On the Proper Treatment of Non-CrispEdges[1]

SHIGETO KAWAHARA
University of Massachusetts, Amherst

'While many-to-one and many-to-many associations are not uncommon, there is nonetheless something unusual about them.'
(Goldsmith 1984: 256)

1. Introduction

It is commonly observed that spreading is blocked by an edge of a particular category (e.g. Nespor and Vogel 1986). For example, Indonesian resolves hiatus by spreading the first vowel to the second syllable node, but such spreading is blocked by a prosodic word edge (Cohn and McCarthy 1994), e.g. $_{\text{Wd}}$[di**j**a] 'two' but di-**ʔ**$_{\text{Wd}}$[ambil] 'taken'. The primary aim of this paper is to develop a general theory that accounts for such blockage of spreading. I propose that such blockage takes place due to the markedness of the structures that result from spreading, which inevitably involve multiply-linked features or segments. To formalize the idea, a general schema of constraints

[1] I wish to thank Michael Becker, Kathryn Flack, Maria Gouskova, Shinsook Lee, John McCarthy, Hajime Ono, Kazutaka Kurisu, Jaye Padgett, Joe Pater, Taka Shinya, Kyoko Takano, the members of the UMass Phonology Group and the audiences at Japanese/Korean Linguistics Conference 13 (especially Stuart Davis and John Whitman), who offered many constructive suggestions which led to much improvement. All errors are mine.

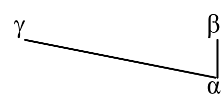
is proposed within the framework of Optimality Theory (henceforth OT; Prince and Smolensky 1993). The proposed schema is called UNIQUE AFFILIATION (UA), as it requires an element to be uniquely affiliated with a higher element. The proposed constraint family captures a general pattern of spreading blockage, and further, it provides a new instance of a constraint schema, contributing to the investigation of internal structure of CON.

The remainder of this paper is structured as follows. §2 presents the formal proposal regarding the markedness of multiple linking. §3 is devoted to justifying the details of the proposal. §4 considers some consequences of the proposed theory. In §5 I consider alternative approaches, mainly focusing on the CRISPEDGE constraints proposed by Ito and Mester, which are functionally quite similar to my proposal. Though the current proposal is inspired by CRISPEDGE constraints, I will show that CRISPEDGE constraints *per se* are insufficient. Throughout, evidence is mostly drawn from Japanese, but cross-linguistic data are used from time to time.

2. Formalization

The core of my proposal is that structures like (1) are marked because α is not uniquely dominated by β, i.e. α is multiply-linked with respect to β.

(1)



This idea is formally articulated in the following constraint schema.

(2) UNIQUE AFFILIATION (α, β):

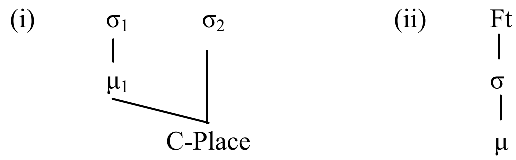
Let α, β, γ be variables ranging over linguistic categories and let $x\delta y$ mean that x is dominated by y, then

(i) $\forall\alpha\ [(\alpha\delta\beta) \rightarrow \neg\exists\gamma\ [(\alpha\delta\gamma) \wedge (\neg(\beta\delta\gamma) \wedge \neg(\gamma\delta\beta))]]$
(ii) Assign one violation mark for each instance of α that falsifies (i)

The constraint schema takes two variable arguments, α and β. UA(α, β) requires that, if α is dominated by β, α be not dominated by any γ unless γ dominates β or vice versa. Informally, α must "uniquely affiliate" with β.

Some illustrative examples are given in (3) below to show how violations of UA are computed. (3i) is a structure of a geminate, which is a typical structure violating UA constraints. The C-Place node is dominated by μ_1, and is also dominated by σ_2 which does not dominate μ_1; therefore, the C-Place is not uniquely dominated by either μ_1 or σ_2. Hence, the structure violates UA(C-Place, μ) and UA(C-Place, σ). The second structure (3ii) is part of the traditional prosodic hierarchy. In this case, UA constraints are satisfied, since even though the mora is simultaneously dominated by both the syllable and the foot, the syllable is also dominated by the foot.

