Ringen, Catherine, and Orvokki Heinämäki. 1999. Variation in Finnish vowel harmony. *Natural Language and Linguistic Theory* 17: 303–337.
Rose, Sharon, and Rachel Walker. 2004. A typology of consonant agreement as correspondence. *Language* 80:475–531.
Sebeok, Thomas A., and Frances J. Ingemann. 1961. *Eastern Cheremis manual*. Bloomington: Indiana University Press.
Steriade, Donca. 1987. Redundant values. In *Papers from the 23rd Regional Meeting of the Chicago Linguistic Society, Part 2*, ed. by Anna Bosch, Barbara Need, and Eric Schiller, 339–362. Chicago: University of Chicago, Chicago Linguistic Society.
Steriade, Donca. 2009. The phonology of perceptibility effects: The p-map and its consequences for constraint organization. In *The nature of the word: Studies in honor of Paul Kiparsky*, ed. by Kristin Hanson and Sharon Inkelas, 151–179. Cambridge, MA: MIT Press.
Walker, Rachel. 1998. Nasalization, neutral segments, and opacity effects. Doctoral dissertation, University of California, Santa Cruz.
Walker, Rachel. 2005. Weak triggers in vowel harmony. *Natural Language and Linguistic Theory* 23:917–989.
Walker, Rachel. 2009. Similarity-sensitive blocking and transparency in Menomini. Paper presented at the annual meeting of the Linguistic Society of America, San Francisco, CA, 9 January.
Walker, Rachel. 2010. Nonmyopic harmony and the nature of derivations. *Linguistic Inquiry* 41:169–179.
Wilson, Colin. 2004. Analyzing unbounded spreading with constraints: Marks, targets, and derivations. Ms., UCLA, Los Angeles, CA.
Wilson, Colin. 2006. Unbounded spreading is myopic. Paper presented at the workshop ''Current Perspectives on Phonology.'' Indiana University, Bloomington, 23 June.

FELL-SWOOP ONSET DELETION

Kazutaka Kurisu
Kobe College

1 Introduction

Harmonic Serialism (HS; McCarthy 2007b, 2008a,b, 2009) and Optimality Theory with Candidate Chains (OT-CC; McCarthy 2007a,c) make assumptions about production of candidates by GEN significantly different from classic OT (Prince and Smolensky 2004). There are important differences in the ability of GEN to supply candidates recursively and the degree of ''freedom of analysis'' given to GEN.

On the one hand, classic OT is a parallel model and GEN yields output candidates only once. As a corollary, classic OT necessarily

For constructive comments on earlier versions of this squib, I thank Shigeto Kawahara and two anonymous reviewers. All remaining errors and oversights are mine.

allows GEN to generate candidates entirely different from a given input. On the other hand, HS and OT-CC are serial theories and endow GEN with the ability to generate candidates recursively. But they impose a restriction on GEN: gradualness. It dictates that each step may contain at most one phonological change.

Repetitive candidate production and gradualness are interlocking notions in HS and OT-CC. In HS, GEN submits the fully faithful form and forms with minimal deviation from the input. EVAL chooses the most harmonic candidate as the output on the first pass. If it selects the faithful form, the derivation converges and no further step is taken. If it selects an unfaithful form, that form serves as the input on the next pass. The same procedure continues to be applied until the derivation converges. In OT-CC, each candidate forms a chain that starts with the form faithful to the input. The *n*th chain member can deviate only minimally from member $n-1$ in the same chain and must perform better than $n-1$ with respect to a language-specific ranking. This harmonic improvement is ensured with a loop of GEN and EVAL. GEN extends chains in consultation with EVAL, so complex phonological changes are results of iterative interaction between GEN and EVAL. In the serial theories, phonological transformation proceeds gradually toward better harmony, unlike in classic OT where candidates with varying degrees of faithfulness violation are produced at once.

Because of their different assumptions about GEN, HS and OT-CC make predictions different from those of classic OT. Suppose that C_1C_2 is a consonant cluster and that C_1 and C_2 are a coda and an onset, respectively. Moreover, suppose that C_1 is an ill-formed coda. Under the assumption that place features are subsegmental entities, McCarthy (2007c, 2008a) argues that the derivational theories correctly predict that C_1 is deleted crosslinguistically when C_1 and C_2 are tautomorphemic.

