Positional Faithfulness, Non-Locality, and the Harmonic Serialism Solution[*]

Karen Jesney

University of Massachusetts Amherst

1. Introduction

Positional Faithfulness constraints (Beckman 1997, 1998, Casali 1996, Lombardi 1999) are widely used in modeling contextual asymmetries in the realization of segmental features. As this paper shows, however, positional faithfulness constraints are also associated with a number of unwanted predictions. These problems arise whenever the constraints responsible for determining which segments fall into positions of privilege fail to dominate the positional faithfulness constraints. The result is pathological opaque and non-local patterns.

Section 2 begins the discussion by elaborating upon the original syllabification-based pathology from Beckman (1998: fn.37; see also McCarthy 2007) and additional examples. These show that the source of the unnatural patterns lies in the output-based definition of privileged positions in parallel Optimality Theory (OT; McCarthy & Prince 1995, Prince & Smolensky 1993/2004). Section 3 argues that adopting a Harmonic Serialist version of Optimality Theory allows positions to instead be defined based on intermediate steps in the derivation. This ensures that positional faithfulness violations are assessed on a consistent basis across candidates, thereby avoiding pathologies. Section 4 expands upon issues raised by this proposal and compares the present solution to alternatives involving direct reference to the input or a fully-faithful prosodified form.

2. The Problem with Positional Faithfulness

Positional Faithfulness constraints assign violation marks when a segment in a privileged *output* position is unfaithful relative to its input correspondent. These constraints are

[*] For helpful comments and discussion, thanks to John McCarthy, Joe Pater, Kathryn Pruitt, Peter Staroverov, Anne-Michelle Tessier, and Matt Wolf. Thanks also to the participants in the UMass Amherst Spring 2008 Phonology seminar and the Fall 2008 Phonology Group, and to the audience at NELS 39, particularly Arto Anttila and Anya Lunden. This work is supported in part by SSHRC Doctoral Fellowship #752-2005-1708.

March 2009. To appear in *Proceedings of the 39th Meeting of the North East Linguistic Society (NELS 39)*. Amherst, MA: GLSA.

vacuously satisfied when the positional condition is not met – i.e., when the segment in question is not in the privileged output position. In (1i), for example, the /pada/→[pat.a] mapping places the coronal segment in output coda position, and so the mapping vacuously satisfies IDENT[±voice]/ONSET; in the absence of onset syllabification, the [±voice] specification of the intervocalic consonant is irrelevant. This contrasts with the /pada/→[pa.ta] mapping in (1ii) where the output coronal stop is syllabified as an onset and a violation of IDENT[±voice]/ONSET is assessed in consequence.[1]

(1)

		IDENT[±voice]/ONSET	IDENT[±voice]
i.	/pada/ → [pat.a]	✓ (vacuously)	*
ii.	/pada/ → [pa.**t**a]	*	*

This vacuous-satisfaction property of positional faithfulness constraints is unproblematic when the constraints responsible for determining which segments occupy the privileged position are high ranking. With ONSET at the top of the constraint hierarchy, for example, IDENT[±voice]/ONSET allows a pattern of coda voicing neutralization to be effectively modeled. Intervocalic obstruents are syllabified as onsets and their [±voice] specification is retained in the output. Final obstruents are syllabified as codas and their input [+voice] features map unfaithfully to [-voice] (see especially Lombardi 1999).

Problems arise, however, because candidates in parallel OT vary freely across all dimensions. When the constraints that determine segments' prosodic positioning are low ranking and unmarked configurations, like onset syllabification, are therefore not categorically required, a candidate with marked prosodic structure can prove optimal if this allows high-ranking positional faithfulness and conflicting markedness constraints to be satisfied. The basic scenario attributed to Rolf Noyer (Beckman 1998: fn.37) is illustrated in (2). Input [-voice] intervocalic obstruents are syllabified in unmarked onset position, giving the mapping /pata/ → [pa.ta] (2a). Input [+voice] intervocalic obstruents, however, are devoiced at the surface and syllabified in marked coda position, giving the mapping /pada/ → [pat.a] (2b). Coda syllabification of input intervocalic /d/ allows the markedness constraint *VOICEDOBS to be satisfied without incurring a violation of IDENT[±voice]/ONSET.