(3)



3. Justifying the Proposal

In this section, I justify the details of my proposal. In UA(α, β), α is a subordinate category and β is a superordinate category. It will be shown that a pair of UA constraints where β is held the same and α is varied are different constraints (§3.1.). Similarly, constraints where α is held the same while β is varied are shown to be different constraints (§3.2). Finally, following the earlier observation made in Walker (2001), §3.3 briefly discusses how a violation mark for UA constraints is assessed.

3.1. α as a Variable Argument

The use of α as a variable argument is motivated by the observation that, given a superordinate category to which there is a multiply-linked subordinate category, its markedness value differs depending on what kind of subordinate element is linked across that superordinate category. Here I illustrate this point using the distribution of geminates and long vowels in Standard noncolloquial Japanese.

Morpheme-internally, geminates and long vowels are amply attested in Japanese, as in *suppai* 'sour' and *okaasan* 'mother'. However, across a morpheme boundary, only geminates are allowed in noncolloquial Standard Japanese. Cross-morphemic geminates are found in so-called reduced compounds, illustrated below (Poser 1984: 89-91; Ito and Mester 1996: 24):

(4) /but-u/ 'strike'

bu**t-t**oosu	'permeate'	bu**p-p**anasu	'fire a bullet'
bu**k-k**orosu	'kill violently'	bu**n-n**aguru	'beat up'

Evidence that cross-morphemic long vowels are illicit comes from blockage of vocalic fusion. Japanese fuses /ei/ and /ou/ into [ee] and [oo], respectively (Vance 1987), as observed in recent loanwords from English in (5a). However, this fusion is blocked across a morpheme boundary, as in (5b):

(5) a. /ei/ → [ee]; /ou/ → [oo]

eesu	'ace'	t**ee**suto	'taste'
k**ee**ki	'cake'	p**ee**suto	'paste'
t**oo**suto	'toast'	s**oo**pu	'soap'
k**oo**to	'coat'	h**oo**pu	'hope'

b. (a) is blocked by a morphological boundary

anim**e i**rasuto	*anim**ee**rasuto	'anime illustration'
suiit**o u**edingu	*suiit**oo**edingu	'sweet wedding'

It thus seems that cross-morphemic long vowels are prohibited in noncolloquial Standard Japanese[2].

Cross-morphemic geminates and long vowels thus have different markedness values in Japanese. It follows that UA(C-Place, Morph), which prohibits cross-morphemic geminates, and UA(V-Place, Morph), which prohibits cross-morphemic long vowels, must be separate constraints, as only the former is violable in Japanese. This supports the hypothesis that α is a variable argument in the proposed constraint schema.

3.2. β as a Variable Argument

In §3.1 I showed that given one superordinate category, the markedness of multiple-linking structures varies depending on what links across that superordinate category. This observation requires the use of α as a variable argument. In this subsection, I will show that β must also be a variable argument, observing that for one subordinate element, the markedness value differs depending on to which superordinate category it is multiply linked.

Evidence for this comes from the phonology of Sino-Japanese compounding, analyzed by Ito and Mester (1996). This section recasts their analysis in terms of UA constraints. Root-final vowels delete in Sino-Japanese whenever possible,[3] and the root-final consonant fuses with the root-initial consonant of the following morpheme because a coda cannot license an independent place specification (Ito 1986). This deletion is illustrated in (6). On the other hand, a vowel adjacent to an edge of a word (usually consisting of two roots) fails to delete, as shown in (7).