This squib discusses a case where C_2 is deleted. Examples come from verb suffix morphology in Japanese. A straightforward analysis is possible in classic OT. Given that place features are subsegmental entities rather than attributes, gradual harmonic ascent is impossible. This impossibility impedes an analysis of onset deletion couched in current HS and OT-CC. With evidence for place features as entities, I draw the conclusion that consonant deletion occurs in a fell-swoop fashion.

This squib is mapped out as follows. In section 2, I present relevant data from the verb suffix morphology of Japanese. Japanese is taken as a representative case, but similar onset deletion is widely attested across languages. In section 3, I show that the data presented in section 2 receive a straightforward account in classic OT. In section 4, I show that the same data cannot be analyzed in terms of stepwise deletion. In section 5, I discuss two alternative HS and OT-CC accounts that do not rest on onset deletion. They call for an unmotivated markedness constraint or unmotivated underlying representations of verb suffixes. One of the alternatives even makes incorrect empirical predictions. In section 6, I offer conclusions.

2 Onset Deletion in Japanese Verb Suffixation

In Japanese verb suffix morphology, an onset consonant is subject to deletion when faithful parsing of a coda-onset sequence would violate the Japanese coda condition.[1] Japanese prohibits coda consonants with their own place specification. Either a coda consonant must be placeless, or its place feature must be licensed by the immediately following onset (Ito 1986, 1989, Ito and Mester 1993). Examples of onset deletion are given in (1).

(1)	/tob/ 'fly'	/ne/ 'sleep'
a. Infinitive /-ru/	tob-u	ne-ru
b. Subjunctive /-reba/	tob-eba	ne-reba
c. Causative /-sase/	tob-ase	ne-sase
d. Volitional /-joo/	tob-oo	ne-joo

Japanese verb roots end in either a consonant or vowel. The descriptive generalization illustrated in (1) is straightforward. The four suffixes surface without an initial consonant after a consonant-final root. However, vowel-final roots take allomorphs beginning with a consonant. All surface forms avoid a consonant cluster or hiatus at a morphological juncture.

Given that suffix-initial consonants have three variants, [r, s, j], and that the quality of the initial consonant is phonologically unpredictable, the lexical representations of the suffixes in (1) must begin with a consonant (McCawley 1968, Vance 1987). No analysis appealing to epenthesis of a suffix-initial consonant is possible. In the subsequent discussion, it is crucial that a suffix-initial consonant is susceptible to deletion after a consonant-final verb root.

Similar deletion of a suffix-initial consonant is observed in a number of languages. In Korean, the accusative is marked with [-ɾɨl] after a vowel-final noun (e.g., [pori-ɾɨl] 'barley-ACCUSATIVE') but with [-ɨl] after a consonant-final noun (e.g., [param-ɨl] 'wind-ACCUSATIVE'). Furthermore, the Korean topic marker alternates between [-nɨn] and [-ɨn] (Martin 1992, Odden 1993), as exemplified by the pair [pori-nɨn] 'barley-TOPIC' and [param-ɨn] 'wind-TOPIC'. In Turkish, the third person singular possessive suffix alternates between [-si/sɪ] and [-i/ɪ], depending on whether the preceding noun is vowel-final or consonant-final (e.g., [fire-si] 'its attrition' and [bedel-i] 'its price') (Lees 1961,

[1] When past /-ta/ and gerundive /-te/ are attached to consonant-final verb roots, a variety of morpheme-particular phonological alternations occur, depending on the quality of the root-final consonant. The whole pattern of alternations is notoriously complicated. It is orthogonal to the issue of onset deletion investigated in this squib. For examples and descriptive generalizations, see McCawley 1968, Vance 1987, and Tsujimura 2007.

Lewis 1967, Carstairs 1987, Csató and Johanson 1998, Embick 2010). The vowel quality of this suffix is controlled by vowel harmony. Finally, Tigrinya plurals exhibit the allomorphemic alternation [-tat] ≈[-at], again depending on whether the preceding stem ends in a vowel or a consonant. Tigrinya has analogous allomorphemic alternations in the first and third person possessive suffixes too (Wolf 2008:209–210). All these crosslinguistic data suggest that onset deletion is not a peculiar characteristic of Japanese.

