Nonlocal Trigger-Target Relations

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This article argues that an approach to unbounded harmony that enforces restrictions only over adjacent elements undergenerates for patterns with nonlocal trigger-target relations. Such patterns may occur even in cases where assimilation propagates locally, as found in Baiyina Oroqen and Mọ̀bà Yorùbá. However, a harmony imperative that is not restricted to adjacent elements is capable of producing these systems, in which a trigger may be related to both adjacent and nonadjacent targets. The appropriate one-to-many relational structure is compatible with Optimality Theory, where well-formedness is evaluated over the entire candidate at once, but it is not consistent with a local iterative spreading rule or an approach using a local spreading constraint, lacking additional constraints on nonlocal dependencies. This study thus identifies a previously unrecognized advantage of analyzing harmony within Optimality Theory, and it signals the necessity for any theory of harmony to handle nonlocal trigger-target relations.

Keywords: harmony, locality, spreading rule, Optimality Theory, Oroqen, Yorùbá

1 Introduction

In unbounded harmony systems, harmony operates to the full extent possible within its domain, such as the word, producing assimilation in all available targets until a boundary is reached or harmony is blocked. A hallmark of unbounded harmony is that it can be partial in its domain. For instance, in a sequence [. . . α β γ . . .], whether a progressive harmony operates from α to β does not depend on whether it proceeds to γ or beyond; that is, it is ''myopic'' (Wilson 2003, 2006).

The myopic nature of unbounded harmony presents a difficulty for an approach that uses AGREE(F) as the harmony-driving constraint. AGREE predicts an unattested ''sour grapes'' effect (terminology due to Padgett 1995a), where unbounded harmony operates only when it is fully achieved in some respect, such as reaching a word boundary (Wilson 2003, 2006, McCarthy 2003, 2004, 2011). The problem is illustrated here with a vowel harmony from the Baiyina dialect of Oroqen (Li 1996). Round harmony operates among nonhigh vowels from a round vowel in the root-initial syllable, as shown in (1).

(1)	a. ɔlɔ̱-jɔ̱	'fish' INDEF.ACC	cf. bɪra-ja̱	'river' INDEF.ACC
	b. bɔdɔ̱-xɔ̱l	'think' IMMED.IMP.2SG	cf. taŋ-ka̱l	'count' IMMED.IMP.2SG

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High vowels block round harmony, which can result in words that show partial harmony, as in (2). A form like *[ɔla̠-ŋɪ], where [a] does not harmonize with [ɔ] in the preceding syllable, does not occur in native words. Examples showing that high unround and round vowels block round harmony to following vowels are provided in section 2.

(2) ɔlɔ̠-ŋɪ 'fish' POSS

In a rule-based approach, local iterative spreading rules are a means of obtaining partial harmony (e.g., Archangeli and Pulleyblank 1994). Within Optimality Theory (OT; Prince and Smolensky 2004), a primary approach to harmony uses AGREE(F), which is similar to local iterative spreading in that it incorporates adjacency into its definition (Baković 2000). This constraint is defined in (3) for [round].

(3) *AGREE([round])*
Adjacent vowels have the same value for the feature [round].

An AGREE-based analysis for round harmony ranks AGREE([round]) over IDENT-IO([round]), the latter of which punishes a change in specification for [round] (McCarthy and Prince 1995). For Baiyina Oroqen, AGREE([round]) must be dominated by a constraint that prevents high vowels from undergoing harmony and causes them to halt it. For present purposes, I refer to this constraint as HIGHVSBLOCK (to be revisited later). The effect of the resulting hierarchy is illustrated in (4), where ''☞'' identifies the attested form and ''☹'' an unwanted selected candidate.

(4) *Partial harmony is not predicted by AGREE(F)*

/ɔla-ŋɪ/	HIGHVSBLOCK	AGREE([round])	IDENT-IO([round])
a. ☹ ɔlaŋɪ		*	
b. ☞ ɔlɔŋɪ		*	*!
c. ɔlɔŋʊ	*!		**

The hypothetical input in (4) contains a round vowel in the first syllable only and a high vowel in the final syllable. Although root vowels do not alternate, it is necessary for the grammar to enforce round harmony in noninitial root vowels, as will be discussed in section 2. Candidate (4c), with harmony reaching all vowels, is ruled out by HIGHVSBLOCK. Candidate (4a), with no harmony, shows a sour grapes effect, whereas (4b) shows partial harmony that reaches the nonhigh vowel in the second syllable. Both (4a) and (4b) incur one violation of AGREE([round]). The partial harmony candidate also violates IDENT([round]), with the result that (4b) is harmonically bounded by (4a). AGREE(F) thus predicts that if every vowel does not harmonize, harmony will not be enforced at all. It presents an undergeneration problem, because it does not predict partial harmony, and an overgeneration problem, because it predicts that unbounded harmony will show a sour grapes property.

These issues give rise to the question of whether there are benefits to analyzing unbounded harmony as a constraint-driven phenomenon in OT. The goal of this article is to investigate this question, and in doing so, to cast new light on the nature of local and nonlocal dependencies. Myopic effects could seem to suggest the need to model unbounded harmony as local iterative spreading (Wilson 2003, 2006), and a recent constraint-driven approach to harmony in the Harmonic Serialism version of OT produces this effect (McCarthy 2011). For instance, a rule such as X → [αF] / [αF] ____ , applied iteratively, would cause progressive harmony for the feature [F] to propagate locally through a sequence of Xs without lookahead to the harmony's endpoint. Yet whether it is driven by rules or constraints, local iterative spreading—implemented at once as a comprehensive approach to locality of spreading and trigger-target interactions—would imply that relations in harmony are limited to pairs of adjacent elements. This article argues for a need to distinguish between the concepts of locality of assimilation and locality of trigger-target relations, the former referring to whether harmony *propagates* among adjacent elements and the latter to whether the *relations* between vowels that trigger harmony and their targets operate among adjacent elements.

Archangeli and Pulleyblank (2007) have drawn attention to the existence of a pattern with such a locality distinction in the nasal harmony of Mọ̀bà Yorùbá. The claim made here is that even in unbounded systems where harmony proceeds among adjacent vowels, the trigger-target relations may be nonlocal, with a single trigger related to many targets, both adjacent and nonadjacent. This one-to-many relational structure is compatible with OT, where evaluation of well-formedness proceeds with scope over the entire candidate, but it is not consistent with a local iterative spreading rule, where well-formedness is evaluated successively over windows of adjacent elements only. Furthermore, while harmony-governing constraints that are restricted to adjacent elements fall short when it comes to nonlocal trigger-target relations, and in the case of AGREE also fail to capture partial harmony, a harmony-driving constraint that is not restricted to adjacent elements is capable of producing these patterns. There are precedents for nonlocal harmony-driving constraints that capitalize on the candidate-wide scope that OT offers (e.g., Kirchner 1993, Kaun 1995, Padgett 1995b, 2002, Walker 1998, 2011, Pulleyblank 2002, McCarthy 2003). In spotlighting the existence of nonlocal trigger-target relations, this article identifies a benefit that OT offers over local iterative spreading rules, and it refines the criteria for a successful theory for harmony, signaling the need for nonlocal information about the point of origin for harmony.