(2) a. *With a [-voice] input, a [-voice] output and **onset** syllabification*

	/pata/	IDENT[±voice]/ONSET	*VOICEDOBS	IDENT[±voice]	ONSET
i.	☞ pa.**t**a				
ii.	pat.a				*!

[1] Throughout, segments that occupy privileged positions for the purpose of assessing positional faithfulness violations are double underlined and in bold.

b. *With a [+voice] input, a [-voice] output and **coda** syllabification*

	/pada/	IDENT[±voice]/ONSET	*VOICEDOBS	IDENT[±voice]	ONSET
i.	pa.**d**a		*!		
ii.	pad.a		*!		*
iii.	pa.**t**a	*!		*	
iv.	☞ pat.a			*	*

The forms in (2) have their underlying [±voice] contrast *opaquely displaced* onto the output prosodic structure. The intervocalic coronal segment appears as [t] in both forms, but differs in its syllabification for reasons that are not apparent at the surface. The resulting pattern is a type of chain shift.[2]

(3) *Chain shift pattern*: /pa.da/ → [pat.a]; /pat.a/ → [pa.ta]
[Input syllabification has no effect on the output pattern.]

Although this unusual interaction has long been recognized, it has not been seen as fatal to positional faithfulness. This is perhaps a result of it being unclear what it would mean for a language to have a surface contrast between [pa.ta] and [pat.a] without phonetic correlates for syllabification, or why a learner would ever choose to attribute this pattern to the underlying [±voice] specification of the segments if there is no evidence for [+voice] at the surface. Consideration of additional inputs reveals an undeniably pathological pattern, however, with the role of [±voice] made clear.

A language with the ranking in (2) prefers devoicing and coda syllabification of input [+voice] obstruents just when this allows for better satisfaction of both the positional faithfulness *and* conflicting markedness constraints. As a result, input [+voice] segments emerge faithfully in onset if coda syllabification is blocked – e.g., by high-ranking *COMPLEXCODA. This is a language, then, that allows contrastive voicing in medial onsets just when there is a preceding consonant in coda position. Otherwise, medial input voicing contrasts are displaced onto output syllabification.

(4) *Input [+voice] obstruents are realized faithfully when coda syllabification is blocked*

	/pazba/	*COMPLEX CODA	IDENT[±voice]/ ONSET	*VOICED OBS	IDENT [±voice]	ONSET
i.	pa.**zb**a			**!		
ii.	☞ pas.**b**a			*	*	
iii.	pas.**p**a		*!		**	
iv.	pasp.a	*!			**	*

Alternatively, a language with the ranking in (2) might show interactions with vowel length that reveal the underlying [±voice] specifications of intervocalic segments. A suffix /-ba/ might surface as voiceless [pa] following roots ending in short vowels where

---

[2] As Blumenfeld (2006) discusses, positional markedness constraints can also cause marked prosodic structures to emerge; the resulting patterns are surface true, however – not opaque.

coda syllabification is possible, for instance, but as [ba] following roots ending in long vowels where coda syllabification is blocked.

This type of pathology, where input featural specifications are opaquely displaced onto output prosodic structure, is general to positional faithfulness constraints, arising whenever the ranking in (5) holds. With the constraints defining the unmarked prosodification ranked low in the hierarchy, marked prosodic structures can prove optimal when this allows higher-ranking positional faithfulness and featural markedness constraints to be satisfied.

(5) *Ranking responsible for pathological positional-faithfulness effects*

POSITIONALFAITH ›› MARKEDNESS ›› GENERALFAITH, PROSODIFICATION

[Prosodification constraints determine patterns of syllabification, footing, segment preservation, etc.]

