broadly, several studies have advocated the benefits of Harmonic Serialism (Kimper 2008, McCarthy 2008a,b, 2009, Pruitt 2008). The issues raised in what follows are generally applicable to those versions of serialism, but for concreteness, I focus on the specific formalisms of OT-CC.

In OT-CC, candidates are “candidate chains” that contain an output form as well as a (possibly null) series of intermediate forms by which that output is derived from a faithful parse of the input. Any

noninitial form in a chain is required to differ minimally from its immediate predecessor and be more harmonic with respect to the language's grammar. The final member of the sequence is the output form over which EVAL operates in selecting the optimal output. The requirements that successive forms in a chain show minimal difference and harmonic improvement are important with regard to the metaphony patterns under study. In what follows, I will show that under their current formulation these requirements predict that nonmyopic harmony with blocking should not be attested. However, a modification that solves the problem loses certain beneficial predictions made under OT-CC's current assumptions.

McCarthy (2007) proposes three well-formedness conditions on candidate chains: Faithful First Member, Gradualness, and Local Optimality. The Faithful First Member condition will not figure in the discussion here. Gradualness states that "the successive forms in a chain must monotonically increase in unfaithfulness relative to the input. The monotonic increase has a slope of one LUM [localized unfaithful mapping] per form in the chain" (p. 77). An LUM is "a single violation of a basic faithfulness constraint in a specific location in a form" (p. 61). Basic faithfulness constraints are proposed to be MAX( $x$ ), DEP( $x$ ), IDENT( $f$ ), and possibly a few others. The condition of Local Optimality requires that "every noninitial form in a chain is more harmonic than its predecessor (= harmonic improvement). It is also more harmonic than every other form that can be derived by violating the same basic faithfulness constraint (= best violation)" (p. 61). Chains that satisfy Gradualness and Local Optimality are produced by a recursive generation procedure that loops between GEN and EVAL (pp. 63–64). McCarthy (2007) and Wolf (2008) argue that a version of OT with these well-formedness conditions makes predictions with various positive results. Nevertheless, when nonmyopic harmony with blocking is brought into the picture, a problem emerges.

Let us first consider an account with blocking by /a/ that obeys the well-formedness conditions of OT-CC. Recall that in Ascrea's metaphony, harmony skips an unstressed penult. This suggests the possibility of a candidate chain for metaphony in CV and Grado where assimilation in a stressed antepenult precedes harmony in the penult, as in ⟨ordeni, órdeni, úrdeni, úrdini⟩. The first member of this chain is faithful, the second adds stress, the third displays harmony in the stressed vowel, and the fourth displays harmony in the unstressed penult.

To make this approach succeed, LOCALITY, which drives the eventual assimilation in the penult, would have to be ranked between the licensing constraint and IDENT<sub>IO</sub>(high). The tableau in (9) shows that the hypothesized series of candidates is harmonically improving: (9c) is more harmonic than (9b), which is more harmonic than (9a). The GEN/EVAL loop could thus generate this chain. Observe that in order for (9b) to be a successor to (9a) in a chain, the licensing constraint must dominate LOCALITY.

(9) *Antepenult raising precedes penult raising*

/orden-i/	LIC([ +high])	LOC	ID(high)
a. órdeni	*		
b. úrdeni		*	*
c. úrdini			**

A problem with this analysis is that it makes the wrong prediction about intervening nonundergoers. They are predicted to be transparent to harmony rather than block it, as shown in (10). Recall that /a/ does not raise because of undominated IDENT<sub>IO</sub>(ATR). Candidate (10b), with transparent /a/, is harmonically improving over (10a), with blocking /a/.

(10) *Erroneous prediction that /a/ will be transparent*

/lavor-a-v-i/	LIC([ +high])	LOC	ID(high)
a. lavóravi	*		
b. lavúravi		*	*

Without further augmentation, an approach relying on a nonlocal assimilation that precedes raising of an intervening vowel carries an implication that nonundergoers will be transparent rather than block. This makes the wrong prediction, at least for CV. Blocking by /a/ in this pattern could be considered an instance of a kind of ‘‘sour grapes spreading’’ (Padgett 1995). *Sour grapes spreading* refers to harmony that must be fully achieved in some respect or not at all. In further research, it would be valuable to identify other cases of sour grapes spreading and examine how they fare as a class within OT-CC.

Within classic OT, the constraint set in question yields a typology of nonlocal target-trigger interactions consistent with the patterns under study. In contexts where satisfaction of licensing would affect a particular feature (F), the ranking IDENT(F), LOCALITY  $\gg$  LICENSE can produce blocking by an unstressed penult, as shown in (8) (for [ATR]). LOCALITY, LICENSE  $\gg$  IDENT(F) produces local spreading through an unstressed penult, as seen in (7a) (for [high]). A third ranking LICENSE  $\gg$  IDENT(F)  $\gg$  LOCALITY can produce nonlocal harmony across an unstressed penult, as in the dialect of Ascrea.

