Obstacles for gradual place assimilation

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In Harmonic Serialism, place assimilation can be modeled as taking one derivational step or two. These options correspond to whether a basic place assimilation operation is available to Gen or not. This paper compares these two possibilities against attested place assimilation patterns, focusing on progressive place assimilation. While the one-step analysis is successful, the two-step analysis is shown not to handle certain assimilation patterns.

1 Introduction

Harmonic Serialism (HS) is a serial version of Optimality Theory (OT) (Prince & Smolensky 1993/2004; McCarthy 2000: *et seq.*).[1] HS shares the basic framework of OT: a function Gen takes an input and produces a set of candidates. The set of candidates is fed into a function Eval, which returns the optimal candidate with respect to the ranked set of constraints, Con.

The main difference between HS and Parallel OT is the function Gen. In Parallel OT, Gen is unrestricted, producing an infinite set of candidates that can differ from the input in unlimited ways. In HS, Gen is restricted to producing a set of candidates that differ only minimally from the input. Given a finite set of operations, the candidate set includes the fully faithful candidate and every candidate that can be derived from the input via the application of a single operation. This property of Gen is called *gradualness.*

Gradualness means that derivations involving the application of more than one operation take multiple steps in HS. This is modeled by looping between Gen and Eval. An initial input in_0 is fed into Gen, and Eval selects the optimal candidate out_0. If candidate out_0 differs from its input in_0, it serves as the input to the next step, $in_1 = out_0$, and the process repeats. The derivation converges

[1] See McCarthy (2016) for a recent overview.

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once the optimal candidate does not differ from the most recent input: $out_n = in_n$. That final optimal candidate is the output.

The effects of gradualness are clearly seen in iterative processes like feature spreading (McCarthy 2009). For example, in Copperbelt Bemba (Bantu), if a word does not end in a high toned mora, the rightmost high tone will spread to the end of the word (Kula & Bickmore 2015), e.g. /bá-ka-fik-a/ > [bá-ká-fík-á] 'they will arrive'. In Parallel OT, the output *bá-ká-fík-á* is a member of the candidate set produced from the input /bá-ka-fik-a/ by Gen. In HS, Gen is limited to spreading the high tone once, and this derivation takes three steps: /bá-ka-fik-a/ > bá-ká-fik-a > bá-ká-fík-a > [bá-ká-fík-á].

This example also speaks to the trade-off between Gen and Con in HS. Both the Parallel OT and HS analyses require a motivating markedness constraint against final toneless moras (Kula & Bickmore 2015). A simple constraint against toneless final moras is sufficient for a Parallel OT analysis; candidates like *bá-ká-fik-a* are not optimal because they contain final toneless moras. In an HS analysis, forms like *bá-ká-fik-a* are optimal candidates at intermediate steps and this markedness constraint cannot motivate gradual spreading. Instead, an alignment constraint is necessary (McCarthy & Prince 1993a), assigning violations in proportion to the number of intervening moras between the rightmost high tone and the end of the word. The optimal candidate at each step of the derivation improves on this constraint by spreading the high tone further until the derivation converges.

Derivational steps in HS exhibit *harmonic improvement*, and can be modeled in a harmonic improvement tableau as in (1) below. (1) shows that the output at each step of the derivation better fits the constraint ranking than the input at that step. Successive optima improve gradually on the gradient alignment constraint, Align-R(Word, H), which penalizes the distance between the right edge of the word and the rightmost high tone. Violations of the faithfulness constraint against spreading a high tone, NoSpread, are determined relative to the input of the current step, not the input to the entire derivation. Hence, each successive output only violates NoSpread once. Every step of the derivation must show harmonic improvement.

In Parallel OT, the constraint set Con defines the predicted typology. In HS, the predicted typology results from the interaction between Con and Gen. Imposing limits on Gen restricts the typological predictions. Determining the operations available to Gen is an important research question in HS (see the papers in McCarthy & Pater (2016) for perspectives on a broad range of topics).