(6) Root-final vowel deletion in Sino-Japanese: /hatu/

hat-tatu	*hat**u**-tatu	'development'
hak-kaku	*hat**u**-kaku	'detection'
hap-pjoo	*hat**u**-pjoo	'presentation'

(7) Deletion fails at the word-edge

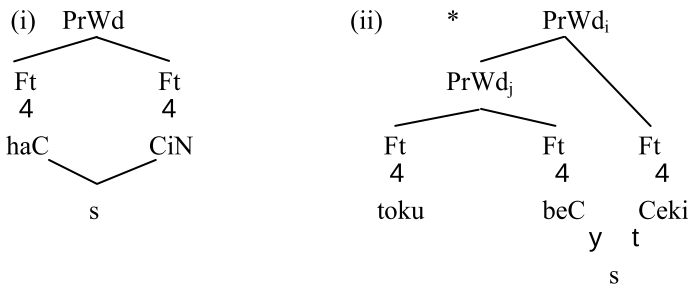
$[[$toku-bets**u**$]_{Wd}$-seki$]_{Wd}$ 'special seat'	*$[[$tokubes$]_{Wd}$ -seki$]_{Wd}$
$_{Wd}[$bets**u** $_{Wd}[$hjoo-ki$]]$ 'separate transcription'	*$_{Wd}[$bep $_{Wd}[$pjoo-ki$]]$

---

[2] As John Whitman reminds me, in casual speech, the inflectional suffix of [i] can be fused with root-final vowels, as in /taka-i/ → [take:] 'expensive'; even in this style of speech, fusion across stems seems impossible. This might suggest that what is prohibited in (5b) in the relevant grammar is multiple linking across a prosodic word boundary, as the inflectional suffix forms a prosodic word with its stem.

[3] In fact, it might be possible to regard the root-final vowels as epenthetic, as the quality of such a vowel is almost predictable (Tateishi 1990): it generally agrees in backness with the first vowel and is always [+high]. However, in some forms, the quality of the second vowel is unpredictable, suggesting that it is underlyingly specified. Further, given Richness of the Base (Prince and Smolensky 1993), the lack of root-final vowels cannot be imposed on inputs (see Kurisu 2000).

Ito and Mester (1996) assume that a Sino-Japanese morpheme corresponds to a prosodic foot; based on this assumption, the generalization that explains the difference between (6) and (7) is straightforward: multiple linking of a C-Place across a foot boundary is allowed, but a C-Place cannot be multiply linked across a prosodic word boundary. This is why deletion fails in (7).

(8)


This analysis can be recast in OT in the following way. I employ ALIGN-L(σ, Stem) as a constraint triggering vowel deletion. This constraint requires every syllable to be aligned with the left edge of a stem (McCarthy and Prince 1993), and this prefers monosyllabic stems. Since vowel deletion takes place in violation of UA(C-Place, Ft), ALIGN-L(σ, Stem) must outrank UA(C-Place, Ft). On the other hand, since the structure (8ii) is not allowed as a result of vowel deletion, UA(C-Place, PrWd) is ranked above ALIGN-L(σ, Stem). The following tableaux summarize the story:

(9) ALIGN-L(σ, Stem) »UA(C-Place, Ft), MAX

/hatu-tatu/	UA(C-Place, PrWd)	ALIGN-L (σ, Stem)	UA(C-Place, Ft)	MAX
a. $_{Wd}$[hatu-tatu]		*/*!		
b. ☞ $_{Wd}$[hat-tatu]		*	*	*

(10) UA(C-Place, PrWd) » ALIGN-L(σ, Stem)

/toku-betsu-seki/	UA(C-place, PrWd)	ALIGN-L (σ, Stem)	UA(C-Place, Ft)	MAX
a. ☞$_{Wd}$[toku-betu]-$_{Wd}$[seki]		*/*/*		
b. $_{Wd}$[toku-bes]- $_{Wd}$[seki]	*!	*/*	*	*

Some remarks about UA(C-Place, PrWd) in (10) are in order. The candidate (b) violates this constraint because as seen in (8ii), the lower $PrWd_j$ does not uniquely dominate the C-Place: it is also linked to the third foot, which is outside of the $PrWd_j$.

In sum, (9) and (10) show that UA(C-Place, Ft) and UA(C-Place, PrWd) are separate constraints, proving that β must be a variable argument.