An alternative to an OT-CC account of [úrdini] with nonlocal assimilation would be to posit a candidate chain where harmony progresses through an intervening syllable first, but this too is not without difficulties. The chain  $**(\text{ordeni}, \text{órdeni}, \text{órdini}, \text{úrdini})$  is invalid, as notated by \*\*. The step from *órdeni* to *órdini* does not obey Local Optimality, because it is not harmonically improving. Raising the penult vowel does not improve satisfaction of LICENSE. Recall that inter-

vening mid vowels do not raise when the stressed vowel does not raise (see (3)). This points to a conclusion that the harmony-driving constraint does not promote raising of an unstressed vowel. Such raising occurs only as a by-product of harmony that reaches the stressed vowel. In a second conceivable chain  $**\langle \text{ordeni, } \acute{\text{ordeni, }} \acute{\text{úrdini}} \rangle$ , the fell-swoop derivational step from *órdeni* to *úrdini* does not obey Gradualness. It contains two LUMs: IDENT(high)@1 (o→u) and IDENT-(high)@4 (e→i). The same general issue also confronts patterns of iterative spreading driven by a constraint like AGREE (Baković 2000), because stepwise spreading does not consistently improve overall harmony at each consecutive stage (McCarthy 2006).

OT-CC postulates PREC(EDENCE) constraints, which mandate that an LUM violating a particular faithfulness constraint be preceded and not followed in the candidate chain by an LUM that violates another particular faithfulness constraint. However, despite the increased power these constraints bring to the framework, adding them does not solve the problem at hand. For instance, one could conceive of an analysis that makes use of a PREC constraint requiring that a violation of IDENT in a stressed syllable be preceded and not followed by a violation of IDENT in an unstressed syllable. Although this would be satisfied by a chain step from *órdeni* to *órdini*, it will not help as this step still does not obey Local Optimality.

Yet another strategy, suggested by a reviewer, would be to extend the OT-CC formalism to include a FOLLOW(F1, F2) constraint: the reverse of a PREC constraint, requiring that a violation of some faithfulness constraint be followed and not preceded by some other faithfulness constraint. For instance, IDENT in a stressed syllable must be followed and not preceded by IDENT in an unstressed syllable. In some word forms, this could perhaps predict blocking of metaphony when an intervening unstressed vowel could not undergo assimilation. However, a fresh problem is introduced whereby the FOLLOW constraint could prevent harmony between an adjacent target and trigger in a disyllabic word. Further, it predicts that harmony could persist to a pretonic syllable when the trigger and stressed syllable were adjacent but not when an intervening unstressed vowel underwent harmony. These unwanted effects render FOLLOW unpromising.

A different conceivable remedy to the problem is to allow what McCarthy (2008b) calls the “simultaneous approach,” in which GEN is permitted to simultaneously add multiple violations of a single basic faithfulness constraint. This could be achieved by revising Gradualness to state that the monotonic increase in unfaithfulness in noninitial forms has a slope per form in the chain of one or more LUMs, where all LUMs in a given step violate a single and the same basic faithfulness constraint. This revision would render the fell-swoop chain  $\langle \text{ordeni, } \acute{\text{ordeni, }} \acute{\text{úrdini}} \rangle$  well formed.

However, the revision in question has mixed results for the bigger picture. Whereas this revision resolves the problem for nonmyopic metaphony, it also produces some unwanted effects. McCarthy



(2008b) has argued that preventing simultaneous violations of the same basic faithfulness constraint is necessary to obtain metrically conditioned syncope in Aguaruna (Awajún). It might be possible to revise the well-formedness conditions further so that they are compatible with both Aguaruna and nonmyopic harmony. For Aguaruna, what must be ruled out is simultaneous faithfulness violations that reduce markedness at multiple loci in a form, and the kind of simultaneity needed for nonmyopic metaphony involves reduction of markedness at a single locus. Nevertheless, even simultaneity that reduces markedness at a single locus loses a welcome result of OT-CC's current formulation of gradualness in which it captures myopia-like effects in truncation and metathesis and rules out apparently unattested patterns of these phenomena with global scope in a form (McCarthy 2006, 2007:84–88).

In sum, the OT-CC theory of gradualness is too restrictive, because it excludes an attested pattern of nonmyopic bounded harmony. A simple revision that would resolve the problem for nonmyopic harmony causes an attested pattern of syncope to be excluded and at the same time allows generation of certain unattested non-myopia-like effects.

#### 4 Conclusion

Although myopia in unbounded harmony has presented a challenge for classic OT, nonmyopic bounded harmony with blocking, as in CV, receives a successful account. This pattern bears out the theory's prediction that a global evaluation of well-formedness in candidates is capable of determining whether assimilation occurs locally. On the other hand, phenomena remain for which classic OT undergenerates (e.g., certain types of opacity) and for which it overgenerates. Whereas OT-CC solves some of these problems, the well-formedness conditions that are part of its formalism are problematic for nonmyopic harmony with blocking, and a straightforward fix produces other unwanted results. Looking forward, these data point to a conclusion that a theory of phonological derivations must allow for certain kinds of fell-swoop derivations. To advance this issue further, it would be valuable to examine other phenomena with nonmyopic or sour grapes effects, which may resist analysis in OT-CC, and consider any connection to boundedness.

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