This paper compares two approaches to place assimilation in HS, focusing on progressive place assimilation: a two-step derivation with delinking and then

Table 1: Harmonic improvement in Copperbelt Bemba

/bá-ka-fik-a/	ALIGN-R(WORD, H)	NOSPREAD
a. bá-ka-fik-a	3	
b. bá-ká-fik-a	2	1
c. bá-ká-fík-a	1	1
d. [bá-ká-fík-á]		1

spreading (McCarthy 2007; 2008), and a one-step derivation where place features are directly changed, ultimately arguing that the one-step derivation better fits the attested typology. These two approaches to place assimilation are laid out in Section 2. Section 3 tests the predictions of these approaches against cases of progressive place assimilation cross-linguistically. Section 4 concludes.

2 Place assimilation in Harmonic Serialism

Place assimilation is a common process cross-linguistically wherein a consonant takes on the place features of an adjacent consonant. Assimilation is overwhelmingly regressive, i.e. in a cluster C_1C_2, C_1 is much more likely to assimilate to C_2 than C_2 is to assimilate to C_1 (Webb 1982; Jun 1995). A robust example of regressive assimilation is found in Diola-Fogny (Niger-Congo) (Sapir 1965). Table (2) gives examples of the four phonemic nasals in the language taking on the place features of a following consonant in coda-onset clusters, e.g. /ni-gam-gam/ > [ni.gaŋ.gam] 'I judge' (2a).[2]

Table 2: Regressive place assimilation in Diola Fogny

	Underlying	Surface	Gloss
a.	/ni-gam-gam/	[ni.gaŋ.gam]	'I judge'
b.	/pan-ɟi-maɲɟ/	[paɲ.ɟi.maɲɟ]	'you (PL) will know'
c.	/ku-bɔɲ-bɔɲ/	[ku.bɔm.bɔɲ]	'they sent'
d.	/na-tiːŋ-tiːŋ/	[na.tiːn.tiːŋ]	'he cut (it) through'

Progressive place assimilation, i.e. where C_2 assimilates to C_1 in a C_1C_2 cluster, is often restricted to certain environments such as root-enclitic junctures (Lam-

[2] Tones are omitted from data throughout this paper.

ont 2015). An example is found in Masa (Chadic) (Antonino 1999; Shryock 1997). Table (3) gives examples of the masculine enclitic /-na/ and the feminine enclitic /-da/. Attached to roots ending with vowels, the enclitics surface faithfully with coronal place, e.g. /tuu-na/ > [tuu.na] 'body-MASC' (3a). Attached to roots ending with obstruents or nasals, the enclitics surface with the place features of the root-final consonant, e.g. /vok-na/ > [vok.ŋa] 'front-MASC' (3g).

Table 3: Progressive place assimilation in Masa

	Underlying	Surface	Gloss
a.	/tuu-na/	[tuu.na]	'body-MASC'
b.	/gam-na/	[gam.ma]	'fish species-MASC'
c.	/vun-na/	[vun.na]	'mouth-MASC'
d.	/zeŋ-na/	[zeŋ.ŋa]	'warthog-MASC'
e.	/cop-na/	[cop.ma]	'gremer lid-MASC'
f.	/vet-na/	[vet.na]	'hare-MASC'
g.	/vok-na/	[vok.ŋa]	'front-MASC'
h.	/naga-da/	[naga.da]	'earth-FEM'
i.	/lum-da/	[lum.ba]	'canoe-FEM'
j.	/binen-da/	[bi.nen.da]	'fish species-FEM'
k.	/haraŋ-da/	[ha.raŋ.ga]	'light-FEM'
l.	/rip-da/	[rip.pa]	'termite species-FEM'
m.	/fat-da/	[fat.ta]	'sun-FEM'
n.	/benek-da/	[be.nek.ka]	'herb species-FEM'

2.1 Place assimilation as a two-step process

McCarthy (2007; 2008) proposes an HS analysis of place assimilation in which the targeted consonant first loses its place features and then place from an adjacent consonant spreads onto the target. Because only one operation can apply at a time in HS, this gives two derivational steps: debuccalization and spreading. This two-step process is referred to as gradual place assimilation in this paper exactly because it takes multiple steps in the derivation.