As further illustration, consider the effects of IDENT[±ATR]/ˈσ – a positional faithfulness constraint that assigns violation marks to segments in output stressed syllables that differ in specification for [±ATR] relative to their input correspondents. In concert with *[-ATR], this constraint can force changes in output footing, giving the pathological surface pattern sketched in (6). The language in question has default trochaic stress due to a TROCHEE ›› IAMB ranking. This pattern is clearly seen when the second input vowel is [-ATR], as in (6a); here, the unmarked trochaic parsing allows the [-ATR] specification of the second vowel to be altered without violating the positional faithfulness constraint IDENT[±ATR]/ˈσ.

(6) a. *With the second input vowel [-ATR], output [+ATR] only and a **trochaic** parse*

	/bidɛ/	IDENT[±ATR]/ˈσ	*[-ATR]	IDENT[±ATR]	TROCH	IAMB
i.	(ˈ**bi**.dɛ)		*!			*
ii.	☞ (ˈ**bi**.de)			*		*
iii.	(bi.ˈ**dɛ**)		*!		*	
iv.	(bi.ˈ**de**)	*!		*	*	

b. *With the initial input vowel [-ATR], output [+ATR] only and an **iambic** parse*

	/bɛdi/	IDENT[±ATR]/ˈσ	*[-ATR]	IDENT[±ATR]	TROCH	IAMB
i.	(ˈ**bɛ**.di)		*!			*
ii.	(ˈ**be**.di)	*!		*		*
iii.	(bɛ.ˈ**di**)		*!		*	
iv.	☞ (be.ˈ**di**)			*	*	

When the *initial* input vowel is [-ATR] as in (6b), however, iambic parsing is preferred. The default trochaic stress pattern is subverted in order to allow for maximal satisfaction of IDENT[±ATR]/ˈσ and *[-ATR].

Again, divergence from the unmarked prosodic structure is optimal only when it provides a global benefit. Trochaic parsing and surface [-ATR] vowels therefore emerge if, as in (7), both input vowels are [-ATR]. Because one of the vowels must be stressed and so will violate positional faithfulness if its input [-ATR] specification is altered, violation of IDENT[±ATR]/ˈσ and *[-ATR] cannot be fully avoided. Without this possibility, default trochaic footing is preferred, and the stressed vowel retains its [-ATR] specification at the surface.

(7) *With both input vowels [-ATR], a stressed [-ATR] output vowel and a* ***trochaic*** *parse*

	/bɛdɛ/	IDENT[±ATR]/ˈσ	*[-ATR]	IDENT[±ATR]	TROCH	IAMB
i.	(ˈ**bɛ**.dɛ)		**!			*
ii.	☞ (ˈ**bɛ**.de)		*	*		*
iii.	(ˈ**be**.de)	*!		**		*
iv.	(bɛ.ˈ**dɛ**)		**!		*	
v.	(be.ˈ**dɛ**)		*	*	*!	
vi.	(be.ˈ**de**)	*!		**	*	

The *non-local* nature of the pattern becomes clear when we consider the consequences of high-ranking constraints that enforce alternating stress – e.g., *CLASH and *LAPSE. Under these conditions, iambs are preferred whenever there are *more* input [-ATR] vowels in odd-numbered syllables than in even-numbered syllables – e.g., /bɛdibedi/ → [(be.ˈdi)(be.ˈdi)]; /bɛdibɛdɛ/ → [(be.ˈdi)(be.ˈdɛ)] – because the marked iambic parsing allows violations of IDENT[±ATR]/ˈσ and *[-ATR] to be minimized. Otherwise, when there are *equal numbers* of input [-ATR] vowels in odd- and even-numbered syllables, or when there are *more* input [-ATR] vowels in even-numbered syllables than in odd-numbered syllables, trochees prove optimal – e.g., /bɛdibidɛ/ → [(ˈbɛ.di)(ˈbi.de)]; /bɛdɛbidɛ/ → [(ˈbɛ.de)(ˈbi.de)]. This is an opaque *majority rules* pattern. It is the *number* of input [-ATR] vowels in various positions that determines the output footing (cf. Baković 2000). In all, a clearly unnatural system.[3]

