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When harmony fails, markedness prevails*

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Abstract

Vowel transparency presents significant challenges for theories of feature spreading that adhere to a principle of (strict) locality. I survey several types of approaches to vowel transparency in the literature, leading to a proposal by Kiparsky & Pajusalu (2003) in which the apparent non-local harmony effect of vowel transparency emerges from special markedness constraints that are only activated when harmony fails. Building on this proposal, I define a set of conditions for how such constraints arise and are activated, and demonstrate how this approach successfully accounts for vowel transparency without sacrificing strict locality.

1 Introduction

> To allow gapped structures to account for transparency effects requires the weakening or abandoning of general locality constraints [. . .], a move that has serious and undesirable consequences in general.
>
> Archangeli & Pulleyblank (1994: 355)

Vowel harmony patterns in which certain vowels appear to be 'skipped' by the spreading feature have led to many and varied proposals for how to account for such apparent skipping. This phenomenon is known as (vowel) TRANSPARENCY, and has proven particularly problematic for theories of vowel harmony that adhere to a principle of STRICT LOCALITY: the formal claim that feature spreading can only affect contiguous strings of segments.

*Doug Pulleyblank has been a friend and his work has been an inspiration for as long as I've dared to consider myself a phonologist. It's an honor to contribute this squib in recognition of his distinguished career and in celebration of his retirement, which I trust he will spend continuing to do all of the fun things he has been doing all along.

A bit of back story on the squib itself, by way of an excuse for it being about 20 years out of date with respect advances in our collective understanding of vowel harmony (not to mention citations). The content is almost exactly that of my talk at the 'Current Perspectives on Phonology' workshop at the Indiana University *PhonologyFest* in June 2006. I didn't write it up and submit it for publication because by that time I had become disillusioned by the lack of impact that my work on vowel harmony appeared to be having, and I had begun working on other topics that eventually took over my research program. I've somewhat recently come back to thinking more and more about 'the various vagaries of vowel harmony' (as I alliteratively referred to them in my dissertation), but not yet to transparency. Finally writing up this squib represents my first attempt to return to this fascinating topic. Thanks to Anne-Michelle Tessier, Kathleen Currie Hall, and Gunnar Hansson — and also to Doug, of course — for the excuse.

I revisit the problem of transparency in vowel harmony here, surveying the literature from a very high vantage point before zeroing in on the proposal of Kiparsky & Pajusalu (2003), that vowel transparency emerges from the activation of special markedness constraints when harmony fails. My modest aim in this squib is to refine Kiparsky & Pajusalu's (2003) proposal by defining how these special markedness constraints arise and are activated, thereby providing a more satisfying account of the phenomenon without sacrificing strict locality.

2 Basic terminology and analytical assumptions

Before we dive further in, I want to establish some basic terminology that will be used in this squib and to clarify some of the basic analytical assumptions that I make about vowel harmony. (Most of these assumptions follow those that I made in Baković 2000.)

First, I use the term HARMONIC FEATURE to refer to the main binary feature that distinguishes pairs of vowels that alternate with each other in a given vowel harmony pattern. For example, if the observed alternating pairs are {*i*∼*ɪ*, *u*∼*ʊ*, *e*∼*ɛ*, *o*∼*ɔ*}, then the harmonic feature is [±ATR]; if in addition to these alternating pairs there is also the pair {*o*∼*a*}, as in Maasai and Turkana (Archangeli & Pulleyblank 1994, Baković 2000), the harmonic feature is still [±ATR] and other factors are responsible for the additional differences in [±low] and [±round] values.[1]

I further assume that *both* values of the harmonic feature spread in a given harmony pattern, not just one or the other, and consequently that the underlying specification of harmonically alternating vowels is irrelevant. (This will become clearer later on, I trust.)

Next, I use the term ORIGIN to refer to the vowel that appears to set in motion the determination of the harmonic feature value for other vowels in the harmony domain (which I'll simply refer to as the 'word' here). I restrict our attention to the type of pattern found in stem-controlled vowel harmony systems, where the origin is always a root vowel. I will also set aside the potential for disharmonic roots for the sake of streamlining the discussion, so there will be no need to determine which of two or more root vowels is 'the' origin: for our purposes, they all are.