The article is organized as follows. In section 2, I introduce data exemplifying the pattern of unbounded round harmony in Baiyina Oroqen, which shows evidence of nonlocal trigger-target relations. In section 3, I turn to the analysis. I first examine purely local approaches that use iterative spreading in a rule-based framework or Harmonic Serialism and determine that they are deficient when it comes to characterizing nonlocal relations. I then present a solution where the harmony-driving constraint and adjacency restriction form discrete components in the analysis, allowing locality of feature associations to function independently from the trigger-target relations of harmony. In section 4, I examine a second unbounded harmony system with nonlocal trigger-target relations: nasal harmony in Mọ̀bà Yorùbá. In section 5, I present the conclusion and outlook.

2 Round Harmony in Baiyina Oroqen

Baiyina Oroqen (also spelled as Baiyinna Orochen) is a variety of Oroqen (Tungusic) spoken in the village of Baiyina, Huma County, Heilongjiang Province, in northeastern China. Baiyina Oroqen exhibits round harmony and tongue root harmony, for which the data and description are due to Li (1996). Baiyina Oroqen has the vowel inventory in (5).

(5) *Baiyina Oroqen vowel system*

	Front		Back			
	Unround		Unround		Round	
	Non-RTR	RTR	Non-RTR	RTR	Non-RTR	RTR
High	i iː	ɪ ɪː			u uː	ʊ ʊː
Nonhigh	ie	ɪɛ	ə əː	a aː	o oː	ɔ ɔː

As will be illustrated below, round harmony in Baiyina Oroqen is triggered by short /o/ and /ɔ/. Tongue root harmony is also evident in the data but not the focus of discussion.

Oroqen is a suffixing language. In root-initial syllables, the distribution of [o, oː, ɔ, ɔː] is unrestricted. The examples in (6) show that in this position they can be the only round vowel in the word.

(6) moliktə a kind of wild fruit ɔxɪxan 'flame'
toːri- 'to lose one's way' nɔːnɪn 'he, she'

Short [o, ɔ] trigger round harmony in following nonhigh back vowels, as seen in (7). In noninitial syllables, [o, oː, ɔ, ɔː] usually occur only following a nonhigh round vowel.

(7) *Roots*
tʃolpon 'morning star' sɔbgɔ 'fish skin'
moɣon 'silver' ɔrɔktɔ 'hay'
sokkoː 'muddy (water)' gɔlɔː 'log'
oloːk 'lie' ɔmɔːŋ 'fatty meat (of deer)'

Suffixed forms
somsok-jo 'pasture' INDEF.ACC ɔlɔ-jɔ 'fish' INDEF.ACC
cf. urə-jə 'mountain' INDEF.ACC cf. bɪra-ja 'river' INDEF.ACC

Unlike their short counterparts, long [oː] and [ɔː] do not trigger round harmony. This is illustrated in (8).

(8) *Roots*
oːdən 'velvet' kɔːŋakta 'handbell'
koːməxə 'windpipe' tɔːlga 'pole used for supporting the coffin'

Suffixed forms
boːl-jə 'slave' INDEF.ACC gɔːl-ja 'policy' INDEF.ACC
boːl-wə 'slave' DEF.ACC kɔː-xaːn 'wine pot' DIM

As the examples in (9) demonstrate, despite not triggering round harmony, [oː] and [ɔː] can be the product of round harmony and propagate it onward. The short [o] and [ɔ] triggers for round harmony can thus be related to targets in adjacent and nonadjacent syllables.

(9) *[oː, ɔː] in final syllable of a polysyllabic root*

sokkoː-mɲo	'muddy (water)' CONTEM
ɔmɔːŋ-mɔ	'fatty meat (of deer or roe deer)' DEF.ACC

[oː, ɔː] in a suffix

ɲoɲo-xoːn-mo	'bear' DIM-DEF.ACC
cf. luxi-xəːn-mə	'arrow' DIM-DEF.ACC
oloː-wkoːn-no-	'cook' CAUS-PRES
cf. buː-wkəːn-nə-	'give' CAUS-PRES
dʒɔlɔ-xɔːn-mɔ	'stone' DIM-DEF.ACC
cf. bɪra-xaːn-ma	'river' DIM-DEF.ACC
bɔdɔ-wkɔːn-nɔ-	'think' CAUS-PRES
cf. waː-wkaːn-na-	'kill' CAUS-PRES

High vowels block round harmony, as shown in (10).

(10)

owon-duləː	'pancake' DESTIN	ɔrɔn-dʊlaː	'reindeer' DESTIN
bolboxi-wə	'wild duck' DEF.ACC	tʃɔlɪk-pa	'cloud-shaped design' DEF.ACC

Furthermore, round high vowels do not trigger round harmony. This is demonstrated by some of the data in (10) and verified by further examples in (11).

(11)

ɲuriktə	'hair'	gʊgdɪ	'bitter'
uʃiː	'rope'	ʊxɪːn	'spark'
dʒuːxin	'otter'	tʃʊːxa	'grass'
suxə	'axe'	ʊnta	'leather shoe'
urəː	'earthworm'	gʊraːn	'male roe deer'

In addition, round high vowels are unrestricted, as shown in (11) for initial syllables, and in (12) for noninitial syllables.

(12)

imuksə-ruk	'oil container' DER.SFX	ʃɪlʊkta	'intestines'
kiluːr	'large piece of ice'	amʊ-rʊk	'toilet' DER.SFX
pəntuː	'pilose antler'	akkʊː	'filled, solid'

From a comparative viewpoint, round harmony in another Oroqen variety requires *dual triggers*, where nonhigh round vowels must occur in two consecutive syllables to initiate harmony (Zhang 1996, Zhang and Dresher 1996, Walker 2001), as discussed further in section 3.3. No monosyllabic roots with short [ɔ] or [o] were found in Li's data for Baiyina Oroqen; such roots are scarce in Oroqen, perhaps even wholly absent (Zhang 1996). Nevertheless, the distribution of round vowels in Baiyina is critically distinct from that of the dual trigger variety. Another property of the dual trigger variety is that [round] must be associated to the first two morae of a stem when affiliated with a nonhigh vowel. This necessitates that if the first root syllable has short [ɔ] or [o], its [round] feature must be shared with the second root syllable. Yet Baiyina does not have this restriction; it permits roots where short [ɔ] or [o] is followed by an unrounded high vowel (see (6), (10)). Hence, a root with nonhigh round vowels in the first two syllables in the output cannot be guaranteed to derive from an input where the second syllable is round (given Richness of the Base; Prince and Smolensky 2004). A nonhigh round vowel in the second syllable in Baiyina is instead enforced by harmony from the first syllable—a singleton trigger.