Other equally pathological patterns can be easily created. The hierarchy in (8), for example, leads to a system where any number of voiced obstruents (and vowels, if ONSET is also high-ranking) can be truncated from the beginning of a word in order to allow for joint satisfaction of IDENT[±voice]/INITIAL and the conflicting markedness constraint *VOICEDOBSTRUENT. Here, the crucially low-ranking prosodification constraint is MAX, which prefers that all input segments be realized in the output. While output realization of the initial input segment is the default preference, it is violable under pressure from the higher-ranking constraints.

(8) *Ranking for pathological truncation pattern*

IDENT[±voice]/INITIAL ›› *VOICEDOBSTRUENT ›› MAX ›› IDENT[±voice]

[3] A further example of the unnatural effects that can be obtained through high-ranking positional faithfulness constraints that target stressed syllables is found in an alignment pathology identified by Wilson (2003). In this case, the regular penultimate stress pattern of the language is over-ridden just when this allows for better satisfaction of the pressures to preserve the underlying nasal specification of the stressed syllable (IDENT[±nasal]/ˈσ) and spread [+nasal] rightward (SPREAD-R([+nasal], PrWd)).

(9) *Input [+voice] obstruents are truncated unboundedly*

	/badaka/	IDENT[±voice]/INITIAL	*VOICEDOBS	MAX	IDENT[±voice]
i.	**b**adaka		*!*		
ii.	**p**ataka	*!			**
iii.	**d**aka		*!	**	
iv.	**t**aka	*!		**	*
v.	☞ **k**a			****	

As with the other cases discussed here, the pattern is opaque; the motivation for truncation is not apparent at the surface. Furthermore, this is not a language that simply lacks output [+voice] obstruents. If all of the potentially-initial segments are specified as [+voice] in the input, there is no truncation and the initial segment preserves its [+voice] specification. In sum, the system is pathological – a consequence of using the output to define privilege while simultaneously optimizing prosodification and featural properties.

3. Resolving the Problem through Harmonic Serialism

In Harmonic Serialism (HS; Prince & Smolensky 1993/2004: 94-95, McCarthy 2006, 2007, 2008ab, Kimper 2008, Pruitt 2008, Shaw 2007, Wolf 2008) candidates are derived through a series of steps. These steps are subject to two conditions: *gradualness*, which requires that each step involve only a single operation, and *harmonic improvement*, which requires that the output of each subsequent step be better-formed according to the language-specific constraint hierarchy.[4] I propose that within this framework the most recent step in the derivation serves as the basis for defining privileged positions and assessing faithfulness violations. This allows the problem of inconsistent privilege to be avoided and ensures that the pathologies observed in parallel OT are excluded.

Under this proposal, two candidates at a given step cannot differ in whether or not a given element is privileged for the purpose of assessing violations of a positional faithfulness constraint. Syllabification of an intervocalic consonant as an onset in the input to a given step ensures that that segment is subject to the positional faithfulness constraint IDENT[±voice]/ONSET regardless of its syllabification in the output (10i, ii). Likewise syllabification of an intervocalic consonant as a coda in the input to a given step ensures that that segment is *not* subject to the positional faithfulness constraint IDENT[±voice]/ONSET regardless of its syllabification in the output (10iii, iv).

(10)

		IDENT[±voice]/ONSET	IDENT[±voice]
i.	pa.**d**a → [pa**t**.a]	*	*
ii.	pa.**d**a → [pa.**t**a]	*	*
iii.	pad.a → [pat.a]	✓	*
iv.	pad.a → [pa.ta]	✓	*

[4] OT with Candidate Chains (OT-CC; McCarthy 2007) elaborates upon the HS framework by introducing comparisons between alternative derivations (i.e., chains) to account for attested patterns of opacity. Chain comparison is not necessary for the current analysis.