In this restricted space of stem-controlled vowel harmony patterns with no disharmonic roots, all non-origin vowels of interest are affix vowels. These are divided into UNDERGOERS and NEUTRALS. Undergoers are vowels that are 'affected' by harmony; that is, vowels that alternate to agree with the harmonic feature value of the vowels on the side of the origin (preceding vowels if the origin is to the left, following vowels if the origin is to the right). Neutrals are vowels that do not harmonically alternate, surfacing with only one of the two harmonic feature values.[2]

Neutrals are in turn divided into OPAQUE and TRANSPARENT vowels, which are distinguished by the surface realization of undergoers on the opposite side of the origin (following undergoers if the origin is on the left, preceding undergoers if the origin is on the right). This is the distinction of greatest interest to us, so we take our time unpacking it in the next section.

[1] The phenomenon of asymmetrical harmonic pairs like {*o*∼*a*} is dubbed 're-pairing' in Baković (2000).

[2] Vowels may be neutral to harmony for either lexical or phonological reasons; we focus exclusively on the latter.

3 Opacity and transparency

Suppose we have an underlying sequence of vowels as shown in (1a), where 'O' is the origin, 'N' is a neutral vowel, and 'U_1' and 'U_2' are undergoers.[3] The origin O is underlyingly specified with one value of the harmonic feature (+), the neutral vowel N is underlyingly specified with the opposite value (−), and the undergoers U_1 and U_2 may be underlyingly specified with either value (±).

(1) a. *underlying* b. *opaque* N c. *transparent* N

$$\begin{array}{c} / \begin{array}{cccc} \mathrm{O} & \mathrm{U}_1 & \mathrm{N} & \mathrm{U}_2 \\ + & \pm & - & \pm \end{array} / \end{array} \qquad \left[\begin{array}{cccc} \mathrm{O} & \mathrm{U}_1 & \mathrm{N} & \mathrm{U}_2 \\ + & + & - & - \end{array} \right] \qquad \left[\begin{array}{cccc} \mathrm{O} & \mathrm{U}_1 & \mathrm{N} & \mathrm{U}_2 \\ + & + & - & + \end{array} \right]$$

Regardless of whether the neutral vowel is opaque (1b) or transparent (1c), the undergoer U_1 on the origin side of the neutral vowel N alternates in agreement with the origin O.[4] The distinction between opaque and transparent neutral vowels lies in the surface harmonic feature value of the undergoer U_2 on the other, non-origin side of N. If U_2 alternates to agree with N, then N is opaque (1b), blocking the further propagation of O's harmonic feature value. If U_2 instead alternates to agree with O, then N is transparent (1c), seemingly allowing O's harmonic feature value to pass through it. The foregoing statements define the distinction between opaque and transparent N in terms of the behavior of U_2; if we instead assume that the opaque/transparent N distinction is given, then undergoers are CONTEXTUALLY PREDICTABLE, as summarized in (2).

(2) **Contextual predictablity of harmony undergoers.** In a sequence $[\mathrm{O}\ \ \mathrm{U}_1\ \ \mathrm{N}\ \ \mathrm{U}_2]$,

a. U_1 agrees with O, and

b. U_2 agrees (i) with N if N is opaque (1b), or (ii) with O if N is transparent (1c).

Note that the surface form with an opaque vowel illustrated in (1b) involves just one transition in the harmonic feature, from the value of the origin to the value of the neutral vowel. The surface form with a transparent vowel illustrated in (1c), however, involves two transitions: from the value of the origin to the value of the neutral vowel and back again. Kiparsky & Pajusalu (2003: 220) have the following to say about this difference between the two types of neutral vowel.

> "The very existence of transparent neutral vowels immediately raises a theoretical puzzle: why should the doubly disharmonic [(1c)] ever be preferable to [(1b)], which has just one disharmonic transition? The term 'transparent' reflects the powerful intuition, which has guided many an analysis in different ways, that the effect of harmony somehow reaches 'across' this kind of neutral vowel. But how can such apparent 'action at a distance' be reconciled with the principle of locality on which so many fundamental results in phonology depend?"

We turn now to a relatively high-level overview of the "many an analysis" of transparency that Kiparsky & Pajusalu reference here, before digging into their proposed alternative.

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[3] Note that O, U_1, N, and U_2 could each in principle be longer subsequences of its respective vowel type.