Harmony involving borrowings and a nonalternating suffix provide further insight into properties of the system. Baiyina has a suffix with a short nonhigh round vowel that is nonalternating. The plural suffix [-nɔr], which attaches to stems denoting kinship, alternates neither in rounding nor in tongue root advancement, as shown in (13). The example with multiple suffixes shows that it triggers round and tongue root harmony in a following suffix with a nonhigh vowel (see above for other alternants of the DEF.ACC suffix).[1] This example provides further evidence that a single vowel can trigger round harmony.

(13) natʃʊ-nɔ̱r 'maternal uncle' PL
nəxu-nɔ̱r 'younger brother' PL
ətʃəxə-nɔ̱r-wɔ̱-t 'paternal uncle' PL-DEF.ACC-PERS.REF(1PL.INCL)

Borrowed stems that contain nonnative disharmonic vowel sequences also indicate that single round vowels can trigger harmony.

(14) kinɔ̱-wɔ̱ 'film' (Russian) DEF.ACC
dʒiŋgo̱ŋ-lo̱ː-tʃo̱ 'to attack' (Chinese) DER.SFX-PAST
variant: dʒiŋgo̱ŋ-lə̱ː-tʃə̱[2]
guaŋbɔ̱-lɔ̱ː-tʃɔ̱ 'to broadcast' (Chinese) DER.SFX-PAST
variant: guaŋbɔ̱-la̱ː-tʃa̱

To summarize, the distribution of round vowels in Baiyina Oroqen is such that rounding contrasts in nonhigh vowels are usually restricted to the root-initial syllable. Short [o] and [ɔ] in the initial syllable trigger round harmony in following sequences of nonhigh vowels, both long and short. However, [oː] and [ɔː] in the initial syllable do not trigger round harmony, although in noninitial syllables they propagate it, revealing that initial [o] and [ɔ] can trigger harmony in adjacent and nonadjacent targets. High vowels block round harmony, and high round vowels do not trigger it.

[1] The only other suffix that Li (1996) found to be nonalternating in harmony is [-mkɔːk], meaning 'during' or 'for the whole of', which attaches to stems denoting time or season, as in [ʃiksə-mkɔːk] 'during the evening', [tɪmaː-mkɔːk] 'during the morning'. Li notes that this suffix is always word-final, so it is not possible to examine its effects on a following suffix.

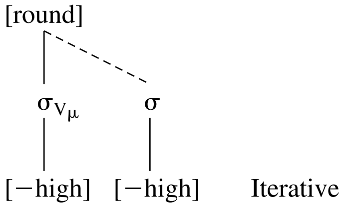
[2] Li (1996:133) reports that when a borrowed Chinese verb stem with a final nonhigh round vowel is followed by a derivational suffix plus an inflectional suffix, the suffixes show round or unround alternants, depending on the consultant. Li provides one example where this is true of a stem ending in a long vowel: [xuibɔ̱ː-lɔ̱ː-tʃɔ̱] / [xuibɔ̱ː-la̱ː-tʃa̱] 'to report' DER.SFX-PAST. In order to assess the significance of this form, more information is needed on its comparative acceptability. No unrounded alternant was reported for the definite accusative suffix attached to borrowed stems ending in [o] or [ɔ].

An alternative view that would yield consistently adjacent triggers and targets categorizes triggers as short vowels in any position plus *noninitial* long vowels. However, there is no evidence that short vowels form a natural class with noninitial long vowels. Stress does not offer a basis for singling out initial long vowels. Li states that ‘‘in a polysyllabic word, if the syllables are equally heavy, stress falls on the final syllable, otherwise stress falls on the last heavier syllable which may not be word-final’’ (1996:86). Heavy syllables contain a coda and/or a long vowel. As I discuss in section 3, round harmony triggered by weak vowels, such as short vowels rather than long, is consistent with observations about the round harmony typology (Kaun 1995, 2004). If the harmony were characterized as also triggered by noninitial long vowels, for which there is no reported weakening, the account would open up typological predictions that are not borne out.

3 Analysis of Baiyina Oroqen

3.1 Local Iterative Spreading

A graphic representation for a potential local iterative spreading rule for round harmony in Baiyina Oroqen is given in (15) (to be revisited), following the conventions of Archangeli and Pulleyblank (1994).[3] I use $\sigma_{V\mu}$ to denote a syllable with a monomoraic vowel.

(15)


This rule spreads [round] iteratively from a short nonhigh vowel to a following nonhigh vowel. Locality is achieved by setting the syllable-head mora as the prosodic anchor for the spreading feature, as represented by the feature-spreading configuration in (15). A representation in which spreading skipped an anchor, producing a gapped configuration across an intervening syllable, would be ill-formed, because the precedence relations that it expressed would be contradictory (Archangeli and Pulleyblank 1994). This rule is local because it does not reference information about nonadjacent elements. If a rule were instead formulated so that it referenced information about a trigger in a nonadjacent syllable even while spreading was restricted to propagating among adjacent syllables, it would no longer be local.

The iterative setting indicates that the rule repeats until its structural description is not met. The vowel sequence at each stage of iterative application in a word with all nonhigh vowels is illustrated in (16a). In contrast to AGREE, this rule can also account for words with partial harmony,

[3] Archangeli and Pulleyblank (1994) characterize conditions on the content of arguments and targets in terms of grounded conditions. I have simply listed here properties that must be true of the trigger and target.

as shown in (16b) (where *SD* = *structural description*). Partial harmony is possible because the structure for harmony is built in successive steps and only adjacent vowels are referenced in each application of the rule without lookahead to well-formedness of the final product. The harmony mechanism in local iterative spreading is therefore myopic.

(16) a. *Iterative round harmony*

Underlying	/ɔla-ja/
Round harmony	ɔlɔ̲-ja
Round harmony	ɔlɔ-jɔ̲
Surface	[ɔlɔjɔ]

b. *Partial round harmony*

Underlying	/ɔla-ŋɪ/	
Round harmony	ɔlɔ̲-ŋɪ	
Round harmony	—	(SD not met)
Surface	[ɔlɔŋɪ]	

Although the local iterative nature of the spreading rule is successful in capturing partial harmony, it is a liability when it comes to vowels that can propagate harmony but not trigger it, as is the case with long nonhigh vowels in Baiyina Oroqen. The rule in (15) yields harmony in adjacent syllables when the first vowel is short, but it incorrectly halts harmony that reaches [oː] or [ɔː], as shown in (17). The problem arises because round harmony in an [ɔː • a] sequence depends on the presence of a short [ɔ] earlier in the word, which requires reference to content beyond adjacent prosodic anchors.