3 Onset Deletion in Classic OT

The examples presented in (1) are straightforwardly analyzed in classic OT. Because suffixal material undergoes deletion, let us assume $\text{MAX}_{\text{ROOT}} \gg \text{MAX}_{\text{AFFIX}}$ (McCarthy and Prince 1995). Wilson (2001) attempts to provide a principled account of crosslinguistically pervasive coda deletion of a tautomorphemic intervocalic consonant cluster. In order to elucidate onset deletion at root-suffix junctures, he also adopts the $\text{MAX}_{\text{ROOT}} \gg \text{MAX}_{\text{AFFIX}}$ metaranking. Assuming descriptive CODA-COND as an undominated constraint that punishes non-place-linked coda consonants, onset deletion in (1) is analyzed straightforwardly, as shown in (2). In classic OT, GEN emits eventual output candidates all at the same time, so fell-swoop consonant deletion is admitted.

(2)

	/tob-ru/	CODA-COND	MAX_{ROOT}	$\text{MAX}_{\text{AFFIX}}$
a.	tob.ru	*!		
b.	to.ru		*!	
c. ☞	to.bu			*

The analysis presented in (2) assumes that there is a syllable boundary between two consonants in VCCV. Japanese tolerates neither complex onsets nor complex codas. Therefore, [V.CCV] and [VCC.V] are impossible syllabifications in the language in general. [VC.CV] is the only available syllabification in Japanese.

4 Onset Deletion in HS and OT-CC

In this section, I demonstrate that the examples in (1) are intractable to current HS and OT-CC. Gradual harmonic improvement is not possible when an onset is deleted. More specifically, I demonstrate that an intermediate stage required for onset deletion decreases phonological harmony such that gradual harmonic ascent is impossible.

In explaining an asymmetry of onsets and codas, McCarthy (2007c, 2008a) argues that deletion of a consonant occurs via debuccalization (i.e., /C/ → ℂ → [Ø], where ℂ stands for a debuccalized consonant). This has to do with the assumption that CON contains MAX(Place), a constraint against debuccalization. MAX(Place) in CON is justified by two related observations.

First, debuccalization involves an unfaithful input-output mapping, and this unfaithful mapping should violate some kind of faithfulness constraint. Given the formulation of IDENT constraints provided by McCarthy and Prince (1995), IDENT(Place) is not the pertinent constraint since debuccalized segments have no corresponding place specification (Lombardi 2001). IDENT(Place) is satisfied vacuously in debuccalization. In current theories of faithfulness, MAX(Place) is the only constraint breached by debuccalization.

Second, MAX(Place) is necessary to explain crosslinguistic variation of repair strategies of coda consonants with an illicit place. Were MAX(Place) not a member of CON, we would expect debuccalization to be the sole repair strategy when the debuccalized counterpart is a possible segment in a given language (i.e., a language with low-ranked HAVE-PLACE). This prediction is false. Japanese prohibits non-place-linked coda consonants, but Japanese has placeless coda nasals. Nevertheless, coda nasals do not always undergo debuccalization in Japanese loanword adaptation. (3a) reveals that coronal nasals are replaced by placeless [N]; but, as (3b) shows, vowel epenthesis salvages offending bilabial nasals. We would expect debuccalization in (3b) too if debuccalization did not incur any faithfulness violation. The examples in (3b) suffice to confirm that debuccalization does not avoid violating faithfulness.

(3)	*English word*	*Adapted form*	*Gloss*
a.	toʊn	tooN	tone
	pɪn	piN	pin
b.	zum	zuu.mu	zoom
	hæm	ha.mu	ham

In the standard assumption of gradualness currently available, one gradual phonological change may incur only one violation of one faithfulness constraint (McCarthy 2007c, 2008a). In practice, what counts as a gradual change is contingent on the faithfulness constraints in CON. Given ample justification for MAX(Place), consonant deletion must occur via debuccalization. Fell-swoop consonant deletion incurs simultaneous violation of MAX(Seg) and MAX(Place), disobeying gradualness.