Under this approach, no pathologies are associated with hierarchies where the constraints responsible for determining prosodification are relatively low ranking. The HS derivations in (11) illustrate this point. In (11a), given the initial input /pata/, the presence of ONSET in the constraint hierarchy results in a preference for onset syllabification of the /t/ at the first step. This form serves as the input to the next step in the derivation, with the onset /t/ now privileged. Submitted to the grammar again, no further improvement is possible, and the faithful output [pa.ta] is deemed optimal.

(11) a. *With a [-voice] input, a [-voice] output and* ***onset*** *syllabification*

/pata/	IDENT[±voice]/ONSET	*VOICEDOBS	IDENT[±voice]	ONSET
☞ pa.ta				
pat.a				*!
pa.**t**a	IDENT[±voice]/ONSET	*VOICEDOBS	IDENT[±voice]	ONSET
☞ [pa.**t**a]				
pat.a				*!

Output: [pa.ta] **Winning derivation: <pata, pa.ta>**

b. *With a [+voice] input, a [+voice] output and* ***onset*** *syllabification*

/pada/	IDENT[±voice]/ONSET	*VOICEDOBS	IDENT[±voice]	ONSET
☞ pa.da		*		
pad.a		*		*!
pa.**d**a	IDENT[±voice]/ONSET	*VOICEDOBS	IDENT[±voice]	ONSET
☞ [pa.**d**a]		*		
pa**d**.a		*		*!
pa.**t**a	*!		*	
pa**t**.a	*!		*	*

Output: [pa.da] **Winning derivation: <pada, pa.da>**

The derivation for input /pada/ in (11b) proceeds in much the same fashion. Here again, the presence of ONSET in the constraint hierarchy results in a preference for onset syllabification of the intervocalic obstruent at the first step. This renders the /d/ privileged for the next step, and leads to violations of IDENT[±voice]/ONSET being assessed for candidates where that input /d/ is not faithfully realized. The optimal candidate is thus [pa.da], with the intervocalic obstruent realized in onset position with its input [+voice] specification preserved.

Both candidates in (11b) where the intervocalic obstruent is devoiced at the second step – i.e., [pa.ta] and [pat.a] – incur a violation of the high-ranking positional faithfulness constraint. It does not matter if the obstruent is resyllabified as an onset in the candidate form; violations of IDENT[±voice]/ONSET are based on the input to the current step in the derivation. As a result, neither of the candidates with unfaithful voicing is harmonically improving. Indeed, the candidate [pat.a], which is optimal in the parallel OT analysis, is harmonically bounded. The surface pattern is the expected one given high-ranking positional faithfulness – preservation of the featural contrast just in the privileged onset environment. The pathologies produced in parallel OT under the same ranking are avoided. There is no opacity here; the underlying featural specification of segments is not able to affect output syllabification.[5]

The footing problem is resolved in the same fashion. The first step of the derivation parses the string into trochees, based on the TROCHEE ›› IAMB ranking. This footing renders the first syllable stressed and therefore privileged for the next step in the derivation; the unstressed second syllable is not similarly protected. The [-ATR] second-syllable vowel in (12a) is thus subject to the pressure of high-ranking *[-ATR], and changing it from /ɛ/ to /e/ at the second step is harmonically improving. The final output reflects this fact, with [(ˈbi.de)] selected as the optimal output form.

(12) a. *With the second input vowel [-ATR], output [+ATR] only and a* ***trochaic*** *parse*

/bidɛ/	IDENT[±ATR]/ˈσ	*[-ATR]	IDENT[±ATR]	TROCH	IAMB
☞ (ˈbi.dɛ)		*			*
(bi.ˈdɛ)		*		*!	
(ˈ**bi**.dɛ)	IDENT[±ATR]/ˈσ	*[-ATR]	IDENT[±ATR]	TROCH	IAMB
(ˈ**bi**.dɛ)		*!			*
☞ (ˈ**bi**.de)			*		*
(**bi**.ˈdɛ)		*!		*	
(**bi**.ˈde)			*	*!	
(ˈ**bi**.de)	IDENT[±ATR]/ˈσ	*[-ATR]	IDENT[±ATR]	TROCH	IAMB
☞ [(ˈ**bi**.de)]					*
(**bi**.ˈde)				*!	