In regressive assimilation, debuccalization, the first step, satisfies the Coda Condition (CODACOND), which is violated by place features that are not associated with an onset. This constraint motivates deleting the place features from the coda consonant, which violates MAX(PLACE). Tableau (1) shows the first step of /ni-gam-gam/ > [ni.gaŋ.gam] 'I judge' (2a). Candidates (1a) and (1b) violate CODACOND because the labial place associated with the medial nasal is not associated with an onset; the final-consonant is taken to be exceptional. A place node deletes in (1b) and (1c), as indicated with the capital letters *H* and *N*, for debuccalized oral and nasal consonants, respectively. (1c) is optimal because it does not violate CODACOND. This tableau demonstrates that only the coda can be targeted for debuccalization; deleting the place features from the onset does not improve on CODACOND.

Tableau 1: Regressive place assimilation: Step 1

/ni-gam-gam/	CODACOND	MAX(PL)
a. ni.gam.gam	W	L
b. ni.gam.Ham	W	1
→ c. ni.gaN.gam		1

The second step satisfies a markedness constraint against placeless segments, HAVEPLACE. This constraint motivates spreading the place features from an adjacent consonant onto the placeless segment, which violates NOLINK(PLACE). Tableau (2) shows this step, continuing the derivation from Tableau (1); the input to this step is the output of the previous step *ni.gaN.gam*. Candidate (1a), the output of Tableau (1), contains a placeless nasal and violates HAVEPLACE. Candidate (1b) is optimal because it does not contain any placeless segments. This candidate will be the input to a third step, where the derivation converges (not shown here).

Tableau 2: Regressive place assimilation: Step 2

ni.gaN.gam	HAVEPLACE	NOLINK(PL)
a. ni.gaN.gam	W	L
→ b. ni.gaŋ.gam		1

The output of each step of the derivation is shown in the harmonic improvement tableau in (4) along with the full constraint ranking. As this tableau makes clear, each subsequent optimum increases in harmony until the convergent optimum is reached (4c). This candidate does not violate either markedness constraint and therefore does not motivate further derivational steps. As the square brackets indicate, it is the ultimate output.

Progressive place assimilation, like that in Masa, cannot be motivated by CO-

Table 4: Harmonic improvement in Diola Fogny

/ni-gam-gam/	CodaCond	HavePlace	Max(Pl)	NoLink(Pl)
a. ni.gam.gam	1			
b. ni.gaN.gam		1	1	
c. [ni.gaŋ.gam]				1

daCond, as this constraint is only satisfied by debuccalizing a coda consonant. Instead, McCarthy (2008: 297) analyzes the first step as satisfying a constraint against place features belonging to affixes, *Place$_{\text{affix}}$. The derivation is otherwise identical to Diola Fogny's: the targeted consonant debuccalizes before place features spread from an adjacent consonant.

Tableaux (3) and (4) below show the derivation of /vok-na/ > [vok.ŋa] 'front-masc' (3g). In Tableau (3), the faithful candidate (3a) and a candidate in which the root-final coda has debuccalized (3b) both violate *Place$_{\text{affix}}$, and lose to the optimal candidate (3c), in which the affix nasal has lost its place features. This candidate serves as the input to Tableau (4), where it loses to candidate (4b), in which the place features of the adjacent dorsal stop spread onto the nasal.

Tableau 3: Progressive place assimilation: Step 1

/vok-na/	*Place$_{\text{affix}}$	Max(Pl)
a. vok.na	W	L
b. voH.na	W	1
→ c. vok.Na		1

Tableau 4: Progressive place assimilation: Step 2

vok.Na	HavePlace	NoLink(Pl)
a. vok.Na	W	L
→ b. vok.ŋa		1

A harmonic improvement tableau for progressive place assimilation in Masa is given in (5). This exactly parallels the derivation in Diola Fogny (4), except for the highest-ranked markedness constraint: CodaCond motivates regressive place assimilation and *Place$_{\text{affix}}$ motivates progressive place assimilation.