3.3. How Violation Marks are Accrued

Finally, some remarks on the second clause of the UA definition - that violation marks are assessed for each instance of α - are in order. This clause is based upon Walker's claim (2001) about vowel harmony in Classical Manchu, where she argues that being multiply linked to three instances of a superordinate category is no more marked than being multiply linked to two instances of the same category (see Pater 2003 for a parallel example in Balantak). Without evidence to the contrary, I formulate UA in such a way that that violations are assessed for each instance of α, rather than for each offending association line. However, if the facts were shown to go the other way, it would be a simple matter to appropriately change or parameterize the definition of UA in (2) (see also §5.1 for related discussion).

4. Some Consequences of the Proposed Theory

I have formulated a hypothesis about the markedness of multiple-linking (§2) and presented justification for the details of the proposal (§3). In this section, I present some further consequences of the proposed theory.

4.1. Expressing the Markedness of Complex Structures

The first favorable consequence of the UA constraints is that they successfully account for the markedness of some autosegmentally complex structures. For example, a H tone associated with more than one tone bearing unit is marked, and this structure is prohibited in some languages (e.g. Sakuma: Goldsmith 1990). The markedness of such spread tones can be expressed via UA(H, TBU). Other such structures include harmonized features (see Beckman's UNIQUE (1998)), long vowels and geminates. See §5.1 for more on the markedness of long vowels and geminates.

4.2. Solving an Old Problem of Heteromorphemic Geminates

The second consequence of the proposed UA theory is that it solves an old problem concerning the creation of true geminates across morphemes. It has been noted that creating a true geminate across a morpheme boundary is often prohibited, as in Tigrinya (Schein 1981), but this prohibition does not always hold, as Tiberian Hebrew allows such a structure (McCarthy 1980).

UA(C-Place, Morph) militates against true geminates across two morphemes, but given the violability of constraints in OT, this situation is exactly what is expected. Assuming that the OCP is satisfied by fusion of adjacent identical elements, permutation of the OCP and UA(C-Place, Morph) accounts for the contrast between Tiberian Hebrew and Tigrinya.

4.3. Eliminating Domain Specifications in Spreading Constraints

UA(α, β) prevents spreading of α from a higher superordinate category β. Thus, the interaction of UA constraints with a general spreading constraint yields domain-specific spreading. More concretely,

(11) Let D_n be an n-level prosodic category and if the domain of harmony of the feature F is D_n, then,

$$UA(F, D_n) \gg \textsc{Spread}(F) \gg UA(F, D_{n-1}), UA(F, D_{n-2}) \ldots$$

As a result, domain specifications can be eliminated from spreading constraints, contra claims by, e.g. Walker (1998: 37) and Padgett (2002a). One prediction of the proposal is that spreading is equally blocked by the left or right edge of a particular category, as UA is not relativized for edges. Whether this prediction is on the right track is left for future investigation.

Another remark about blocking spreading by a set of UA constraints is in order. It is commonly observed that multiple linking across a higher category results in higher markedness value. This derives from the fact that multiple linking across a higher category (e.g. PrWd) usually entails multiple linking across lower categories (e.g. Ft, σ, μ). Thus, spreading across a higher category incurs a superset of violation marks compared to spreading across a lower category, and hence it is universally more marked even without ranking stipulation. In other words, UA for lower categories is more stringent.[4] See de Lacy (2002) for discussion on stringency.

5. Alternatives

Before concluding the paper, in this section, I compare UA constraints with alternatives, first with CRISPEDGE constraints proposed by Ito and Mester (1994, 1999)[5] and second with a faithfulness constraint *SPREAD.

5.1. CRISPEDGE(PCAT)

First, the definition of CRISPEDGE is given below.

(12) CRISPEDGE(PCat): PCat is crisp

> Crisp dfn = Let A be a terminal (sub)string in a phonological representation, C a category of type PCat, and A be-the-content of C. Then C is crisp (or has crisp edges) if and only if A is-a PCat.

Informally, if a PCat C dominates an element A, CRISPEDGE(C) requires that no other category dominates A. So UA and CRISPEDGE are similar in their function; however, crucially, the locus of violation is C for CRISPEDGE constraints. I argue that, CRISPEDGE constraints have the following problems because of this characteristic.