Output: [(ˈbi.de)] **Winning derivation: <bidɛ, (ˈbi.dɛ), (ˈbi.de)>**

b. *With the first input vowel [-ATR], a [-ATR] output vowel and a* ***trochaic*** *parse*

/bɛdi/	IDENT[±ATR]/ˈσ	*[-ATR]	IDENT[±ATR]	TROCH	IAMB
☞ (ˈbɛ.di)		*			*
(bɛ.ˈdi)		*		*!	
(ˈ**bɛ**.di)	IDENT[±ATR]/ˈσ	*[-ATR]	IDENT[±ATR]	TROCH	IAMB
☞ [(ˈ**bɛ**.di)]		*			*
(ˈ**be**.di)	*!		*		*
(**bɛ**.ˈdi)		*		*!	
(**be**.ˈdi)	*!		*	*	

Output: [(ˈbɛ.di)] **Winning derivation: <bɛdi, (ˈbɛ.di)>**

The derivation in (12b) begins in the same fashion, with the string parsed into a trochaic foot, and the first syllable becoming privileged for the purpose of assessing

[5] An output like [pat.a] might emerge given a different constraint set. If the intervocalic obstruent were pulled into the initial syllable in order to satisfy WEIGHT-TO-STRESS, for example, a derivation like <pada, pad.a, pat.a> could prove optimal. Such coda syllabification would affect intervocalic obstruents regardless of their underlying [±voice] specification, however, making the pattern fully transparent.

IDENT[±ATR]/ˈσ at the following step in the derivation. Here, though, the marked [-ATR] vowel is in the stressed syllable, and so retains this feature value in the output. Altering the footing in order to avoid violation of IDENT[±ATR]/ˈσ is not an option here; the status of the initial syllable as privileged was established at the previous step, and so any unfaithful mapping of a [±ATR] feature in that syllable will incur a violation of the constraint. Unlike with the parallel OT analysis, the footing of the output candidate is not relevant for the assessment of positional faithfulness violations, and so mapping (ˈ**b<u>ɛ</u>**.di) to (**b<u>e</u>**.ˈdi) at the second step in the derivation cannot be harmonically improving.

There can be no majority rules or non-local effects in the HS analysis; decisions about footing are not affected by the underlying [±ATR] specification of the segments involved. Unlike with the parallel OT system described in §2, the number and input positioning of segments with marked feature values has no effect upon the output prosodification. The system is strictly transparent; decisions about syllabification, footing, etc. are local and marked feature values are limited to privileged positions.

4. Discussion

The proposal presented in this paper raises two issues to be considered further in this section – the relative ordering of prosodification and featural changes, and the role of the ultimate input vs. the most recent derivational step in assessing positional faithfulness violations.

4.1 Ordering of Prosodification and Featural Operations

The discussion thus far has assumed that prosodification takes place prior to any feature-changing operations. There are two possible ways of accounting for this. First, it may be the case that, as argued in McCarthy (2007), operations like syllabification that do not violate faithfulness constraints occur freely before all other operations. Under this scenario, the first step in the HS tableaux in section 3 is this fully-faithful initial parse, and all languages will prosodify the string at least partially before performing any featural operations.

Alternatively, it may the case that prosodification is a step of the derivation on par with featural operations, being driven PARSE-SEGMENT and PARSE-σ constraints that demand prosodification. (See Pruitt 2008 for discussion of the typological advantages associated with iterative footing driven by PARSE-σ in a HS framework.) If the stage in the derivation where prosodification occurs is a function of the relative ranking of the markedness constraints, then the possibility that it might apply *after* featural operations must be considered.