This constraint ranking motivates a similar derivation with vowel-final roots like /tuu-na/ > [tuu.na] 'body-masc' (3a). The markedness constraint *Place$_{\text{affix}}$

Table 5: Harmonic improvement in Masa

/vok-na/	*PLACE$_{\text{AFFIX}}$	HAVEPLACE	MAX(PL)	NOLINK(PL)
a. vok.na	1			
b. vok.Na		1	1	
c. [vok.ŋa]				1

is violated by the enclitic nasal regardless of the shape of the root. Debuccalization therefore occurs with vowel-final roots just as it does with nasal- and obstruent-final roots.

The enclitics surface with coronal place regardless of the adjacent vowel's quality, e.g. compare [tuu.na] 'body-MASC' with [ma.ɗii.na] 'dew-MASC' and [ci.ta.na] 'job-MASC'. The violation of HAVEPLACE introduced in the first step of the derivation is therefore not repaired by spreading place features from the adjacent root vowel. Instead, coronal place features are inserted as a default (Lombardi 2002; de Lacy 2006), which violates DEP(PLACE).

The derivation of /tuu-na/ > [tuu.na] 'body-MASC' (3a) is shown in Tableaux (5) and (6). In the first step, the affix nasal debuccalizes to satisfy *PLACE$_{\text{AFFIX}}$. In the second step, default place features are inserted to satisfy HAVEPLACE. Because spreading place is preferred to inserting place with nasal- and obstruent-final roots, DEP(PLACE) dominates NOLINK(PLACE). The nasal losing its coronal place features only to later gain coronal place features constitutes a vacuous Duke-of-York derivation (McCarthy 2003).

Tableau 5: Default place epenthesis: Step 1

/tuu-na/	*PLACE$_{\text{AFFIX}}$	MAX(PL)
a. tuu.na	W	L
→ b. tuu.Na		1

Tableau 6: Default place epenthesis: Step 2

tuu.Na	HAVEPLACE	DEP(PL)
a. tuu.Na	W	L
→ b. tuu.na		1

This analysis treats the enclitics as underlyingly having coronal place features: /-na/ and /-da/. The facts of the language are also consistent with their being underspecified for place: the masculine enclitic underlyingly being /-Na/ and the feminine enclitic being /-Ha/, their place and voice features predictable from context. As McCarthy (2008: 286) argues, underlyingly placeless consonants do not have to pass through a debuccalization step, as CodaCond can motivate place assimilation directly.

Such a derivation is shown for [vok.ŋa] 'front-masc' (3g) in Tableau (7), with the underlying form of the affix containing a nasal underspecified for place. Because CodaCond is satisfied by place features linked to an onset, directly spreading place onto the nasal in (7c) is optimal. Debuccalizing the root-final stop (7b) is dispreferred by the relative ranking of Max(Place) and NoLink(Place). Assuming underspecification, with vowel-final roots, default place features are inserted without the enclitics first passing through a debuccalization step.

Tableau 7: Progressive place assimilation as underspecification

/vok-Na/	CodaCond	Max(Pl)	NoLink(Pl)
a. vok.Na	W		L
b. voH.Na		W	L
→ c. vok.ŋa			1

Gradual place assimilation predicts that targets of progressive place assimilation surface with default place features in contexts that do not license place spreading. The two analyses given for the Masa enclitics here explain their surfacing with coronal place intervocalically as a result of their derivation, not their underlying form. Underlying place features first pass through a debuccalization step. Because derivations in HS cannot look ahead to later steps, this process applies whenever an enclitic attaches to a root. This debuccalized segment then surfaces with default place features that are inserted to satisfy HavePlace. Likewise, in the underspecification analysis, the enclitics enter the derivation placeless and surface with default place features intervocalically to satisfy HavePlace. The co-occurrence of progressive place assimilation and the realization of default place features is predicted by gradual place assimilation. In general, gradual place assimilation is always compatible with an underspecification analysis.