[4] This is due to the 'myopic' property of feature spreading (Wilson 2003, 2006); see also Baković (2000: Ch. 1, §2.3.2) and references there for related discussion. On whether myopia is a universal property of all feature spreading patterns, see now McCollum *et al.* (2020), Meinhardt *et al.* (2024), McCollum *et al.* (to appear) and references there.

4 Approaches to transparency

Phonologists have developed several approaches to account for transparency while attempting to maintain some form of locality. Many of these can be broadly categorized into what I will call *derivational*, *representational*, and *realizational* approaches. Let's examine each of these in turn.

4.1 Derivational approaches

Derivational approaches to transparency resolve the locality problem by positing intermediate stages of the derivation in which locality is maintained, only to be later disrupted by a redundancy rule absolutely neutralizing transparent vowels. The central insight is that transparency can be reanalyzed as a form of derivational opacity that emerges through serial ordering.[5]

In this type of approach, neutrals are initially treated just like undergoers: their underlying specification for the harmonic feature is in principle irrelevant (3a), and they undergo harmony from the origin (3b). This is the step of the derivation at which feature spreading is local. Neutrals are distinguished from undergoers at a later derivational step (3c), where neutrals alone are redundantly assigned a value of the harmonic feature that may differ from the origin.

(3) a. *underlying* b. *intermediate* c. *surface*

$$\Big/\begin{smallmatrix}\text{O} & \text{U}_1 & \text{N} & \text{U}_2\\ + & \pm & \pm & \pm\end{smallmatrix}\Big/ \longrightarrow \Big|\begin{smallmatrix}\text{O} & \text{U}_1 & \text{N} & \text{U}_2\\ + & + & + & +\end{smallmatrix}\Big| \longrightarrow \Big[\begin{smallmatrix}\text{O} & \text{U}_1 & \text{N} & \text{U}_2\\ + & + & - & +\end{smallmatrix}\Big]$$

This type of analysis was first proposed by Lightner (1965), and later implemented in slightly different ways by Vago (1973, 1976) and Kiparsky (1981).[6] It also forms the basis of Walker's (2000) analysis using Sympathy Theory (McCarthy 1999), and of the analyses in Baković (2000) and Baković & Wilson (2001) using Optimality Theory with Targeted Constraints (Wilson 2000).

4.2 Representational approaches

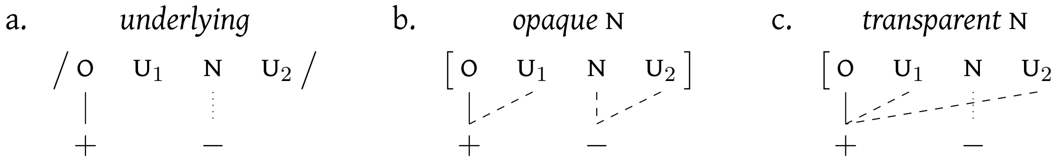
Representational approaches are ones that address the problem of transparency by allowing feature spreading to somehow 'skip' or 'apply across' neutral segments. Most implementations essentially give up on strict locality because they allow for discontinuities in the surface string.

Glossing over differences in implementation, the figures in (4) illustrate how these representational approaches distinguish opacity from transparency. Typically, but not necessarily, undergoers are assumed to have no underlying specification for the harmonic feature, as shown in (4a). Neutrals may or may not be similarly underspecified, but in any event they are incompatible with one of the harmonic feature values (here, '+') and are thus destined to surface with

[5] Note that the terms 'opacity' and 'transparency' are used in two different senses in phonological theory: *derivational* opacity is useful for describing *vowel* transparency, while *vowel* opacity is *derivationally* transparent. Hoo, boy.

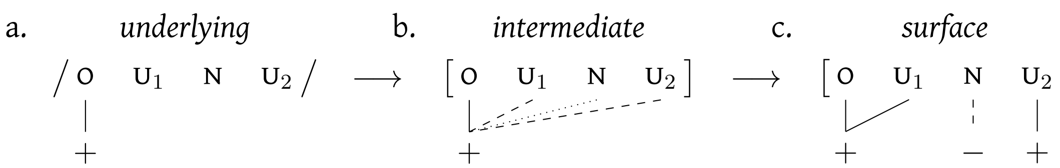
[6] As both Vago (1976) and Kiparsky (1981) show, this order between harmony and redundancy also accounts for the existence in Finnish and Hungarian of a set of roots with only neutral front vowels that nevertheless take back vowel suffixes: the neutral root vowels are underlyingly back, this value spreads to the suffixes, and finally the root vowels are redundantly specified as front. Krämer (2003) aptly dubs these 'Trojan vowels'.

the other ('−'). In the opaque N case (4b), locality is enforced and the harmonic feature value of N is thus spread to U_2. In the transparent N case (4c), locality is somehow suspended such that the harmonic feature value of O spreads 'across' N to U_2 while N is realized with the other value.