For our purposes, the important result here is that even if prosodification occurs after feature-changing operations, the types of pathologies discussed in §2 do not result. The reason for this rests with privileged positions being defined based on the input to the current step in the derivation. To see how this works, we can consider again the footing example, assuming this time that the constraint PARSE-σ is low-ranking and that prosodification is therefore postponed. (The rest of the constraint hierarchy is unchanged.)

(13) *With the initial input vowel [-ATR] and* P*ARSE-σ low ranking, no output [-ATR] vowels anywhere and* ***trochaic*** *footing*

/bɛdi/	IDENT [±ATR]/ˈσ	*[-ATR]	IDENT [±ATR]	PARSE-σ	TROCH	IAMB
(ˈbɛ.di)		*!				*
bɛdi		*!		**		
☞ bedi			*	**		
bedi	IDENT [±ATR]/ˈσ	*[-ATR]	IDENT [±ATR]	PARSE-σ	TROCH	IAMB
☞ [(ˈbe.di)]						*
(be.ˈdi)					*!	

Output: [(ˈbe.di)] **Winning derivation: < bɛdi, bedi, (ˈbe.di)>**

Here, the most harmonically-improving initial step is to tense the [-ATR] vowel; there is no footing present in the input at this stage, and so no violations of high-ranking IDENT[±ATR]/ ˈσ can be incurred by this operation. The next step foots the string, with pressure from the TROCHEE ›› IAMB ranking making the first syllable stressed. The resulting output [(ˈbe.di)] – a form devoid of marked [-ATR] vowels – cannot be further improved upon and so is deemed the optimal output.

The language that results from late prosodification does not show effects of positional faithfulness; it is a language that disallows [-ATR] vowels in all positions. Crucially, it is also not a pathological language like those discussed in §2. The pattern here is perfectly transparent. Disyllabic inputs are consistently parsed into trochees and only [+ATR] vowels are allowed at the surface. This finding is true quite generally. If segments are not prosodified until late in the derivation, the effects of positional faithfulness are not felt, but the surface language is perfectly non-pathological. It is simply a language with regular parsing and a strict prohibition against the marked features that might otherwise be protected by positional faithfulness constraints.[6]

4.2 Faithfulness to the Immediate Input

This paper has claimed that the pathologies observed in parallel OT arise because prosodification and featural realization are optimized simultaneously, and privileged positions are defined based on the output. An alternative to the HS proposal made here, then, might be to retain a parallel OT framework but define privilege based on input prosodification. Ultimately, however, this proves untenable.

[6] This result is at least partially dependent upon violations of positional faithfulness constraints only being incurred at the step where the featurally-unfaithfully mapping occurs. Alternative patterns will result if the derivation "remembers" that a newly-privileged element was mapped unfaithfully at an earlier stage, and new positional faithfulness violations are assessed once prosodification is introduced.

Relying on the input to achieve the desired positional faithfulness effects requires that the prosodification of the input precisely match that of the output – a violation of Richness of the Base. Even if the assumption of input-output prosodic identity is plausible in some situations, such as when words only ever appear as bare forms, in many cases affixation or other processes are likely to cause divergences in prosodification between the input and the output. When this happens, the result is a grammar that admits marked features in output positions where they are not normally licensed just because they are protected by their input prosodification. Purely surface-true patterns cannot be captured using positional faithfulness constraints in this type of system. A generalization like "voicing contrasts are neutralized in coda" cannot be modeled; if a segment is initially syllabified as an onset, this initial syllabification will ensure that its [+voice] feature is preserved in the output even if the segment is subsequently resyllabified as a coda due to affixation, truncation, syncope, or some other process (see Benua 1997 and Wilson 2001 for relevant discussion).