2.2 Place assimilation as a one-step process

The two-step process outlined above can be compared to a one-step process, which grants Gen a place-changing operation. The trade-off between Gen and Con mirrors the distinction between positional markedness and positional faithfulness in Parallel OT (Zoll 2004). The two-step process uses positional markedness constraints, CodaCond and *Place$_{\text{AFFIX}}$, and a general faithfulness constraint, Max(Place) in the first step of the derivation. The one-step process uses a general markedness constraint and positional faithfulness constraints.

In the one-step process, both regressive and progressive place assimilation are motivated by a markedness constraint against heterorganic clusters, Agree(Place) (Yip 1991; Lombardi 1999; Baković 2000; 2007). This constraint is satisfied by changing the place features of one of the consonants, violating Ident(Place). Which consonant is targeted follows from the relative ranking of positional faithfulness constraints. For the purposes of this paper, the two relevant constraints are Ident(Place)$_{\text{ONSET}}$ (Beckman 1998), which is violated by changing the place features of a consonant in onset position, and Ident(Place)$_{\text{ROOT}}$ (McCarthy & Prince 1995), which is violated by changing the place features of a consonant in the morphological root.[3]

In coda-onset clusters, Ident(Place)$_{\text{ONSET}}$ prefers regressive place assimilation. Tableau (8) shows the one-step derivation of /ni-gam-gam/ > [ni.gaŋ.gam] 'I judge' (2a). The faithful candidate (8a) contains a heterorganic cluster and violates Agree(Place). It is dispreferred to the unfaithful candidates in which the place assimilation operation has applied (8b-c). An onset is targeted in (8b), which is dispreferred to (8c), in which a coda is targeted. Under this analysis, the word-final consonant does not enjoy any special status; it is not a member of a cluster, and does not violate the markedness constraint.

Tableau 8: Regressive place assimilation as one step

/ni-gam-gam/	Agree(Pl)	Ident(Pl)	Ident(Pl)$_{\text{ONSET}}$
a. ni.gam.gam	W	L	
b. ni.gam.bam		1	W
→ c. ni.gaŋ.gam		1	

The conflict between the two positional faithfulness constraints is seen at root-enclitic junctures; without a morpheme boundary or another relevant asymme-

[3] Positional faithfulness constraints have been shown to produce pathological effects unless the relevant position is defined over the input (Jesney 2011). This paper assumes that syllabification co-occurs with other operations at each step, following McCarthy (2008), which makes Ident(Place)$_{\text{ONSET}}$ meaningless in the first step as the input is not syllabified. This problem can be avoided by assuming syllabification applies at an earlier derivational step (Elfner 2009). Ident(Place)$_{\text{ROOT}}$ does not have this problem because Consistency of Exponence ensures that morphological affiliation is invariant throughout the derivation (McCarthy & Prince 1993b).

try (Lamont 2015), IDENT(PLACE)$_{\text{ONSET}}$ guarantees that regressive assimilation is the default repair. In Masa, the enclitic consonant in onset position is targeted for assimilation, so IDENT(PLACE)$_{\text{ROOT}}$ dominates IDENT(PLACE)$_{\text{ONSET}}$. This is shown in Tableau (9) with /vok-na/ > [vok.ŋa] 'front-MASC' (3g). If the relative ranking of the positional faithfulness constraints were switched, regressive place assimilation would be preferred, and (9b) would be the optimal candidate.

Tableau 9: Progressive place assimilation as one step

/vok-na/	AGREE(PL)	IDENT(PL)	IDENT(PL)$_{\text{ROOT}}$	IDENT(PL)$_{\text{ONSET}}$
a. vok.na	W	L		L
b. vot.na		1	W	L
→ c. vok.ŋa		1		1

Because AGREE(PLACE) is only violated by consonant clusters, it does not motivate any operations in intervocalic contexts. Assuming underlying coronal place, the derivation of /tuu-na/ > [tuu.na] 'body-MASC' (3a) converges in one step because there is no reason to change the enclitic nasal. Under the one-step derivation, underlying place features surface in intervocalic contexts. If the enclitic nasal is underlyingly underspecified for place, it will pass through a derivational step in which default place is inserted just as in the two-step process.

The intervocalic context is where the two analyses make different predictions. Under the two-step process, affix consonants debuccalize and then surface with default place features. Under the one-step process, affix consonants surface faithfully. The following section presents a modest survey of progressive place assimilation and argues that predictions of the one-step process are borne out.