With this background in mind, let us consider onset deletion. Taking /tob-ru/ as an example, [tob.ɾu], where [ɾ] stands for a placeless consonant, must be the initial output in HS or the second chain member in OT-CC. GEN does not generate fell-swoop [to.bu]. The key observation is that [tob.ɾu] is never more harmonic than fully faithful [tob.ru]. As demonstrated in (4), the two compared candidates violate CODA-COND equally. No markedness constraint militates against word-medial onset [r], but [tob.ɾu] additionally violates HAVE-PLACE and MAX(Place). The irrelevance of their ranking with respect to other constraints is indicated by a boldface line in (4). [tob.ɾu] is harmonically bounded by [tob.ru]. In HS, [tob.ru] converges on the first pass, so the derivation terminates. In OT-CC, ⟨tob-ru, tob.ɾu⟩ is

not a well-formed chain, meaning that there is no legitimate chain that reaches [to.bu].

(4)

/tob-ru/	CODA-COND	MAX_{ROOT}	MAX_{AFFIX}	HAVE-PLACE	MAX(PLACE)
a. ☞ tob.ru	*				
b. tob.ɾu	*			*!	*

The problem with stepwise deletion of a suffix-initial consonant is clear. Intermediate debuccalization does not improve harmony, but fell-swoop deletion is blocked by gradualness. In onset deletion, the notions of gradualness and steady harmonic ascent are antagonistic to each other. Onset deletion favors fell-swoop generation of ultimate output candidates as assumed in classic OT.

The failure of the gradual approach to onset deletion is systematic in that onset deletion is not an idiosyncratic property of Japanese. As mentioned in section 2, onset deletion across a morpheme boundary is frequently found across languages.

If we adhere to the definition of gradualness proposed by McCarthy (2007c, 2008a), relinquishing MAX(Place) is the only possibility that enables fell-swoop onset deletion. This move is neither desirable nor possible. First, eliminating MAX(Place) is undesirable since it would cause the merit of serialism discussed by McCarthy (2007c, 2008a) (i.e., serialism explains the fact that a coda consonant is deleted across languages when a given tautomorphemic coda-onset cluster is impermissible) to evaporate. Second, MAX(Place) cannot be abandoned since its necessity is firmly established, as discussed above.

Stepwise onset deletion is problematic unless the onset itself is ill-formed, regardless of whether the consonant belongs to a root or to an affix. At stake is the finding that debuccalization of an onset consonant (not of an affixal consonant) deteriorates local harmony. All cases of onset deletion pose a challenge to the combination of gradualness and steady harmonic ascent, whether the onset is part of a root or of an affix, as long as consonants are vulnerable to debuccalization before deletion.

In discussing crosslinguistic C_1 deletion in /VC_1C_2 V/, McCarthy (2007c, 2008a) cites Wilson's (2001) observation that the tautomorphemic coda/onset asymmetry does not hold at root-suffix demarcations. Also, McCarthy cites Jun's (1995) observation that place assimilation can be progressive at root-suffix boundaries. In order to accommodate Jun's observation in HS, McCarthy argues for the necessity of affix-specific markedness constraints. On the other hand, there is no convincing HS and OT-CC analysis of onset deletion appealing to affix-particular markedness constraints. In order to explain (1), affix-specific segmental markedness constraints *[r, s, j] will be required. However, they are implausible for two reasons. First, the three consonants do appear after a vowel-final verb root. Second, these consonants

appear in Japanese suffixes elsewhere. For example, the causative suffix has medial [s], as (1c) shows. These facts suggest that recourse to the affixal status of a deleted onset consonant is not on the right track.

5 Against Alternative Analyses

In this section, let us consider two alternative analyses framed in HS and OT-CC. In the analysis in section 4, it was assumed that onset deletion is a response to a CODA-COND violation. The difficulty with the gradual approach discussed in section 4 is closely associated with this assumption. Discussed below are two conceivable analyses with no appeal to onset deletion: a cluster constraint analysis (section 5.1) and an allomorph selection analysis (section 5.2).

5.1 Cluster Constraint Analysis

In the standard understanding of phonology, outputs contain syllable structure, but phonotactic constraints do not necessarily refer to syllable structure. One may therefore propose an analysis of consonant deletion without referring to the Japanese coda condition.