A related alternative takes privilege to be based on an initial featurally-faithful prosodification of the input (see e.g., Sprouse 1997). This effectively introduces a form of limited serialism, though it is ultimately inadequate. Basing privilege on a fully-faithful parse fails to allow for changes in prosodification which may arise due to syncope or other processes – a problem for any case where the surface distribution of features can only be reliably determined based on the prosodic structure of the output. This problem persists in a fully-serialist framework if positions are consistently defined based on a single initial prosodification (e.g., McCarthy 2007). Only a HS model that allows for evolving inputs avoids this issue, ensuring that positions of privilege shift in a manner consistent with the observed prosodification.

4.3 Summary

The parallel OT problem with positional faithfulness outlined in this paper is a very general one, arising whenever the constraints responsible for determining which segments occupy privileged positions are ranked low in the hierarchy. The Harmonic Serialism solution comes not from altering the ranking, but from reinterpreting the basis upon which privilege is established. Rather than being based on the prosodification in the output candidate, privilege is understood here as stemming from the prosodic structure associated with the input to the current step in the derivation. This approach allows the desired effects of positional faithfulness to be seen, without also predicting opaque and non-local patterns that fall outside the range of what is attested in human language.

References

Baković, Eric. 2000. *Harmony, Dominance and Control*. PhD dissertation. Rutgers University.

Beckman, Jill. 1997. Positional faithfulness, positional neutralization, and Shona vowel harmony. *Phonology* 14(1): 1-46.

Beckman, Jill. 1998. *Positional Faithfulness*. PhD dissertation. University of Massachusetts Amherst.

Benua, Laura. 1997. *Trans-Derivational Identity: Phonological Relations Between Words*. PhD dissertation. University of Massachusetts Amherst.

Blumenfeld, Lev. 2006. *Constraints on Phonological Interactions*. PhD dissertation. Stanford University.

Casali, Roderic. 1996. *Resolving Hiatus*. PhD dissertation. UCLA.

Kimper, Wendell. 2008. Local optionality and Harmonic Serialism. Ms., University of Massachusetts Amherst. [ROA-988].

Lombardi, Linda. 1999. Positional faithfulness and voicing assimilation in Optimality Theory. *Natural Language and Linguistic Theory* 17: 267-302.

McCarthy, John J. 2006. Restraint of analysis. In E. Baković, J.J. McCarthy & J. Itô (eds.), *Wondering at the Natural Fecundity of Things: Essays in Honor of Alan Prince*, 195-219. [ROA-844.4].

McCarthy, John J. 2007. *Hidden Generalizations: Phonological Opacity Optimality Theory*. London: Equinox.

McCarthy, John J. 2008a. The gradual path to cluster simplification. *Phonology* 25(2): 271-319.

McCarthy, John J. 2008b. The serial interaction of stress and syncope. *Natural Language and Linguistic Theory* 26: 499-546.

McCarthy, John J. & Alan Prince. 1995. Faithfulness and reduplicative identity. *University of Massachusetts Occasional Papers* 18: 249-384.

Prince, Alan & Paul Smolensky. 1993/2004. *Optimality Theory: Constraint Interaction in Generative Grammar*. Oxford Blackwell.

Pruitt, Kathryn. 2008. Iterative foot optimization and locality in stress systems. Ms., University of Massachusetts Amherst. [ROA-999].

Shaw, Jason. 2007. Compensatory lengthening via mora preservation in OT-CC: theory and predictions. Paper presented at *NELS 38*. Ottawa, ON: University of Ottawa.

Sprouse, Ronald. 1997. A case for enriched inputs. Paper presented at *TREND*. [ROA-193].

Wilson, Colin. 2001. Consonant cluster neutralization and targeted constraints. *Phonology* 18: 147-197.

Wilson, Colin. 2003. Analyzing unbounded spreading with constraints: marks, targets, and derivations. Ms., UCLA.

Wolf, Matthew. 2008. *Optimal Interleaving: Serial Phonology-Morphology Interaction in a Constraint-Based Model*. PhD dissertation. University of Massachusetts Amherst.

Department of Linguistics
226 South College
University of Massachusetts
Amherst, MA 01004

kjesney@linguist.umass.edu