3 Progressive place assimilation cross-linguistically

Progressive place assimilation often only targets a single suffix in a language, motivating an analysis that relies on morpheme-specific constraints (Pater 2009). When that suffix surfaces with default place features, it is consistent with an underspecification account and therefore consistent with a two- or one-step derivation. For example, the progressive suffix in Noni (Niger-Congo) is analyzed underlyingly as /-te/ (Hyman 1981). Attached to roots with final vowels, it surfaces with a lateral. Roots with final labial nasals take [-te], roots with final coronal nasals take [-e], and roots with final dorsal nasals take [-ke]. Examples are shown in Table (6). Like the gender enclitics in Masa, the Noni progressive is amenable to having an initial stop underspecified for place: /-He/.

Table 6: Progressive place assimilation in Noni

	Underlying	Surface	Gloss
a.	/cii-te/	[cii.le]	‘drag-PROG’
b.	/cim-te/	[cim.te]	‘dig-PROG’
c.	/bin-te/	[bi.ne]	‘dance-PROG’
d.	/ciŋ-te/	[ciiŋ.ke]	‘tremble-PROG’

Languages where the targeted suffix surfaces with marked place features cannot be analyzed this way. For example, the qualitative suffix in Kukú (Nilotic) assimilates to root-final nasals and obstruents and surfaces as a palatal stop intervocalically (Cohen 2000). Examples are given in Table (7). Similar allomorphy is found in the related languages Bari (Yokwe 1987) and Mundari (Stritz 2014). In Kukú, palatal place features are neutralized in coda position: compare [gɪɲa] ‘be snapped’ and [gɪn] ‘snap’. This indicates that palatals are more marked than plain coronals. From the perspective of default place insertion, the word [ɟu.ɟɪ] ‘sharpen-QUAL’ (7a) is surprising; an unmarked stop is expected, e.g. **ɟu.dɪ*.

Table 7: Progressive place assimilation in Kukú

	Underlying	Surface	Gloss
a.	/ɟu-ɟa/	[ɟu.ɟɪ]	‘sharpen-QUAL’
b.	/ʔjɛm-ɟa/	[ʔjɛm.ba]	‘cast the evil eye-QUAL’
c.	/ŋaɲ-ɟa/	[ŋan.da]	‘dismantle-QUAL’
d.	/dɛŋ-ɟa/	[dɛŋ.ga]	‘perform surgery-QUAL’
e.	/ɗip-ɟa/	[ɗib.bɨ]	‘sound-QUAL’
f.	/ʔjʊt-ɟa/	[ʔjʊd.dʊ]	‘plant-QUAL’
g.	/ɗuk-ɟa/	[ɗug.gɨ]	‘build-QUAL’

Another suffix incompatible with underspecification is the Afrikaans (Germanic) diminutive /-ʲki/ (Lamont 2017b: and references therein). Examples are given in Table (8). The diminutive surfaces with dorsal place intervocalically (8a), which is unattested as a default (de Lacy 2006). Furthermore, the diminutive triggers bidirectional place assimilation: it surfaces with labial place after labial-final roots, e.g. /rɑːm-ʲki/ > [rɑːm.pi] 'frame-DIM' (8b), but triggers root-final coronals to undergo regressive assimilation, e.g. /mɑːn-ʲki/ > [mɑːjŋ.ki] 'moon-DIM' (8c). Without positing underlying dorsal place features, the regressive assimilation seen with coronal-final stems is inexplicable.[4]

Table 8: Bidirectional place assimilation in Afrikaans

	Underlying	Surface	Gloss
a.	/pɑː-ʲki/	[pɑː.ki]	'father-DIM'
b.	/rɑːm-ʲki/	[rɑːm.pi]	'frame-DIM'
c.	/mɑːn-ʲki/	[mɑːjŋ.ki]	'moon-DIM'
d.	/kuənəŋ-ʲki/	[kuə.nəŋ.ki]	'king-DIM'

Not all languages target a single affix for progressive place assimilation. Some, such as Masa, have multiple affixes that undergo progressive place assimilation. A richer inventory of targeted affixes can be found in the closely related language Musey (Chadic) (Shryock 1996). Musey has cognates of the Masa gender enclitics /-na/ and /-da/ as well as a host of other enclitics that undergo progressive place assimilation. Table (9) gives examples with the negative enclitic /-ɗi/ and the intensifier enclitic /-kɪjo/. Dassidi (2015) also reports similar allomorphy with the infinitive marker /-da/ and the causative marker /-gi/.