First, CRISPEDGE does not look at the source of noncrispness (cf. Walker 2001). Thus, it predicts that the markedness of noncrisp edges is consistent regardless of what is linked across that category. However, this prediction is inconsistent with what we saw in §3.1: in Japanese, a C-Place can link across morphemes while a V-Place cannot. By incorporating a

---

[4] This stringency relationship does not hold for structures that violate exhaustivity. For instance, in a trisyllabic structure with the first two syllables footed and the final syllable being directly attached to a PrWd, spreading from the second syllable to the third violates UA(α, Ft) but it does not violate UA(α, PrWd). Spreading from the third syllable to outside of the PrWd on the other hand violates UA(α, PrWd), but not UA(α, Ft). Whether the latter is universally more marked than the former is yet to be determined in future investigation.

[5] CRISPEDGE constraints are further developed and utilized in Noske (1997); Baker (1998); Keer (1999); Pater (2001); Walker (2001); Kawahara (2003) among others.

variable argument α, the proposed UA theory overcomes this problem.

Second, if we attempt to express the markedness of geminates and long vowels by CRISPEDGE constraints (Baker 1998), it predicts that geminates are always more marked than long vowels. This is because while long vowels violate only CRISPEDGE(μ), geminates violate both CRISPEDGE(μ) as well as CRISPEDGE(σ) (in addition to NOCODA), as seen in (13), and as a result geminates incur a superset of the violations incurred by long vowels.

(13) (i) geminates (ii) long vowels

However, this prediction is inconsistent with the actual data. For instance, to create a heavy syllable, some languages resort to gemination rather than vowel lengthening. The Sizuoka dialect of Japanese is one example, as seen in the formation of emphatic forms; /takai/ → [takkai] *taakai 'expensive' (Davis and Ueda 2003). A word formation process found in Japanese motherese also exhibits the same tendency, as in /oki/ → [okki] *[ooki] 'to wake up' (Kawahara 2001). Further, there are languages that have only geminates but not long vowels; Ainu is such an example (Chiri 1951). CRISPEDGE cannot explain these patterns.

Recall, on the other hand, that in the UA theory, long vowels and geminates are penalized by different constraints: UA(V-Place, μ) for the former and UA(C-place, μ), UA(C-Place, σ) for the latter. If UA(V-Place, μ) » UA(C-place, μ), UA(C-Place, σ) holds, geminates are less marked than long vowels.

Third, according to the formulation of UA given in (2), UA cares about the number of offending subordinate categories (i.e. the number of α), but CRISPEDGE constraints do not. Supporting evidence for this aspect of UA is found in Gã (Padgett 1995):

(14)	a. **ŋ͡mk͡p**okua	'nipple'	**ŋ͡mk͡p**ai	'libation'
	b. **ŋ-g͡b**ekɛ	'my child'	**ŋ-k͡p**ai	'my cheeks'

As seen in (14a), morpheme-internally, nasal place assimilation to a complex segment is total. On the other hand, as in (14b), across a morpheme boundary assimilation is partial: only the dorsal node spreads. This partial assimilation can be captured as the effort to minimize of the number of elements linked across morphemes, i.e. the effect of UA(C-Place, Morph) ranked above the trigger constraint for assimilation. Let this trigger constraint be SPREAD(Place), which requires that adjacent consonants share every place node (Padgett 2002ab). The ranking UA(C-Place, Morph) » SPREAD(Place) alone predicts that no assimilation takes place cross-morphemically, but given that placeless nasals are marked, HAVE-PLACE(NAS) can be ranked above UA(C-Place, Morph), requiring that at least one place feature spread. [6] Finally, I follow Padget's feature class theory (1995, 2002b) and assume that UA(C-Place, Morph) is violated for each C-Place linked across morphemes; hence spreading two C-Places is worse than spreading only one C-Place. The following tableau summarizes the story: [7]

(15) Assimilation only partial across a morpheme boundary

/N#kpai/	HAVEPLACE	UA(C-Pl, Morph)	SPREAD(Place)
a. N kpai L/D	*!		**
b. ☞ ŋ kpai D/L		*	*
c. ŋm kpai D L		*/*!	