(17)

Underlying	/dʒɔla-xaːn-ma/	
Round harmony	dʒɔlɔ̲-xaːn-ma	
Round harmony	dʒɔlɔ-xɔ̲ː̲n-ma	
Round harmony	—	(SD not met)
Surface	*[dʒɔlɔxɔːnma]	

If the spreading rule were revised so that it were nonlocal and applied between a trigger (short nonhigh round) and a target (nonhigh) at any distance, then blocking by unround high vowels would not be predicted if they lacked a specification for [−round]. This is plausible given crosslinguistic evidence for the inactivity of [−round], which has been used to argue that [round] is a privative feature (Steriade 1995). Possibly a rule could be framed with further complexity or supplemented with an external condition to resolve the problem of unwanted termination of harmony at long vowels, but this would undermine the simplicity that makes a local iterative rule appealing.

Setting aside the problem in (17) for a moment, some benefits offered by a local iterative spreading rule are recreated in the framework of Harmonic Serialism, in an analysis where harmony progresses vowel by vowel in successive steps of the derivation (McCarthy 2011). In the Serial Harmony (SH) approach, Share(F) is the harmony-driving constraint.

(18) *Share(F)*
Assign one violation mark for every pair of adjacent segments that are not linked to the same token of [F].

In Harmonic Serialism, the output of a pass through Gen and Eval is submitted as the input to Gen and Eval in repeating cycles until convergence is reached, where no further changes are possible. GEN functions in a gradual fashion. At each step of the derivation, candidates can differ from the input by no more than a single GEN-induced change (e.g., McCarthy 2007, 2008a,b). Spreading a feature to a target segment qualifies as a single change. Using SHARE([round]) in place of AGREE with the same constraint ranking as in (4) achieves iterative harmony, as shown in (19). I assume here that [round] is a privative feature, so specifications for [−round] do not enter into evaluation with respect to SHARE([round]). The faithfulness constraint is accordingly adjusted to IDENT-O→I([round]), which penalizes a segment specified as [round] in the output whose input correspondent is not [round] (Pater 1999).

(19) *Local iterative harmony*

Step 1

/ɔla-ja/	HIGHVSBLOCK	SHARE([round])	IDENT-O→I([round])
a. ☞ ɔlɔja		*	*
b. ɔlaja		**!	

Step 2

ɔlɔ-ja	HIGHVSBLOCK	SHARE([round])	IDENT-O→I([round])
a. ☞ ɔlɔjɔ			*
b. ɔlɔja		*!	

As shown in (20), the same constraints achieve partial harmony, a result that escapes AGREE(F).

(20) *Partial harmony*

Step 1

/ɔla-ŋɪ/	HIGHVSBLOCK	SHARE([round])	IDENT-O→I([round])
a. ☞ ɔlɔŋɪ		*	*
b. ɔlaŋɪ		**!	

Step 2 – Convergence

ɔlɔ-ŋɪ	HIGHVSBLOCK	SHARE([round])	IDENT-O→I([round])
a. ☞ ɔlɔŋɪ		*	
b. ɔlɔŋʊ	*!		*

An appeal of the SH account is that it captures the myopic character of unbounded harmony in a constraint-based system, combining insights deriving from the optimality-theoretic structure of ranked and violable constraints with the advantages of a gradual progression toward improvement, which was obtained by a local iterative rule. However, the problem that long vowels present for a local iterative spreading rule is likewise a problem for a purely local SH account. Suppose that a version of SHARE([round]) were defined so as to assign a penalty to every pair of adjacent nonhigh vowels that are not linked to the same token of [round], where the first vowel is short. This constraint would incorrectly predict that long vowels would not propagate round harmony. The same issue confronts any account using a constraint enforcing harmony only over adjacent elements where properties at the potentially nonlocal point of origin for harmony do not enter into the calculation. This points to a need to separate the treatment of locality of assimilation from locality of trigger-target relations, a topic to which I turn in the next section.

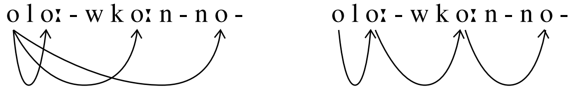
As a side point, segments that are reported to be transparent to harmony, such as transparent vowels in vowel harmony, could seem to present another problem for harmony that is restricted to adjacent elements. That question is distinct from the issue under focus here. In Baiyina Oroqen, round harmony propagates locally—that is, it never skips a vowel—yet the trigger-target relations are nonlocal. Further, whether transparent segments are actually skipped in harmony is a matter of current debate. For overviews on this topic, see Archangeli and Pulleyblank 2007 and Rose and Walker 2011.

3.2 A Maximal Harmony Constraint Solution

The capacity of long nonhigh vowels to transmit round harmony in Baiyina Oroqen but not trigger it supports a structure for trigger-target relations like that shown in (21a), where a short nonhigh round vowel triggers harmony in all following nonhigh vowels. Arrows identify relations between a trigger and a target. In this structure, relations are not restricted to vowels in adjacent syllables, and a single trigger may be related to multiple targets. This system contrasts with local successive trigger-target relations, shown in (21b), where the first vowel triggers harmony in the second, the second in the third, and so on.

(21) *Trigger-target relations*

a. Nonlocal one-to-many   b. Local successive



A local iterative spreading rule models the local successive relational structure, but it fails to capture the behavior of long vowels. A local successive structure predicts that triggers and targets are adjacent; it does not allow for an adjacent vowel that propagates harmony from a more distant trigger. However, the nonlocal one-to-many structure is consistent with the status of long vowels as targets but not triggers, because all targets stand in a relation with a short vowel trigger. Nevertheless, harmony in Baiyina Oroqen is local with respect to propagation; that is, harmony proceeds only among adjacent syllables.

A stumbling block for a local iterative spreading rule or a constraint-based approach where dependencies are restricted to adjacent elements is that they do not draw a distinction between locality of spreading, such as feature links, and the locality of scope for trigger-target relations. A theory that separates these components can successfully characterize the harmony pattern in Baiyina Oroqen. An example is offered in my analysis of Baiyina Oroqen in Walker 2011, the relevant aspects of which are recapitulated here.

To characterize unbounded harmony with the potential for nonlocal trigger-target relations, I propose a maximal harmony constraint schema along the lines in (22).