As in Kukú and Afrikaans, the dorsal-initial morphemes /-kɪjo/ and /-gi/ make an underspecification analysis implausible, as dorsal place would have to be inserted as a default. Furthermore, because Musey also has coronal-initial morphemes that undergo progressive place assimilation, default place insertion would have to be lexically-specified so that some morphemes receive coronal place by default and others dorsal place by default.

Under the one-step process, these data are not problematic. Each affix/enclitic enters the derivation with underlying place features that surface faithfully unless an obstruent- or nasal-final root triggers assimilation; Jun (1995) gives an analysis in Parallel OT along these lines. Tableaux (10) and (11) give the derivations for /ka-ɗi/ > [ka.ɗi] 'exist-NEG' (9a) and /kulum-ɗi/ > [ku.lum.bi] 'horse-NEG' (9b) as one-step derivations. As Tableau (10) shows, with vowel-final roots, the enclitic

[4] An anonymous reviewer points out that an interesting comparison can be made between HS and Stratal OT (Kiparsky 2000). The work of root-faithfulness in HS parallels spelling out root features before affixation or cliticization. The analysis of Afrikaans in Lamont (2017b) requires violable root-faithfulness, which seems difficult to reconcile with cyclic spell out.

Table 9: Progressive place assimilation in Musey

	Underlying	Surface	Gloss
a.	/ka-ɗi/	[ka.ɗi]	‘exist-NEG’
b.	/kulum-ɗi/	[ku.lum.bi]	‘horse-NEG’
c.	/sun-ɗi/	[sun.da]	‘work-NEG’
d.	/ʔeŋ-ɗi/	[ʔeŋ.gi]	‘strength-NEG’
e.	/too-kɪjo/	[too.gɪ.jo]	‘sweep-INTENSE’
f.	/hum-kɪjo/	[hum.bɪ.jo]	‘hear-INTENSE’
g.	/fen-kɪjo/	[fen.dɪ.jo]	‘blow one’s nose-INTENSE’
h.	/galaŋ-kɪjo/	[ga.laŋ.gɪ.jo]	‘shake-INTENSE’

surfaces faithfully and the derivation converges. As Tableau (11) shows, with obstruent- and nasal-final roots, the enclitic surfaces homorganic to the root-final consonant. The optimal candidate of Tableau (11) will be the input to a second step, where the derivation converges (not shown here).

Tableau 10: Faithful realization intervocalically

/ka-ɗi/	Agree(Pl)	Ident(Pl)	Ident(Pl)$_{\text{root}}$	Ident(Pl)$_{\text{onset}}$
→ a. ka.ɗi				
b. ka.bi		W		W

Tableau 11: Progressive place assimilation as one step

/kulum-ɗi/	Agree(Pl)	Ident(Pl)	Ident(Pl)$_{\text{root}}$	Ident(Pl)$_{\text{onset}}$
a. ku.lum.ɗi	W	L		L
b. ku.lun.ɗi		1	W	L
→ c. ku.lum.bi		1		1

The intervocalic context poses a challenge to the two-step process. Following the derivation given for Masa above, we expect the intensifier enclitic in Musey to surface with default place when the context for spreading is unavailable. This is shown in Tableaux (12) and (13) with /too-kɪjo/ > [too.gɪ.jo] ‘sweep-INTENSE’ (9e). Even if dorsal place were somehow the default in Musey, it would not explain why other enclitics surface with coronal place after this step.