(4)


Note that if the transparent vowel is literally specified for the opposing value of the harmonic feature, as suggested by (4c), the presumed-universal constraint against crossing association lines is violated.[7] One way to avoid this representational issue is to assume that neutral vowels are persistently underspecified: they cannot bear either value of the harmonic feature in phonological representations, and their apparent realization with only one value is an illusion of the interface with some phonetic interpretation component (which is typically left to the phonologist's imagination). For general critiques of the crucial invocation of underspecification in the analysis of vowel harmony, see Artstein (1998) and Baković (2000: Ch. 6, §3).

Another way to avoid line crossing is illustrated by the serial derivation in (5), adapted from Kiparsky (1981). The harmonic feature value of the origin spreads completely, perhaps or perhaps not skipping over neutrals (5b). The subsequent redundant specification of neutrals with the opposing harmonic feature value causes the erstwhile multiply-linked feature to be split in two, resulting in what Archangeli & Pulleyblank (1994) refer to as a 'twin peaks' representation (5c).

(5)


Examples of particular implementations of the general representational approach are many and varied. They include proposals for optionally non-local rules (Jensen 1974), the lack of an opposing feature value on transparent vowels that would otherwise block spreading (Clements 1981), a violable NoGap constraint (Itô *et al.* 1995, Akinlabi 1997), alignment constraints that prefer full spreading but that can be satisfied by 'twin peaks' representations (Pulleyblank 1996, Orie 2001), explicitly non-local anti-disagreement conditions (Pulleyblank 2003), and particular constraint weighting conditions and scaling factors for non-local harmony triggers (Kimper 2011).

Other implementations of the representational approach resolve the issue by *relativizing* locality in some principled way. Ní Chiosáin & Padgett (2001: 118–119) distinguish strict locality from RELATIVIZED LOCALITY, whereby features can spread between non-contiguous segments if and only if the intervening, unaffected segments are not "legitimate targets in some respect." In the relativized view, spreading of a feature F can skip a segment α if "α lacks whatever property it

[7]See the references to this constraint peppered throughout Archangeli & Pulleyblank (1994), who propose that it follows from their broader Precedence Principle (p. 38), which is itself a subcase of their Locality Condition (p. 26).

is that grants legitimacy (e.g., it is not F-bearing, has the wrong prosodic status, or lacks a certain feature geometric node [. . .]).” All three of these parenthesized legitimacy conditions have been invoked to account for the apparent transparency of *consonants* to vowel harmony,[8] but only the first is really relevant to accounts of vowel transparency; see e.g. Nevins (2010).

Overall, these representational approaches differ from derivational approaches in that they do not technically require the neutral vowel to ever bear either value of the harmonic feature, even at some intermediate stage. Instead, representational mechanisms of some form or other effectively permit feature sharing without requiring adjacency in the surface string.

A couple of proposals under the overall representational approach umbrella deserve special comment because of how they each effectively side-step the locality issue. One example is Goldsmith’s (1985) proposal that there is only one value of the harmonic feature, and that relevant forms are of two representational types: those that undergo spreading of the specified value of the harmonic feature from the origin (6a), and those that surface with default values of the harmonic feature (6b) — another example of the ‘twin peaks’ representation, assuming these default values are literally inserted rather than mysteriously interpreted as such by the phonetics.

(6) a. *spreading* b. *default*

The key to this analysis is for the spreading value of the harmonic feature in (6a) to be the same as the value that transparent vowels end up also having by default in (6b).

Another example is Smolensky’s (2006) embedded feature domains proposal (see also O’Keefe 2005), which side-steps locality by allowing the feature domain of the neutral vowel to be embedded within the larger feature domain spanning from the origin, as shown in (7).