(22) *∀-HARMONY(F/C, V)*
For every feature F in context C in a word, a violation is assigned to every vowel to which F is not associated.

See Walker 2011 for details of the formal statement of this schema, cast in terms of licensing of the feature by the targets, which may be restricted to prominent contexts. ∀-HARMONY constraints have the capacity to deal with harmony patterns that maximize the exposure for a perceptually weak property, building on the insights of Cole and Kisseberth (1995a,c) and Kaun (1995, 2004). However, not all constraints that drive maximal harmony in a word are necessarily tied to perceptual weakness. Evaluation of a candidate output with respect to an ∀-HARMONY constraint involves assessing relations between a potential trigger vowel and all other vowels in the domain for harmony, whether they are adjacent or nonadjacent. This formalization is consistent with the idea that unbounded harmony serves to improve perceptibility of a distinctive property—often that of a weak trigger—by exhausting all relevant opportunities for its expression, not just requiring agreement among neighbors.[4]

The active constraint in Baiyina Oroqen is ∀-HARMONY([round]/V_{μ}[−high], V), which states that for any [round] feature associated with a short nonhigh vowel, a violation is assigned to every vowel that is not associated with that token of [round]. Again, I assume that [round] is privative. The restriction to short nonhigh vowels is consistent with Kaun's (1995, 2004) typological finding that triggers for round harmony may be restricted to weak vowels. Short vowels are less robust than long ones because of their shorter duration. Furthermore, Kaun has argued that lip rounding is perceptually weaker in vowels with a lower jaw position (i.e., nonhigh) than in vowels that are higher.[5] As I discuss in Walker 2011, the units to which association with [round] is enforced could be generalized to segments instead of vowels. However, a possible basis for targeting vowels is that they are higher in sonority than consonants. Note that because lip rounding is perceptually weaker in nonhigh vowels, they are not expected to serve as licensors in a harmony constraint for [round] to the exclusion of higher vowels.

[4] For similar perspectives on constraints that promote harmony from weak triggers, see Walker 2005, Jiménez and Lloret 2007, Lloret 2007, Downing 2010, and Kimper 2011.

[5] Another pertinent factor is that rounding is plausibly contrastive only among nonhigh vowels in Tungusic languages. In that case, backness would be an active contrast among high vowels rather than [round] in Baiyina Oroqen. For discussion of the claim that triggers for round harmony in Tungusic are vowels for which rounding is contrastive, see Kaun 1995, Dresher and Zhang 2005, and Dresher 2009. This could be a source of explanation for the fact that only nonhigh vowels trigger harmony in Baiyina Oroqen, but the restriction to short vowels must be for reasons independent of contrast.

The weakness of nonhigh round vowels is also reflected in the markedness constraint *[round, −high] (Kirchner 1993, Archangeli and Pulleyblank 1994, Kaun 1995). The relevant faithfulness constraints are (a) IDENT-O→I([round]), introduced above; (b) IDENT-I→O([round]), violated when a round vowel becomes unround; and (c) positionally specific IDENT-I→O-σ_1([round]), which assigns a penalty to an unround vowel in the initial syllable of the output whose input correspondent is round. The latter constraint achieves control of harmony by the initial syllable (Beckman 1998). The rankings among the constraints and their motivations are outlined in (23).

(23) a. IDENT-I→O-σ_1([round]) ≫ ∀-HARMONY
A nonhigh round vowel is preserved in the initial syllable even if there are vowels that do not harmonize with its round feature.
b. i. IDENT-I→O-σ_1([round]) ≫ *[round, −high]
ii. ∀-HARMONY ≫ *[round, −high], IDENT-O→I([round])
Nonhigh round vowels occur freely in the initial syllable (i), and they can occur elsewhere as the product of harmony (ii).
c. *[round, −high] ≫ IDENT-I→O([round])
Nonhigh round vowels do not occur otherwise.

The effect of the combined hierarchy comprising (23a–b) is illustrated in (24) with a word where a long vowel propagates round harmony from a short trigger.

(24) *Short vowels trigger round harmony in nonlocal targets*

/ɔmaːŋ-ma/	IDENT-I→O σ_1([round])	∀-HARMONY ([round]/V_μ[–high], V)	*[round, –high]	IDENT-O→I ([round])
a. ☞ ɔmɔːŋmɔ			***	**
b. ɔmɔːŋma		*!	**	*
c. ɔmaːŋma		*!*	*	
d. amaːŋma	*!			

Candidate (24a) is the winner, with round harmony reaching from the initial nonhigh vowel to all other vowels in the word, both long and short. Candidate (24b), with partial harmony that reaches only the second syllable, incurs a violation of ∀-HARMONY, because [round] in the short nonhigh initial vowel is not associated with the final vowel. Candidate (24c), with no spreading from the initial round vowel, incurs two violations with respect to ∀-HARMONY, one for each of its unround vowels. Candidate (24d) loses because the initial round vowel of the input maps to an unround vowel. This tableau demonstrates that with ∀-HARMONY as the harmony-driving constraint, round harmony targets long nonhigh vowels as well as vowels past them, not because long vowels trigger harmony, but because ∀-HARMONY identifies every vowel as a target in a word with short [ɔ] or [o].

The ranking in (23c) is needed to rule out a faithful mapping for hypothetical inputs like /bɪrɔ-/, in which a nonhigh round vowel occurs in a noninitial syllable where it could not be the product of round harmony. This generalization holds over the Oroqen vocabulary excluding some borrowings and nonalternating suffixes (see (13)–(14)). The exemption of the latter could be handled by lexically indexed faithfulness constraints (Pater 2000, 2009) for the morphemes in question that dominate *[round, −high].

∀-HARMONY can drive partial harmony in words where a blocking vowel is present. The GESTURALUNIFORMITY constraint in (25) prevents [round] from spreading between vowels that differ in height (adapted from Kaun 1995, 2004; see also Cole and Kisseberth 1995d).

(25) *GESTURALUNIFORMITY([round], [high])*
Assign a violation to each sequence of adjacent vowels to which a token of the feature [round] is associated, where the vowels differ in specification for [high].

GESTURALUNIFORMITY dominates ∀-HARMONY so that harmony is blocked between a nonhigh vowel and a prospective high vowel target, as illustrated in (26).[6]

(26) *Partial harmony*

/bolbəxi-wə/	GESTUNI ([round], [high])	∀-HARMONY ([round]/V_{μ}[–high], V)	*[round, –high]	IDENT-O→I ([round])
a. ☞ bolboxi-wə [round]		**	**	*
b. bolbəxi-wə [round]		***!	*	
c. bolboxu-wo [round]	*!*		***	***

The selected output is candidate (26a), for which round harmony operates to the nonhigh vowel in the second syllable and is blocked by the high vowel in the third syllable. This candidate incurs two violations of ∀-HARMONY. The sour grapes candidate in (26b) fails because it incurs an additional violation of the ∀-HARMONY constraint. In candidate (26c), round harmony proceeds through all vowels, incurring two violations of GESTURALUNIFORMITY, one for the [o • u] sequence and one for [u • o].