Tableau 12: Problematic default place epenthesis: Step 1

/too-kɪjo/	*PLACE$_{AFFIX}$	MAX(PL)
a. too.kɪ.jo	W	L
→ b. too.Hɪ.jo		1

Tableau 13: Problematic default place epenthesis: Step 2

too.Hɪ.jo	HAVEPLACE	DEP(PL)
a. too.Hɪ.jo	W	L
→ b. too.tɪ.jo		1

McCarthy (2008: 298) suggests that the general phonotactics of the language can account for this. Musey only allows the placeless consonants [h] and [ɦ] word-initially (Shryock 1996). This suggests a markedness constraint against word-internal placeless consonants, such as ALIGN-L(h, WORD).[5] This constraint is violated when the segments [h] and [ɦ] do not occur word-initially. It is also violated by debuccalized segments, because, by definition, these are placeless.

Introducing this constraint into the two-step analysis results in a ranking paradox. This is shown in Tableau (14) with the first steps of /too-kɪjo/ > [too.gɪ.jo] 'sweep-INTENSE' (9e) and /hum-kɪjo/ > [hum.bɪ.jo] 'hear-INTENSE' (9f). The left hand column gives the desired winner and a competing candidate in the first step separated by a tilde. In the intervocalic context (14a), debuccalization should not occur. In the consonant cluster context (14b), debuccalization should occur to feed place spreading. The markedness constraints *PLACE$_{AFFIX}$ and ALIGN-L(h, WORD) are given with their evaluations of the winner ∼ loser pairs.

Tableau 14: Ranking paradox in Musey

	*PLACE$_{AFFIX}$	ALIGN-L(h, WORD)
a. too.kɪ.jo ∼ too.Hɪ.jo	L	W
b. hum.Hɪ.jo ∼ hum.kɪ.jo	W	L

There is a stark ranking paradox in Tableau (14). Including ALIGN-L(h, WORD) in the constraint set does not have the desired effect of blocking debuccalization only in intervocalic contexts. If it is ranked above *PLACE$_{AFFIX}$, it blocks

[5] A lowercase *h* is used to represent placeless consonants instead of an uppercase *H* to avoid confusion with the high tone alignment constraint used in §1.

debuccalization in all contexts, preventing any place assimilation from occurring. Whereas the one-step process adequately models the Musey allomorphy, the two-step process cannot. This result holds for Kukú, Afrikaans, and any language that targets a consonant with marked place features for progressive place assimilation.

4 Conclusion

Research in Harmonic Serialism (HS) is concerned not just with the content of Con, but also with what operations are available to Gen. This paper examined the predictions made by removing place assimilation as a basic operation in HS and replacing its functionality with a delinking and then spreading derivation, as proposed by McCarthy (2007; 2008). This restricted Gen was argued not to be able to model attested progressive place assimilation systems found in Kukú, Afrikaans, and Musey. It was shown that allowing Gen a basic place assimilation operation results in a better fit of the attested data.

As noted earlier, place assimilation is overwhelmingly regressive. Up until very recently, all cases of progressive place assimilation known in the theoretical literature targeted consonants with unmarked place features except for the Musey intensifier enclitic /-kɪjo/. McCarthy (2007) even calls Musey a 'unique challenge' to the two-step derivation, emphasizing that no other affix was known that shared these properties.

Relying on the Coda Condition to motivate place assimilation predicts progressive place assimilation like that in Musey is phonologically impossible, fulfilling the typological observation. In lieu of a survey of Musey-like languages (Lamont 2015), this strong typological prediction has to be weakened. There are more languages like Musey cross-linguistically that are well-behaved phonologically, which any phonological theory needs to be able to account for.

The one-step process that relies on Agree(Place) is able to adequately model the attested place assimilation typology. However, it predicts that Musey-like languages should be much more common than they are. Whenever a conflicting faithfulness constraint dominates Ident(Place)$_{\text{onset}}$, progressive or bidirectional assimilation is predicted. Given the very limited distribution of these systems, the factorial typology vastly overpredicts their occurrence. This strongly suggests an external influence on the typology such as articulatory or perceptual pressures (Jun 1995; Steriade 2001), but such a discussion is beyond the scope of this paper.

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