(7) Embedded feature domain analysis of transparency

[O U$_1$ N U$_2$]
[+ [−]]

Where the embedded domain and the larger, ‘matrix’ domain cover the same segment, as they do in the case of N here, realization of the embedded domain takes precedence over realization of the matrix domain. Locality is thus of course compromised at the level of phonetic realization, but not at the formal phonological level. And speaking of phonetic realization. . .

4.3 Realizational approaches

Realizational approaches maintain that the harmonic feature does indeed spread locally, including through (as opposed to across) neutral vowels, but that the phonetic realization of the harmonic feature is obscured or otherwise perceptually undetectable on transparent vowels.

[8] See Gafos (1999) and Ní Chiosáin & Padgett (2001) on the strictly local view regarding consonants.

Analyses of this type posit that a harmonic feature may be present in the phonological representation of a neutral vowel without being phonetically realized or perceptible. The linking of the harmonic feature would thus be continuous in the phonological representation, respecting strict locality. Various explanations have been offered as to why the feature might not be phonetically realized on neutral vowels. These include violable EXPRESS(F) constraints that govern the phonetic realization of features (Cole & Kisseberth 1994, 1995), theories of contrast and redundancy that limit the phonetic expression of non-contrastive features (Ní Chiosáin & Padgett 2001), models of spreading that focus on prosodic rather than segmental domains (Piggott & van der Hulst 1997, Piggott 2003), and approaches that emphasize "quantal characteristics of the relation between articulation and acoustics of transparent vowels" (Beňuš & Gafos 2007).

5 When harmony fails, markedness prevails

All of the approaches to the analysis of vowel harmony reviewed in §4 share in common the assumption that the harmonic feature values of all undergoers are contextually predictable, as discussed in §3. The summary of what it means for undergoers to be contextually predictable is repeated in (8), and the representations this summary references are repeated in (9).

(8) **Contextual predictablity of harmony undergoers.** In a sequence $[\text{O}\ \text{U}_1\ \text{N}\ \text{U}_2]$,

a. U_1 agrees with O, and

b. U_2 agrees (i) with N if N is opaque (9b), or (ii) with O if N is transparent (9c).

(9)

	a. *underlying*	b. *opaque* N	c. *transparent* N
	$/\text{O}\ \ \text{U}_1\ \ \text{N}\ \ \text{U}_2/$	$[\text{O}\ \ \text{U}_1\ \ \text{N}\ \ \text{U}_2]$	$[\text{O}\ \ \text{U}_1\ \ \text{N}\ \ \text{U}_2]$
	$+\ \ \pm\ \ -\ \ \pm$	$+\ \ +\ \ -\ \ -$	$+\ \ +\ \ -\ \ +$

The contextual predictability of the harmonic feature values of U_1 and U_2 is reflected in the fact that their underlying specifications are irrelevant. This is indicated with the ambiguous '$\pm$' in (9a), perhaps more often handled with underspecification, but the point is the same: whatever their underlying values ('$+$', '$-$', or absent), their surface values are contextually predictable.

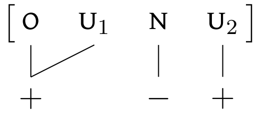
With the notable exception of Goldsmith (1985), all of the analyses reviewed in §4 take it as a given that the contextual predictability of undergoers follows from the harmony imperative; that is, that the harmonic feature value of an undergoer is directly determined by the vowel it is stated to 'agree with' in (8). In the case of U_1, this is of course a reasonable premise: U_1 agrees with O because the harmonic feature value originally associated with O spreads locally to U_1.[9]

This premise is also reasonable in the case of U_2, when N is opaque (9b): U_2 agrees with N because the harmonic feature value originally associated with N spreads locally to U_2. When N is transparent, however, this premise sets the locality trap: if we insist that U_2 agrees with O because the harmonic feature value originally associated with O spreads non-locally to U_2, then we have to contend with the apparent fact that N must be 'skipped' by the spreading feature value.

[9] I use 'spreads' here loosely, aiming to be rhetorically inclusive of non-autosegmental analyses of harmony.

For his part, Goldsmith (1985) rejects the premise in this case. In his analysis, the harmonic feature values of all vowels in (9c) are inserted by default.[10] Recall that this results in the 'twin peaks' representation in (6b), repeated here in (10) and with association lines solidified for clarity.

(10) 'Twin peaks' representation



The harmonic feature value of U$_2$ here is still contextually predictable in Goldsmith's analysis, but it is due to this value being the default one, not due to spreading from the origin.