Crucially, CRISPEDGE would treat (b) and (c) both as noncrisp, and so cannot distinguish them in terms of markedness. In summary, the data from Gã supports UA's claim that the markedness of multiply-linked structures varies as a function of the number of offending subordinate categories.

5.2. Faithfulness Constraints: *SPREAD

The second alternative considered here is the faithfulness constraint *SPREAD. UA constraints prohibit spreading from a particular domain, so one might wonder whether they could be replaced by a set of faithfulness constraints that prohibit spreading from a particular domain, say, *SPREAD(α, β): "don't spread α from the domain β" (see McCarthy 2000). However, there is evidence that markedness constraints are needed to rule out multiply-linked structures. For example, UA(V-Place, μ) expresses the markedness of a long vowel and so, when undominated, it produces a language that has no long vowels. Its counterpart *SPREAD(V-Place, μ), which prohibits spreading of a V-Place which is already linked to a mora, might prohibit the creation of a long vowel, but it does not say anything about underlying long vowels; this then fails to characterize a language without long vowels. More generally, given Richness of the Base, the lack of some structures must be accounted for by markedness constraints rather than by faithfulness constraints. Thus, though *SPREAD and UA partially overlap in their functions, UA constraints are independently required.

---

[6] See Padgett (2002b) for a hypothesis about why the dorsal node, rather than the labial node, spreads. See also Ohala and Lorentz (1977).

[7] If SPREAD(Place) dominates IDENT(Place), the underlying place specification of the nasal morpheme does not matter.

6. Concluding Remarks

At a descriptive level, this paper has shown that when an element is multiply linked across a higher category, its markedness is determined on the basis of (i) what is multiply linked (§3.1) (ii) what the superordinate category is (§3.2) and (iii) the number of multiply-linked elements (§5.1). I proposed the UNIQUE AFFILIATION constraint schema to account for this observation. This theory captures the general pattern of spreading blockage, and hence contributes to the investigation of internal structure of CON, which, in this view, is not merely a list of constraints (de Lacy 2002; Gouskova 2003; McCarthy 2002: 17-22, in press; Smith 2002; Smolensky 1995 among others).

As a final remark, it may have been noticed that for all the UA constraints proposed in this paper, α is smaller than a syllable. In fact, whether a syllable can belong to more than one higher unit is a controversial matter (see Hyde 2002 for recent discussion), and for prosodic categories higher than syllables, it is doubtful that they can ever multiply link to higher categories. This restriction presumably derives from a substantive condition independent of the UA schema: the larger an element is, the more difficult it gets to repeat it. It remains to be seen whether some other substantive restrictions interact with UA constraint schema.

References

Baker, B. 1998. Edge-Crispness: Segment to Mora Isomorphism. *Proceedings of WCCFL* 16: 33-47.

Beckman, J. 1998. Positional Faithfulness. Doctoral dissertation, UMass, Amherst.

Chiri, M. 1952. *Ainu Gohoo Gaisetsu*. Heibonsha.

Cohn, A. and J. McCarthy. 1994. Alignment and Parallelism in Indonesian Phonology. Ms. Cornell University and UMass, Amherst.

Davis, S. and I. Ueda. 2003. Mora Augmentation Processes in Japanese. *Journal of Japanese Linguistics* 18: 1-23.

de Lacy, P. 2002. Formal Expression of Markedness. Doctoral dissertation, UMass, Amherst.

Goldsmith, J. 1984. Meeussen's Rule. *Language Sound Structure*, eds. M. Aronoff and R. Oehrle, 245-259. Cambridge: MIT Press.

Goldsmith, J. 1990. *Autosegmental and Metrical Phonology*. Oxford: Blackwell.

Gouskova, M. 2003. Relational Hierarchies in OT. Ms., Rutgers University.

Hyde, B. 2002. A Restrictive Theory of Metrical Stress. *Phonology* 19: 313-359.

Ito, J. 1986. Syllable Theory in Prosodic Phonology. Doctoral dissertation, UMass, Amherst.

Ito, J. and A. Mester. 1994. Reflection on CodaCond and Alignment. *Phonology at Santa Cruz* 3: 22-46.