Suppose that there is a context-free markedness constraint against a cluster of consonants with different place specifications, as depicted in (5). Essentially, this is the cluster condition in the sense of Yip 1991:62. It militates against disagreement of place features. Therefore, the cluster constraint is satisfied if the two consonants are homorganic or if at least one of them lacks a place feature. In the latter case, place disagreement does not arise although two consonants do not have the same place specification. The cluster constraint is vacuously satisfied. (For the sake of perspicuity, I adopt $*C_\alpha C_\beta$ as shorthand for the constraint in (5).)

(5) * C C
| |
[Place]$_\alpha$ [Place]$_\beta$

The constraint against distinct place specifications is essential in order to accommodate total and partial geminates, where one place feature is shared by two skeletal slots. Indeed, Japanese tolerates partial geminates such as [mb] and [nd]. Such legitimate partial geminates would also be erroneously ruled out unless α and β are conditioned to be heterorganic.

$*C_\alpha C_\beta$ should outrank HAVE-PLACE and MAX(Place). In addition, let us assume $\text{MAX(Place)}_{\text{ROOT}} \gg \text{MAX(Place)}_{\text{AFFIX}}$. As demonstrated in (6), where both [b̥] and [ɾ̥] stand for debuccalized consonants, debuccalization improves phonological harmony on the first pass in HS. This means that [tobɾ̥u] is a valid second chain member in OT-CC. This initial step of /r/-debuccalization is successful in both HS and OT-CC.

(6)

	/tob-ru/	*CαCβ	HAVE-PLACE	MAX(Place)$_{ROOT}$	MAX(Place)$_{AFFIX}$
a.	tobru	*!			
b.	tobru		*	*!	
c. ☞	tobru		*		*

In HS, [tobru] serves as the input on the second pass. As demonstrated in (7), elision of placeless [ɾ] further improves harmony. No more harmonic ascent is achieved relative to the given constraint hierarchy, so [tobu] converges on the third pass. In OT-CC, ⟨tob-ru, tobru, tobu⟩ is chosen as the optimal chain. So the cluster constraint analysis might seem successful.

(7)

	/tobru/	HAVE-PLACE	MAX$_{ROOT}$	MAX$_{AFFIX}$
a.	tobru	*!		
b. ☞	tobu			*

However, this syllable-free analysis of consonant deletion is less than satisfactory for Japanese-internal and crosslinguistic reasons. The cluster constraint permits homorganic consonant clusters, so no deletion of a suffix-initial consonant should take place in Japanese when a verb root ends in an alveolar. This prediction is false, as exemplified in (8).[2] This observation suggests that homorganicity is irrelevant here. Rather, the illicitness of non-place-linked codas is the problem. Thus, the cluster constraint approach, insensitive to syllable structure, is unsuccessful after all.

(8)

	/kat/ 'win'	/ʃin/ 'die'	/tor/ 'take'
a. Infinitive /-ru/	kats-u	ʃin-u	tor-u
b. Subjunctive /-reba/	kat-eba	ʃin-eba	tor-eba
c. Causative /-sase/	kat-ase	ʃin-ase	tor-ase
d. Volitional /-joo/	kat-oo	ʃin-oo	tor-oo

In addition, there are crosslinguistic problems with the use of the cluster constraint in analyses of onset deletion. Various languages exhibit onset deletion at a root-suffix juncture, although not all languages have the same coda condition as Japanese. For example, Korean tolerates [p, t, k, m, n, ŋ, l] in codas. Furthermore, a coda-onset sequence may consist of labial and velar consonants. Hence, the [-ril]≈[-il] and [-nin]≈[-in] alternations in Korean discussed in section 2 occur in order to optimize syllable structure rather than to avoid a consonant cluster that mixes different place features. This consideration illuminates two problems with the cluster constraint approach.

[2] In the native stratum, /t/ turns into [ts] before [u].

First, it is not a general solution to the cases in section 2 and many others. Second, it misses the basic observation that such morphophonological alternations take place for syllable-related reasons.

Apart from the discussion above, the invalidity of the cluster constraint is pointed out in previous literature. The cluster constraint does not mention what syllable position is occupied by each member of the cluster. Were $*C_{\alpha}C_{\beta}$ really a member of CON, there should be a large number of languages in which homorganic consonants make up a complex onset or complex coda while heterorganic consonants do not. This tendency is not sufficiently robust. Jun (1995:22) argues that none of the languages discussed by Yip (1991) (i.e., English, Menominee, Diola Fogny, Attic Greek, Japanese, and Finnish) possess a variety of basic sequential patterns sanctioned by the cluster constraint. This would be surprising if the cluster constraint were an authentic phonological constraint, even though constraints are by hypothesis violable in OT. Furthermore, as an anonymous reviewer points out, heterorganic consonant clusters are sometimes required. For example, English prohibits a labial consonant before [w].