Kiparsky & Pajusalu's (2003) analysis of vowel transparency also results in a 'twin peaks' representation, and for related reasons. They suggest that when total harmony fails due to the presence of neutral vowels, the grammar falls back on markedness — in other words, a kind of default. Specifically, the inevitable disharmony resulting from the presence of neutral vowels activates markedness constraints that are otherwise inactive. These constraints favor unmarked feature values in contexts where harmony cannot be achieved; critically, the harmonic feature value that appears to be 'unmarked' in these contexts happens to be the value opposing N, in the same way that the default value in Goldsmith's analysis also happens to be this value.

The essential components of Kiparsky & Pajusalu's analysis of transparency are summarized at a very high level by the tableau in (11). Starting from the bottom of the constraint hierarchy: IDENT is a faithfulness constraint violated by each change in the harmonic feature value from input to output. The underlying/input values of undergoers and neutrals are irrelevant — hence the bottom rank IDENT — so the number of violations in each case varies in some unknowable way that is insignificant to the analysis. AGREE is the markedness constraint responsible for (strictly local) harmony, violated once for each disharmonic transition: twice by the winning transparent N candidate in (11a), zero times by the losing harmonic candidate in (11b), and once by the losing opaque N candidate in (11c). The latter two candidates are thus marked with an 'L' in this column, an explicit indication that AGREE prefers the loser to the winner in each case.

(11) Kiparsky & Pajusalu's (2003) analysis of transparency (adapted)

/O — U$_1$ — N — U$_2$/ (+ ± ± ±)	AGREE & *U̲ (−)	*N (+)	AGREE	IDENT	
a. ☞ [O — U$_1$ — N — U$_2$] (+ + − +)			**	(∗ . . .)	transparent N
b. [O — U$_1$ — N — U$_2$] (+ + + +)		*W	L	(∗ . . .)	harmonic
c. [O — U$_1$ — N — U$_2$] (+ + − −)	*W		*L	(∗ . . .)	opaque N

[10] Whether O and U$_1$ autosegmentally share the same inserted default value is irrelevant to the point here.

The double violation of AGREE is tolerated due to the higher rank of the next two constraints. *N̟ is the markedness constraint responsible for the redundant harmonic feature specification of neutral vowels as '−', and is thus violated by the losing harmonic candidate in (11b). This candidate is thus marked with a 'W' in this column, an explicit indication that *N̟ prefers the winner to this loser. The competition thus comes down to transparent vs. opaque N, and without any further constraints to decide the matter, opaque N has the edge because the highest-ranked constraint that distinguishes these two candidates, AGREE, prefers opacity.

This is why Kiparsky & Pajusalu (2003: 228) posit the conjoined constraint AGREE & *U̠, violated whenever there is *both* an AGREE violation *and* an undergoer with the '−' value of the harmonic feature. This is where the opaque N candidate in (11c) runs aground, as indicated by the 'W' in this column, thus sealing its fate as a loser to the transparent N candidate.[11] Kiparsky & Pajusalu's key insight here is that the contextual predictability of U_2 is dependent on the fact that N interrupts the spread of the harmonic feature. The markedness of undergoers with the same harmonic feature value as neutrals is *activated* by the failure of (total) harmony — hence the title of this section and of this squib: "when harmony fails, markedness prevails."

I find the core of this insight compelling, but take issue with a couple of different aspects of Kiparsky & Pajusalu's implementation of it. The first issue is that constraint conjunction is too blunt an instrument.[12] Conjunction could just as easily be used to express something that *never* appears to occur in vowel harmony: "when harmony fails, *faithfulness* prevails." That is, suppose we replace Kiparsky & Pajusalu's conjoined constraint with AGREE & IDENT in (11): we then predict that the underlying harmonic feature specifications of undergoers and neutrals *are* potentially relevant, because they surface faithfully when (and *only* when) disharmony is inevitable due to the presence of a neutral vowel. The resulting pattern would be what Wilson (2006) calls 'sour grapes' ("If I can't spread all the way, then I won't spread at all!"), a special case of 'non-myopic' spreading; see again the references(-in-the-references) in fn. 4 above.