[6] GESTURALUNIFORMITY is motivated by a crosslinguistic tendency for within-height round harmony (Steriade 1981, Kaun 1995, 2004). An alternative perspective is that harmony propagates only among vowels for which rounding is contrastive in Oroqen, which are plausibly nonhigh vowels.

An outcome where round harmony skips [i] and reaches the final nonhigh vowel, as in [bolboxiwo], can be excluded by positing that GEN is constrained by a NOGAP constraint that prevents feature associations that gap across prosodic anchors or segments (e.g., Pulleyblank 1996, Ní Chiosáin and Padgett 1997, 2001, Walker 1998).[7] Alternatively, NOGAP could be considered part of CON (e.g., Itô, Mester, and Padgett 1995, Uffmann 2004), in which case it would dominate ∀-HARMONY in Baiyina Oroqen. In either event, the propagation of harmony among adjacent elements is attributed to NOGAP, a general constraint governing the well-formedness of feature representations. Placing the labor of adjacency restrictions on NOGAP leaves the harmony-driving constraint open to enforce nonlocal trigger-target relations. This segregation predicts the possibility of target vowels that propagate harmony but do not trigger it, the behavior exhibited by long nonhigh vowels in Baiyina Oroqen round harmony. It also offers an explanation for the absence of sour grapes effects in unbounded harmony. Since each vowel that fails to harmonize with a trigger forms a locus of violation of ∀-HARMONY, unbounded harmony is expected to propagate until it is impeded by a blocker or reaches the boundary of its domain. In this regard, it is correctly predicted to be myopic.

To summarize, a harmony-driving constraint like ∀-HARMONY, which evaluates relations between a trigger for harmony and all prospective targets without an adjacency restriction, provides a characterization for attested nonlocal trigger-target relations, a property that eludes a local iterative spreading rule. The same problem is true of adjacency-restricted constraint-based approaches to the harmony driver absent supplementation by additional constraints that govern nonlocal dependencies between originating triggers for harmony and their targets. Furthermore, ∀-HARMONY shares with local iterative spreading the advantage of predicting the possibility of partial harmony in unbounded systems. In the ∀-HARMONY account, NOGAP restricts the propagation of harmony to adjacent syllables. Independent of harmony, NOGAP finds motivation in screening out phonological representations with contradictory precedence relations. Returning to the question of whether there are benefits to analyzing unbounded harmony as a constraint-driven phenomenon in OT, the answer can now be made in the affirmative. A local iterative spreading rule, which models harmony in terms of local successive relations, is insufficient for harmony with nonlocal trigger-target relations. However, the evaluative structure of OT, which assesses well-formedness over the entire candidate at once, offers a scope that is consistent with nonlocal one-to-many relations.

3.3 The Question of Additional Dual Vowel Triggers

There is reason to ask whether dual triggers could be active in addition to the single vowel triggers that have been established in Baiyina Oroqen, and if they were, whether the picture for locality would change. The question arises because, as mentioned in section 2, there is a variety of Oroqen where round harmony is triggered only by a sequence of two syllables containing nonhigh round

[7] See Gafos 1996 for related work. Proposals in other frameworks to prevent gapped structures are made by Levergood (1984) and Archangeli and Pulleyblank (1994).

vowels (Zhang 1996, Zhang and Dresher 1996). Sources cited for this pattern are Zhang's 1995 field notes; Hu 1986, based on speakers from Alihe; and Zhang, Li, and Zhang 1989, based on speakers from Xunke.[8] The identified locales are for Oroqen dialects distinct from Baiyina (Whaley and Li 2000). Yet if a dual vowel trigger condition were pervasive across Oroqen dialects, an alternative hypothesis about round harmony in Baiyina is that it has a disjoint characterization for its triggers: dual vowel triggers and single short nonhigh round vowels. On this view, round harmony in a word like [sokkoː-mɲo] 'muddy (water)' CONTEM could involve a relation between a dual trigger and a vowel in the third syllable.

The existence of [Oː • O] stems in Zhang's variety (where [O] represents [o] or [ɔ]) is the primary basis for distinguishing dual trigger round harmony from the Baiyina pattern, where harmony is triggered by single short vowels. Zhang (1996) lists five [Oː • O] forms, given in (27). Stems of this kind are not reported for Baiyina.

(27)	boːdo	'kitchen knife'	(p. 163)	ŋɔːkɔ	'smell'	(p. 187)
	moːgo	'mushroom'	(p. 173)	mɔːtçɔn-[9]	'difficulty'	(p. 189)
	moːro-	'moan'	(p. 163)			

Further probing reveals an imbalance between [Oː • O] forms and those where a nonhigh vowel in the second syllable is unround. Li Bing (pers. comm.) states that [Oː • O] stems are rare in the Oroqen language, and instances of [Oː • A] and [Oː • Aː] are prevailing (where [A] represents a nonhigh unround vowel).[10] Consistent with this observation, the first two words in (27) are borrowings from Chinese (*poudao* [pʰoutao] *pou* 'cutting open' + *dao* 'knife', *muogo* [muoku] 'mushroom'), and a wordlist of 228 Oroqen words provided by Whaley, Grenoble, and Li (1999) contains no [Oː • O] stems, but does contain two [Oː • A] stems and one [Oː • Aː] stem. This imbalance is not expected if round harmony across Oroqen varieties is chiefly restricted to contexts with dual vowel triggers. For this reason, I assume that harmony in Baiyina Oroqen is triggered only by single short vowels with the potential for nonlocal trigger-target relations.

Moreover, even if dual triggers were appropriate in addition to single short vowel triggers for round harmony in Baiyina, this would still necessitate referencing the rounding quality of a nonadjacent vowel. Following the formulation of Hayes and Londe (2006) and Hayes et al. (2009), the dual trigger harmony constraint for Oroqen would be *[+round, −high][+round, −high][−round, −high] (using binary [round]). In a sequence [O • Oː • V_x], the operation of round harmony to V_x requires information about vowels in the two syllables that precede it, the first of which is nonadjacent to V_x. Accordingly, this alternative view would be unsuccessful using a spreading rule restricted to the target and an immediately adjacent trigger syllable.