In Yip's (1991) proposal, the cluster constraint is crucially accompanied by coronal underspecification. Equipped with coronal underspecification, Yip declares that the cluster constraint holds of English. But a variety of evidence shows the need for underlying coronal specification in English phonology (see McCarthy and Taub 1992:364–365 for a summary). Additional criticisms of the cluster constraint can be found in Jun 1995 and Scholz 2003.

An anonymous reviewer points out that the cluster constraint in (5) is a notational variant of AGREE(Place). Whether the two constraints are notational variants or not depends on how they are formulated. However, note that analyses appealing to AGREE(Place) are not promising on independent grounds. McCarthy (2011) provides two typological reasons for supposing AGREE not to be the driving force of harmony phenomena, demonstrating that AGREE both undergenerates existing languages and overgenerates the existence of unattested languages.

5.2 Allomorph Selection Analysis

As another alternative in HS and OT-CC, let us consider an account appealing to allomorph selection (Mascaró 1996, Tranel 1996, 1998, Ito and Mester 2004, 2006, Yip 2004), as suggested by McCarthy (2007c). By hypothesis, all allomorphs are listed in the lexical representation, and the choice of a particular allomorph is a consequence of output optimization relative to a given constraint ranking. In addition, no faithfulness constraint is violated no matter which allomorph is chosen. Given this idea, both /-ru/ and /-u/ are supplied in the infinitive, for instance. No faithfulness violation is incurred, so [to.bu] is correctly generated, as demonstrated in (9). This analysis does not invoke consonant deletion, so debuccalization is not involved either.

(9)

/tob-{ru, u}/	CODA-COND	MAX_{ROOT}	MAX_{AFFIX}
a. tob.ru	*!		
b. ☞ to.bu			

But this alternative approach leaves a mystery. Namely, it is unclear in (1) why each suffix has two allomorphs that are phonetically very similar. Two allomorphs of each suffix are identical except for the presence or absence of an initial consonant. If the lexical representation of a given morpheme consisted of arbitrary allomorphs, we would naturally expect dissimilar sets of allomorphs rather than phonetically similar ones (see Kiparsky 1996 and Paster 2006 for relevant discussion).

Quite dissimilar allomorphs are by no means rare across languages. One example is the third person masculine singular pronominal enclitic in Moroccan Arabic. [-u] is suffixed to a consonant-final stem whereas [-h] appears after a vowel-final stem. [-u] and [-h] are considerably dissimilar, so neither would be derived from the other by deploying natural phonological processes (Harrell 1962, Mascaró 1996, Paster 2006, Wolf 2008). In situations like this where no adequate phonological analysis is feasible for deriving phonetically distant allomorphs, allomorph listing is an attractive analytical possibility especially if, as Wilson (2003) argues, human beings are unable to learn unnatural phonological patterns.

In cases where natural phonological processes can derive phonetically similar allomorphs, however, allomorph listing is hardly justifiable. In (1), the phonological resemblance between the suffixal allomorphs in each pair strongly indicates that the two share a common underlying form. The Japanese coda condition is independently necessary, so consonant deletion is sufficiently motivated. The similarity of allomorphs is not incidental in the proposed phonological analysis with a consonant-initial form as the unique underlying form. By contrast, the similarity of the allomorphs would be a mere coincidence in the allomorph selection analysis. It is more restrictive to construe the two allomorphs of each of the four suffixes in (1) as two complementary phonological realizations of a single underlying form.[3]

[3] Some recent studies argue for a subcategorization approach to allomorphs of affixes, based primarily on the observation that not all allomorphemic alternations are adequately explained in phonological or phonetic terms (Paster 2006, Bye 2007, Yu 2007). By contrast, Wolf (2008) discusses Kɔnni as one of the languages in which exclusive subcategorization misses regular phonotactic restrictions that hold across the board, both tautomorphemically and heteromorphemically. With evidence for and against the phonological and subcategorization approaches to affixation, it is sensible to countenance a hybrid model that reconciles phonological and subcategorization approaches even though no satisfactory proposal has been made so far.