Ito, J. and A. Mester. 1996. Stem and Word in Sino-Japanese. *Phonological Structure and Language Processing: Cross-linguistic Studies*, eds. T. Otake and A. Cutler, 13-44. New York: Mouton de Gruyter.

Ito, J. and A. Mester. 1999. Realignment. *Prosody-Morphology Interface*, eds. R. Kager, H van der Hulst and W. Zonnenveld, 188-217. Cambridge: Cambridge University Press.

Kawahara, S. 2001. Reduplication not Driven by a RED Morpheme. Talk given at Phonological Association in Kansai (PAIK) at Kobe University. December 14th.

Kawahara, S. 2003. On a Certain Type of Hiatus Resolution in Japanese. *Phonological Studies* 6: 11-20.

Keer, E. 1999. Geminates, the OCP and the Nature of CON. Doctoral dissertation, Rutgers University.

Kurisu, K. 2000. Richness of the Base and Root Fusion in Sino-Japanese. *Journal of East Asian Linguistics* 9: 147-185.

McCarthy, J. 1980. The Representation of Consonant Length in Hebrew. *Linguistic Inquiry* 12: 321-327.

McCarthy, J. 2000. Faithfulness and Prosodic Circumscription. *Optimality Theory: Phonology, Syntax and Acquisition*, eds. J. Dekkers, F. van der Leeuw, and J. van de Weijer, 151–189. Oxford: Oxford University Press.

McCarthy, J. 2002. *A Thematic Guide to Optimality Theory*. Cambridge: Cambridge University Press.

McCarthy, J. in press. OT Constraints are Categorical. To appear in *Phonology* 20.

McCarthy, J. and A. Prince. 1993. Generalized Alignment. *Yearbook of Morphology*. 79-153.

Noske, M. 1997. Feature Spreading as Dealignment: The Distribution of [ç] and [x] in German. *Phonology* 14: 221-234.

Nespor, M and I. Vogel. 1986. *Prosodic Phonology*. Dordrecht: Foris Publications.

Ohala, J and J. Lorentz. 1977. The Story of [w]: An Exercise in the Phonetic Explanation for Sound Patterns. *Proceedings of BLS* 3: 577-599.

Padgett, J. 1995. Partial Class Behavior and Nasal Place Assimilation. *Proceedings of the Arizona Phonology Conference*.

Padgett, J. 2002a. Russian Voicing Assimilation, Final Devoicing, and the Problem of [v]. Ms., University of California, Santa Cruz.

Padgett, J. 2002b. Feature Classes in Phonology. *Language* 78: 81-110.

Pater, J. 2001. Austronesian Nasal Substitution Revisited: What's Wrong with *NC (and What's Not). *Segmental Phonology in Optimality Theory*, ed. L. Lombardi, 159-182. Cambridge: Cambridge University Press.

Pater, J. 2003. Balantak Metathesis and Theories of Possible Repair in Optimality Theory. Ms., UMass, Amherst.

Poser, W. 1984. The Phonetics and Phonology of Tone and Intonation in Japanese. Doctoral dissertation, MIT.

Schein, B. 1981. Spirantization in Tigrinya. *Theoretical Issues in the Grammar of Semitic Languages*: *MIT Working Papers in Linguistics* 3: 32-43.

Smith, J. 2002. Toward a Compositional Treatment of Positional Constraints: The Case of Positional Augmentation. *Papers in Optimality Theory II: University of Massachusetts Occasional Papers in Linguistics* 26: 337-370.

Smolensky, P. 1995. On the Internal Structure of the Constraint Component CON of UG. Talk given at UCLA. April 7th, 1995.

Tateishi, K. 1990. Phonology of Sino-Japanese Morphemes. *University of Massachusetts Occasional Papers in Linguistics* 13: 209-235.

Vance, T. 1987. *An Introduction to Japanese Phonology*. New York: State University of New York Press.

Walker, R. 1998. Nasalization, Neutral Segments and Opacity Effects. Doctoral dissertation, University of California, Santa Cruz.

Walker, R. 2001. Round Licensing, Harmony, and Bisyllabic Triggers in Altaic. *Natural Language and Linguistic Theory* 19: 827-878.