[8] The locale for Zhang's 1995 fieldwork is not mentioned. However, Matthew Pankhurst (pers. comm.), who has been conducting fieldwork in Heilongjiang Province more recently and who has met with some of the same consultants in the region as Zhang Xi did, concludes that Zhang's fieldwork most probably extended no further north than Alihe, which is south of Huma County, where the Baiyina dialect is spoken.

[9] This stem also occurs as [mɔːtçan-] in Oroqen varieties (Li Bing, pers. comm.).

[10] Zhang (1996:158n7) observes that ''no two identical long vowels are found to occur adjacently in a stem'' in his investigation of Oroqen, which indicates an absence of [Oː • Oː] roots.

4 Nasal Harmony in Mọ̀bà Yorùbá

Nonlocal trigger-target relations are not reported for Baiyina Oroqen alone. In this section, I outline evidence for another system that shows nonlocal trigger-target relations under conditions of local assimilation, drawing from nasal harmony data in Mọ̀bà Yorùbá.

The Mọ̀bà dialect of Yorùbá exhibits a regressive nasal harmony triggered by nasal vowels [ĩ, ã, ũ] which is unbounded in the word (Ajíbóyè 2001, Ajíbóyè and Pulleyblank 2008). High vowels, glides, and liquids are nasalized when they occur before a nasal vowel, as shown in (28). Nasal harmony can extend over sequences of viable targets. The liquid /l/ becomes [n] when nasalized; however, [n] is not phonemic in the language. Nasalized segments preceding a trigger for nasal harmony are underlined.

(28) *Monomorphemic forms*

<u>ĩw̃</u>ĩ		‘spirit’	<u>ĩj̃</u>ã̀		‘argument’
<u>ũw̃</u>ã́		‘lie’	<u>ũr̃</u>ĩ		‘iron’
<u>ũ̀j̃</u>ã̀		‘famine’	/lĩ/	[<u>n</u>ĩ]	FOCUS MARKER

Polymorphemic forms

/ù-ã̀/	[<u>ũ̀</u>ã̀]	‘measurement’	/ù-rĩ̀/	[<u>ũ̀r̃</u>ĩ̀]	‘walk (n.)’
/ù-jĩ̀/	[<u>ũ̀j̃</u>ĩ̀]	‘praise (n.)’			

Obstruents are transparent to nasal harmony. A high vowel becomes nasalized when it precedes a nasal vowel and an obstruent stop or fricative intervenes, even though the obstruent remains oral (29).

(29)

<u>ĩ̀</u>tã̀	‘story’	<u>ũ</u>gũ	‘corner (of a house)’
<u>ĩ̀</u>dũ	‘bed bug’	<u>ĩ̀</u>s<u>ũ̀</u>gbĩ̀	‘traditional singers’
<u>ĩ</u>kã́	‘termite’	<u>ĩ̀</u>fũ	‘intestine’
<u>ũ̀</u>kpĩ̀	kind of insect	<u>ĩ̀</u>sĩ̀	‘worship’

Nonhigh oral vowels block nasal harmony. They remain oral in the context of a following nasal vowel (30a), and nasal harmony does not proceed to high vowels and sonorant consonants that precede them (30b).

(30)

a.	o<u>r̃</u>ĩ	‘song’	ɛ<u>r̃</u>ã	‘meat’
	e<u>r̃</u>ĩ	‘elephant’	a<u>r̃ĩr̃</u>ĩ	‘enjoyable’
	ɔ̀<u>r̃</u>ã̀	‘matter’	ɛ̀g<u>ĩ</u>gũ	kind of tree
b.	ùrò<u>j̃</u>ĩ̀	‘news’	ùrɔ̀<u>r̃</u>ũ̀	‘peace of mind’
	ìrègṹ	‘reproaching’	ìsasũ̀	kind of pot

Mọ̀bà Yorùbá has only a single phonemic nasal stop, /m/. Of particular relevance for this study is that /m/ does not trigger harmony. If /m/ is immediately followed by an oral vowel, then a high oral vowel can precede /m/ (31a). However, /m/ does not impede harmony from a nasal vowel. If /m/ is followed by a nasal vowel, a preceding high vowel is nasalized (31b).[11] The contrast between (31a) and (31b) is consistent with nasal harmony that is triggered by nasal vowels but not by nasal consonants. If nasal consonants are participants in harmony but do not trigger it, then the examples in (31b) involve nonlocal trigger-target relations between a nasal vowel and a high vowel in the preceding syllable in the presence of local transmission of nasalization.

(31)	a.	ùmoɟì	name of a village	ìmɛ́lɛ́	'laziness'
		ùmórù	personal name		
	b.	ĩmṹ	'nose'	ũ̀mã́lɛ̀	'light'
		ĩmã̀	'palm leaf'	ũ̀mṹra	'preparedness'
		ũ̀mũmĩ̀	'drinking cup'	ũ̀mã̀sí	'having knowledge of an act'

Like round harmony in Baiyina Oroqen, nasal harmony in Mọ̀bà could be considered a pattern with weak triggers. Cues for nasalization could be weaker in nasal vowels than in nasal stops, since the former have oral and nasal airstreams, while the latter have nasal airflow only (see Cole and Kisseberth 1995a for a related proposal). Nasal harmony that is triggered by nasal vowels could potentially be driven by an ∀-HARMONY constraint for [nasal] associated to a vowel.[12]

The sequences of a nasal stop followed by an oral vowel in (31a) are derived contexts. When a nasal stop is followed by a vowel in the same morpheme, the vowel must also be nasal. Hence, forms like [mũ] 'drink' are attested, but tautomorphemic syllables like [mu], [ma], [me], and so on, are not. More generally, within a morpheme, sonorant consonants always agree in nasality with a tautosyllabic vowel in Mọ̀bà.

Obstruents are transparent to nasal harmony in Mọ̀bà, which indicates that propagation of nasal harmony can skip segments.[13] However, nasal stops do not show the characteristics of segments that are skipped by harmony. First, nasal stops show phonetic evidence of the harmonizing nasal property, unlike obstruents, which remain oral. Second, nasals pattern with other sonorant consonants—and not the obstruents—in participating in syllable-internal nasality agreement within a morpheme, which points to a representation in which [nasal] is regularly shared across a vowel and preceding tautomorphemic nasal. For these reasons, I conclude that when nasal harmony reaches a vowel preceding a nasal stop, it propagates locally through the nasal stop, while the trigger-target relation between the trigger nasal vowel and preceding vowel is nonlocal. This conclusion is consistent with that of Archangeli and Pulleyblank (2007), who identify harmonizing sequences like those in (31b) as compatible with a representation that does not skip a

[11] Three of the examples in (31b) show that nasalization does not extend to sonorant consonants or high vowels that occur in the syllable following a nasal vowel. Regressive directionality is further supported by [amã̀rí], a personal name.