The second issue is that the *U̠ conjunct of the conjoined constraint only coincidentally targets the relevant subset of vowels. To understand this issue better, consider Kiparsky & Pajusalu's specific analysis of transparency in Finnish [±back] harmony. The alternating vowel pairs are {*ä*∼*a*, *ö*∼*o*, *ü*∼*u*}, and the transparent neutral vowels are {*i*, *e*}. Given this inventory and the harmonic behaviors of the vowels within it, the markedness constraint corresponding to *N̟ is as stated in (12a) and the one corresponding to the *U̠ conjunct is as stated in (12b).[13]

(12) a. $\begin{bmatrix}-\text{low}\\-\text{round}\end{bmatrix} \Rightarrow [-\text{back}]$ (i.e., **ɯ*,**ɤ*) b. $[-\text{back}] \Rightarrow \begin{bmatrix}-\text{low}\\-\text{round}\end{bmatrix}$ (i.e., **ä*,**ö*,**ü*)

[11] Kiparsky & Pajusalu (2003: 228–229) address the fact that AGREE & *U̠ may not be a *local* conjunction (Smolensky 2006), given that "the minimal substrings that contain the violations [do not] overlap". It may be sufficient that the minimal substrings that contain the violations in (11c) are *adjacent*, but what if the opaque N candidate contains a longer subsequence of neutral vowels N, increasing the distance between U_2 and the disharmonic transition from U_1 to N? Ringen (1988: 336–337) reports that Hungarian experimental subjects "used exclusively front suffix vowels with most mixed vowel roots ending in multiple transparent vowels", suggesting that adjacency is necessary; Ringen & Heinämäki (1999: 312–313) report that there is variation in suffix vowel realization after similarly mixed roots in Finnish, but attribute it "to (some) speakers' analysis of certain forms as compounds."

[12] I state this with full knowledge of my own blunt use of constraint conjunction in Baković (2000), but I digress.

[13] (12) is adapted from Kiparsky & Pajusalu (2003: 222, (2)). I use the same vowel symbols except *ɨ*↦*ɯ* and *õ*↦*ɤ*.

These two markedness constraints are *converses* of each other, and I submit that this is not a coincidence.[14] Building on Kiparsky & Pajusalu's basic insight, I conjecture that not only disharmony but the *cause* of disharmony — that is, the constraint corresponding to *N̟ in (12a), penalizing the would-be alternants of the neutral vowels *i*, *e* — is responsible for both the definition and the activation of the constraint corresponding to *U̠ in (12b), as summarized in (13).

(13) **The neutrality condition.**

If the vowel inventory of a language with $[\pm\text{F}]$-harmony lacks vowels violating a constraint $\mathbb{M}$ that can be stated as $[\beta\text{G}, \gamma\text{H}, \ldots] \Rightarrow [\alpha\text{F}]$, then disharmonic (non-vacuous) satisfaction of $\mathbb{M}$ activates the converse of $\mathbb{M}$, $\mathbb{M}'$, which can be stated as $[\alpha\text{F}] \Rightarrow [\beta\text{G}, \gamma\text{H}, \ldots]$.

The elements of the neutrality condition can be broken down as follows.

(14) a. "If the vowel inventory of a language with $[\pm\text{F}]$-harmony…"
— This refers to a language with the ranking ⟦AGREE(F) ≫ IDENT(F)⟧.

b. "…lacks vowels violating a constraint $\mathbb{M}$ that can be stated as $[\beta\text{G}, \gamma\text{H}, \ldots] \Rightarrow [\alpha\text{F}]$…"
— This refers to the lack of $[\alpha\text{F}, \beta\text{G}, \gamma\text{H}, \ldots]$ vowels from the inventory of the language, due to the ranking ⟦$\mathbb{M}$ ≫ IDENT(F)⟧.

c. "…then disharmonic (non-vacuous) satisfaction of $\mathbb{M}$…"
— This refers to $\mathbb{M}$ being best-satisfied by some form of disharmony (opacity or transparency), due to the ranking ⟦$\mathbb{M}$ ≫ AGREE(F)⟧.

d. "activates the converse of $\mathbb{M}$, $\mathbb{M}'$, which can be stated as $[\alpha\text{F}] \Rightarrow [\beta\text{G}, \gamma\text{H}, \ldots]$."
— Under the above conditions, the constraint $\mathbb{M}'$, which is the logical converse of $\mathbb{M}$, becomes active. This constraint prefers segments that bear the harmonic feature value $[\alpha\text{F}]$ to also bear the feature values $[\beta\text{G}, \gamma\text{H}, \ldots]$.