6 Conclusion

When a coda-onset consonant cluster appears, onset deletion may take place, at least across a morpheme boundary. Gradualness and constant harmonic improvement are mutually antagonistic in onset deletion. More specifically, debuccalization of an onset consonant decreases phonological harmony, so onset deletion should occur in a fell-swoop fashion, whether the onset is affiliated with a root or an affix. Two analyses without onset deletion are conceivable, appealing either to a cluster constraint or to allomorph selection. Neither is satisfactory. The former makes wrong predictions, and the cluster constraint itself is dubious. The latter requires unmotivated underlying representations of verb suffixes.

Given MAX(Place) in CON and gradualness in the sense of McCarthy (2007c, 2008a), gradual segmental deletion is an inevitable consequence in HS and OT-CC. Given good evidence for MAX(Place) and the definition of gradualness currently available, I conclude that onset deletion favors global optimality in classic OT. However, stepwise consonant deletion is not a central property of HS and OT-CC per se. There might be some definition of gradualness that accommodates fell-swoop segmental deletion as a single gradual step. If no such definition of gradualness proves to be available, however, onset deletion presents an empirical challenge not only to the idea of gradual segmental deletion but also more broadly to HS and OT-CC.

References

Bye, Patrik. 2007. Allomorphy – selection, not optimization. In *Freedom of analysis*, ed. by Sylvia Blaho, Patrik Bye, and Martin Krämer, 63–91. Berlin: Mouton de Gruyter.

Carstairs, Andrew. 1987. *Allomorphy in inflection*. London: Croom Helm.

Csató, Éva, and Lars Johanson. 1998. Turkish. In *The Turkic languages*, ed. by Lars Johanson and Éva Csató, 203–235. London: Routledge.

Embick, David. 2010. *Localism versus globalism in morphology and phonology*. Cambridge, MA: MIT Press.

Harrell, Richard. 1962. *A short reference grammar of Moroccan Arabic*. Washington, DC: Georgetown University Press.

Ito [Itô], Junko. 1986. Syllable theory in prosodic phonology. Doctoral dissertation, University of Massachusetts, Amherst.

Ito [Itô], Junko. 1989. A prosodic theory of epenthesis. *Natural Language and Linguistic Theory* 7:217–259.

Ito [Itô], Junko, and Armin Mester. 1993. Licensed segments and safe paths. *Canadian Journal of Linguistics* 38:197–213.

Ito, Junko, and Armin Mester. 2004. Morphological contrast and merger: *Ranuki* in Japanese. *Journal of Japanese Linguistics* 20:1–18.

Ito, Junko, and Armin Mester. 2006. Indulgentia parentum filiorum pernicies: Lexical allomorphy in Latin and Japanese. In *Won-*

dering at the natural fecundity of things: Essays in honor of Alan Prince, ed. by Eric Baković, Junko Ito, and John McCarthy, 185–194. Santa Cruz: University of California, Santa Cruz, Linguistics Research Center.

Jun, Jongho. 1995. Perceptual and articulatory factors in place assimilation: An optimality theoretic approach. Doctoral dissertation, UCLA, Los Angeles, CA.

Kiparsky, Paul. 1996. Allomorphy or morphophonology? In *Trubetzkoy's orphan: Proceedings of the Montréal Roundtable on ''Morphonology: Contemporary Responses,''* ed. by Rajendra Singh, 13–31. Amsterdam: John Benjamins.

Lees, Robert. 1961. *The phonology of Modern Standard Turkish*. Bloomington: Indiana University.

Lewis, Geoffrey. 1967. *Turkish grammar*. Oxford: Oxford University Press.

Lombardi, Linda. 2001. Why place and voice are different: Constraint-specific alternations in Optimality Theory. In *Segmental phonology in Optimality Theory: Constraints and representations*, ed. by Linda Lombardi, 13–45. Cambridge: Cambridge University Press.

Martin, Samuel. 1992. *A reference grammar of Korean*. Tokyo: Tuttle.