[12] Transsyllabic nasal harmony from nasal vowels in Mọ̀bà Yorùbá is regressive only. For a version of ∀-HARMONY that is sensitive to precedence, see Walker 2011.

[13] Ajíbóyè and Pulleyblank (2008) analyze the output of harmony in forms with skipped segments as having separate [nasal] feature specifications flanking the skipped segment. Similar representations are obtained in Walker 2011 with a version of ∀-HARMONY that operates over feature chains, which include duplicated occurrences of a feature.

segment but involves nonlocal trigger-target relations. Likewise, Ajíbóyè and Pulleyblank (2008) argue that nasal harmony in Mọ̀bà is not the product of an iterative spreading rule, because nasal stops are not triggers for transsyllabic harmony.

A comprehensive account of the distribution of nasality in Mọ̀bà Yorùbá necessitates more than a constraint driving regressive harmony from nasal vowels alone. The analysis proposed by Ajíbóyè and Pulleyblank (2008) employs several sequential feature cooccurrence constraints of the form *X . . . Y, which restrict sequences of oral and nasal elements. These constraints come in versions that restrict only adjacent elements and also in versions that restrict elements that may be at a greater distance. For examples like those in (31b), which show nonlocal trigger-target interactions, Ajíbóyè and Pulleyblank propose the constraint *[Oral/μ C_0 Nas/μ]$_{Wd}$, which assigns a violation to an oral mora that precedes a nasal mora with or without intervening consonants. A separate sequential constraint functions to enforce harmony between a nasal vowel and a sonorant consonant in its syllable onset. The result is that for a word like [ũr̃ĩ] 'iron', the final nasalized vowel triggers nasal harmony in the immediately preceding consonant and also in the nonadjacent preceding vowel. Ajíbóyè and Pulleyblank's account therefore involves one-to-many trigger-target relations, similar to the basic claim above about trigger-target relations in Baiyina Oroqen, and Mọ̀bà provides a second pattern where nonlocal trigger-target relations are witnessed in contexts where harmony propagates locally.

5 Conclusion and Outlook

In this article, I have examined two harmony systems that present nonlocal trigger-target relations in forms where harmony propagates among adjacent elements. In Baiyina Oroqen, round harmony is propagated by long and short nonhigh vowels, but it is triggered by short nonhigh vowels only. In Mọ̀bà Yorùbá, nasal consonants propagate nasal harmony triggered by a nasal vowel, but they do not trigger harmony themselves. Both systems are compatible with approaches using harmony-driving constraints that evaluate relations between a potential trigger and other segments in the harmony domain, both adjacent and nonadjacent, but they are not consistent with harmony analyzed using a local iterative spreading rule or a constraint system that enforces restrictions over adjacent elements only, such as SHARE(F), without augmentation by nonlocal constraints governing trigger-target relations.

Harmony-driving constraints that do not restrict relations to adjacent elements come in several forms, including ALIGN(F) (Kirchner 1993, Jurgec 2011), ALIGN(F-domain) (Cole and Kisseberth 1995b), EXTEND(F) (Kaun 1995), SPREAD(F) (Padgett 1995b, 2002, Walker 1998), *X . . . Y (Pulleyblank 2002), MATCH(F) (McCarthy 2003), LICENSE(F, ∀V) (Walker 2011), and so on. Constraints of this kind have the capacity to produce partial harmony, avoiding the sour grapes pathology. While some of these constraints have been criticized on the grounds of not being categorical, that problem is not inherent to nonlocal harmony-driving constraints (McCarthy 2003). More serious is an overgeneration problem, whereby such constraints predict the possibility of unwanted interactions between harmony and other phenomena, such as blocking of epenthesis, size restrictions on reduplicants, allomorph selection, and displacement of barriers to harmony

(Wilson 2003, 2006, McCarthy 2004, 2011). In order to address this problem, strategies can be sought to limit overgeneration in an approach where harmony constraints are not restricted to adjacent elements. Alternatively, a theory with local harmony drivers could be devised such that properties of a nonlocal originating trigger enter into the calculation.

Kimper (2011) proposes to redefine SPREAD(F) in positive terms so that it rewards assimilation rather than punishing disharmony. This approach does not predict minimization of vowels that are inaccessible to harmony. Kimper implements the constraint within Serial Harmonic Grammar (Pater 2012), bypassing pathologies that would emerge in classic OT (Prince and Smolensky 2004), such as epenthesis of vowels simply to serve as targets for harmony. This solution is thus far largely harmony-specific because it identifies SPREAD(F) for positive formulation, but further research is needed to examine the extent to which other constraints could be successful in positive form and the potential scope of their effects. Other means for resolving overgeneration problems more generally in OT have been proposed, including targeted constraints (Wilson 2000, 2001), procedural constraints (Blumenfeld 2006), and the P-map as a basis for constraint organization (Steriade 2009). Whether any of these approaches is a fitting solution to limiting the overgeneration issue for ∀-HARMONY or constraints like it remains to be determined. Nevertheless, a general means for addressing overgeneration is independently motivated, since it is not unique to constraints that promote harmony.

In Serial Harmonic Grammar, Mullin (2011) proposes to augment a theory using adjacency-restricted SHARE(F) so that harmony is sensitive to nonlocal triggers. This approach assumes representations with headed feature domains (e.g., Cole and Kisseberth 1995b, McCarthy 2004), where heads usually serve as triggers. Mullin introduces constraints that assign violations to dependents in domains that are headed by certain segments. Such constraints utilize the scope of OT evaluation to enforce dependencies between heads and potentially nonlocal targets for harmony. These constraints encode one-to-many relations like those advocated here, but separate from the harmony-driving constraint. This proposal enlarges the set of predicted patterns using SHARE(F). The full range of the predicted typology remains to be examined, yet the approach offers a possible means for incorporating nonlocal relations in a system where the harmony driver is restricted to adjacent elements.

On the other hand, a theory that separates the harmony driver from the adjacency restriction eliminates a potential duplication problem. A constraint like NOGAP is motivated to constrain featural representations by phenomena beyond harmony alone. An approach where NOGAP restricts harmony to propagating among adjacent elements, without a further adjacency stipulation in the harmony-driving constraint, avoids repeating locality restrictions in featural phenomena across constraints.

Whatever the ultimate disposition of locality in the harmony-driving constraint, a purely local theory of the relations involved in unbounded harmony is deficient. Specifically, this study has brought into focus that a successful theory of harmony must accommodate nonlocal trigger-target relations. In this respect, the OT procedure of evaluating well-formedness over an entire candidate offers an advantage over local iterative spreading rules, revealing a benefit of a particular kind of unrestricted locality.

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