The basic idea is that Kiparsky & Pajusalu's *U̠ conjunct stands on its own in the constraint hierarchy, but that it is only defined and active when (13) holds. This is illustrated in (15) with an abstract Finnish example, where the activated $\mathbb{M}'$ is indicated with '∘' instead of '∗'.

(15) Neutrality condition analysis of transparency in Finnish

/*a* – $\frac{ö}{o}$ – $\frac{i}{ɯ}$ – $\frac{ö}{o}$/	°*ä*,°*ö*,°*ü*	**ɯ*,**ɤ*	AGREE(bk)	IDENT(bk)	
a. ☞ [*a* – *o* – *i* – *o*]			∗∗	(∗…)	transparent
b. [*a* – *o* – *ɯ* – *o*]		*W	L	(∗…)	harmonic
c. [*a* – *o* – *i* – *ö*]	°W		*L	(∗…)	opaque

[14] Kiparsky & Pajusalu (2003: 222) suggest that it *is* a coincidence, noting that "*ä* is less marked than *ü*, *ö*, which suggests that in addition to [(12b)] there is a more specific constraint **ö*,**ü*." They suggest that this more specific constraint is necessary to account for an apparent split in the behavior of these vowels in Southern Vespian and the South Estonian Mulgi dialect, described very cursorily on p. 221 and not analyzed anywhere in the article.

The neutrality condition defines and activates 𝕄′ whenever the condition holds, but like any constraint, 𝕄′ can be ranked anywhere. In Finnish, it is ranked above AGREE, but the reverse ranking holds in Eastern Khanty, resulting in opacity (Kiparsky & Pajusalu 2003: 229).

(16) Neutrality condition analysis of opacity in Eastern Khanty

/a − ${}^{\ddot{o}}_{o}$ − ${}^{i}_{ɯ}$ − ${}^{\ddot{o}}_{o}$/	*ɯ,*ɤ	AGREE(bk)	°ä,°ö,°ü	IDENT(bk)	
a. ☞ [a − o − i − ö]		∗	∘	(∗ . . .)	opaque
b. [a − o − ɯ − o]	*W	L	L	(∗ . . .)	harmonic
c. [a − o − i − o]		**W	L	(∗ . . .)	transparent

And of course, in situations where there is no disharmonic candidate that seriously competes the fully harmonic form, 𝕄′ is simply not activated by the neutrality condition. This is illustrated with a form that with a front vowel in the origin position in (17), for which the optimal candidate is handily the fully harmonic form in both Finnish and Eastern Khanty.

(17) No activation of 𝕄′ when harmony is not at stake

/ä − ${}^{\ddot{o}}_{o}$ − ${}^{i}_{ɯ}$ − ${}^{\ddot{o}}_{o}$/	*ɯ,*ɤ	AGREE(bk)	IDENT(bk)	
a. ☞ [ä − ö − i − ö]			(∗ . . .)	harmonic
b. [ä − ö − ɯ − o]	*W	*W	(∗ . . .)	perversely opaque
c. [ä − ö − i − o]		*W	(∗ . . .)	perversely disharmonic

6 Conclusion

The approach outlined in this squib, building on Kiparsky & Pajusalu's (2003) insights, provides a principled account of transparency in vowel harmony that does not sacrifice locality. The key advance is in explicating how the converses of neutrality-defining markedness constraints are defined and activated in response to the failure harmony. This describes apparent non-local harmony as the result of emergent unmarkedness, rather than as true exceptions to locality.

A potential future direction for this work would be the analysis of parasitic harmony patterns, where markedness also prevails when harmony fails. In a height-parasitic rounding harmony pattern such as the well-known case in Yowulmne (formerly Yawelmani; see e.g. Kuroda 1967, Kisseberth 1969, Kenstowicz & Kisseberth 1979), suffix vowels alternate to agree in [±round] with root vowels, but only if the two vowels independently agree in [±high]; if they don't, the suffix vowel surfaces in a contextually predictable manner as [−round]. This fact has led past researchers (e.g., Steriade 1981) to invoke underspecification; I believe it would be worthwhile to pursue some generalized version of the neutrality condition proposed here instead.

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