Mascaró, Joan. 1996. External allomorphy as emergence of the unmarked. In *Current trends in linguistics: Models and methods*, ed. by Jacques Durand and Bernard Laks, 473–483. Salford, Manchester: University of Salford, European Studies Research Institute.

McCarthy, John J. 2007a. *Hidden generalizations: Phonological opacity in Optimality Theory*. London: Equinox.

McCarthy, John J. 2007b. Restraint of analysis. In *Freedom of analysis*, ed. by Sylvia Blaho, Patrik Bye, and Martin Krämer, 203–231. Berlin: Mouton de Gruyter.

McCarthy, John J. 2007c. Slouching towards optimality: Coda reduction in OT-CC. *Phonological Studies* 10:89–104.

McCarthy, John J. 2008a. The gradual path to cluster simplification. *Phonology* 25:271–319.

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

McCarthy, John. 2009. Studying GEN. *Journal of the Phonetic Society of Japan* 13:3–12.

McCarthy, John J. 2011. Autosegmental spreading in Optimality Theory. In *Tones and features: Phonetic and phonological perspectives*, ed. by John Goldsmith, Elizabeth Hume, and Leo Wetzels, 195–222. Berlin: Mouton de Gruyter.

McCarthy, John J., and Alan Prince. 1995. Faithfulness and reduplicative identity. In *Papers in Optimality Theory*, ed. by Jill N. Beckman, Laura Walsh Dickey, and Suzanne Urbanczyk, 249–384. University of Massachusetts Occasional Papers in Linguistics 18. Amherst: University of Massachusetts, Graduate Linguistic Student Association.

McCarthy, John J., and Alison Taub. 1992. Review of *The special status of coronals: Internal and external evidence*, ed. by Carole Paradis and Jean-François Prunet (1991). *Phonology* 9: 363–370.

McCawley, James. 1968. *The phonological component of a grammar of Japanese*. The Hague: Mouton.

Odden, David. 1993. Interaction between modules in Lexical Phonology. In *Phonetics and phonology 4: Studies in Lexical Phonology*, ed. by Sharon Hargus and Ellen Kaisse, 111–144. San Diego, CA: Academic Press.

Paster, Mary. 2006. Phonological conditions on affixation. Doctoral dissertation, University of California, Berkeley.

Prince, Alan, and Paul Smolensky. 2004. *Optimality Theory: Constraint interaction in generative grammar*. Malden, MA: Blackwell.

Scholz, Sybil. 2003. The status of coronals in Standard American English: An optimality-theoretic account. Doctoral dissertation, University of Cologne.

Tranel, Bernard. 1996. French liaison and elision revisited: A unified account in Optimality Theory. In *Aspects of Romance linguistics*, ed. by Claudia Parodi, Carlos Quicoli, Mario Saltarelli, and Maria Luisa Zubizarreta, 433–455. Washington, DC: Georgetown University Press.

Tranel, Bernard. 1998. Suppletion and OT: On the issue of syntax/phonology interaction. In *WCCFL 16: Proceedings of the 16th West Coast Conference on Formal Linguistics*, ed. by Emily Curtis, James Lyle, and Gabriel Webster, 415–429. Stanford, CA: CSLI Publications.

Tsujimura, Natsuko. 2007. *An introduction to Japanese linguistics*. 2nd ed. Malden, MA: Blackwell.

Vance, Timothy. 1987. *An introduction to Japanese phonology*. Albany: State University of New York Press.

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

Wilson, Colin. 2003. Experimental investigation of phonological naturalness. In *WCCFL 22: Proceedings of the 22nd West Coast Conference on Formal Linguistics*, ed. by Gina Garding and Mimu Tsujimura, 101–114. Somerville, MA: Cascadilla Press.

Wolf, Matthew. 2008. Optimal interleaving: Serial phonology-morphology interaction in a constraint-based model. Doctoral dissertation, University of Massachusetts, Amherst.

Yip, Moira. 1991. Coronals, consonant clusters, and the coda condition. In *The special status of coronals: Internal and external evidence*, ed. by Carole Paradis and Jean-François Prunet, 61–78. San Diego, CA: Academic Press.

Yip, Moira. 2004. Phonological markedness and allomorph selection in Zahao. *Language and Linguistics* 5:969–1001.

Yu, Alan. 2007. *A natural history of infixation*. Oxford: Oxford University Press.