Varied Alignment in the Halkomelem Continuative Reduplicant[*]

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1. Introduction

Lexically prespecified phonological patterns have long been accepted within the generative framework. It is widely acknowledged that classes exist within languages, and sometimes these classes each take on morphemes that may differ in terms of size, alignment, phonological content, or all three, even when identical semantic information is being introduced. In some cases these classes are etymologically based and in others they are historically based, or in certain cases the classes appear to be random with no logically predictable determiner. The principal question to be addressed in this paper is how Optimality Theory (Prince & Smolensky 1993; McCarthy & Prince 1993ab), a framework that calls for one invariant constraint ranking to hold throughout a particular language, accounts for two distinct reduplicant alignments of morphemes bearing the same shape and semantic content? The answer lies in the acceptance of lexically prespecified information, and its insertion into Optimality Theory by way of stratum specific constraints.

Upriver Halkomelem (Galloway 1993; Urbanczyk 1998), a Salish language spoken in British Columbia, exhibits rich patterns of productive reduplicative and/or infixational processes that contribute a wide array of semantic information. The main focus of this paper is to analyze continuative verb formation created by reduplication and extend an analysis presented by Urbanczyk (1998) in order to elucidate a patterned reduplication not accounted for in her paper, as well as refining her original analysis. First, a brief introduction to Optimality Theory and how it accounts for reduplication is explained. Second, Urbanczyk's analysis is presented in short, followed by problems noted with the rankings and a prefixed continuative reduplication pattern not accounted for in her analysis. This overlooked pattern at first appears to be problematic in an Optimality Theoretic account, whereby multiple rankings would be necessary in

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order to account for the two distinct alignments. However, when viewed from the idea that these two patterns belong to different lexical classes, and prespecification and multiple input-output faithfulness are instantiated in order to create a single invariant constraint ranking, a central tenet of Optimality Theory, the problem is resolved. Next, a parallel is made to Japanese, for which the aforementioned model was originally proposed, by way of learnability, illustrating the plausibility of extending this model to the grammar of Upriver Halkomelem. Finally, the advantages and ramifications of such a model are discussed.

2. Optimality Theory

Optimality Theory is a recent framework within generative grammar arguing that surface forms of a language are selected from a set of candidate outputs evaluated by cross-linguistically universal constraints, based on faithfulness and markedness, that are ranked and violable. This theory has been adapted, to an extent, in syntax; however, its success in the past decade lies primarily in phonology and prosodic morphology.

A central tenet of Optimality Theory is that of correspondence occurring between the input and the output, as well as the base and the reduplicant. Input-output and base-reduplicant correspondence is schematized in (1):

(1) Correspondence of IO and BR (McCarthy and Prince 1994)
Input: /Af RED + Stem/

⇳ *IO-Faithfulness*

Output: [Base] ⇔ [reduplicant]

BR-Faithfulness

Input-output correspondence is governed by IO constraints, whereas base-reduplicant correspondence is governed by BR constraints. The faithfulness of the reduplicant corresponds to the output or base that is contrived from correspondence to the input. This is illustrated in (1).

Generally, reduplicants exhibit less marked structures than the output bases of a particular language (McCarthy and Prince 1994; Alderete, et. al 1999). For example, if an input form in the language is $C^1V^1C^2$, whereby codas are permissible in the base forms, a high-ranking IO constraint, say MAX-IO, may force the retention of C^2 of the base in the output. However, it is possible that the maximal reduplicant in the language is *CV*, where codas are impermissible. This occurrence is accounted for in OT by ranking FAITH-IO constraints above MARKEDNESS constraints, causing the retention of C^2 in the base and the dominance of MARKEDNESS constraints over FAITH-BR constraints, preventing the surfacing of the C^2 in the reduplicant. This ranking for an emergence of the unmarked is presented in (2).

(2) *Emergence of the Unmarked* (McCarthy and Prince 1994)
FAITH-IO » MARKEDNESS » FAITH-BR

This is important because in Upriver Halkomelem reduplication, like most other reduplication patterns occurring the in world's languages, the reduplicant is more restricted than the base in terms of markedness, as illustrated by the ranking in (2). The IO faithfulness constraints dominate the markedness constraints, which in turn dominate the BR faithfulness constraints.

3. Urbanczyk's Account

Urbanczyk (1998) analyzes four patterns that produce the continuative form of the verb observed by Galloway (1993). These four patterns are presented in (3).

(3) Various forms of the continuative in Upriver Halkomelem

	Base	Reduplicated form	Gloss
(a)	wíqəs	wíwəqəs	'yawn'-'yawning'
(b)	mə́q'ət	hə́mq'ət	'swallow'-'swallowing'
(c)	ləx^{w}ə́lcɛ	lə́x^{w}əlcɛ	'spit'-'spitting'
(d)	ʔíməx^{j}	ʔí:məx^{j}	'walk'-'walking'

The example in (3a) comes from the most productive pattern of continuative formation, whereby C^1 of the root and *ə* are infixed after the first syllable of the base. The form in (3b) shows *hə* prefixation (with *ə* deletion in the base and possible stress shift), (3c) illustrates stress shift, and (3d) shows lengthening of the initial vowel of the base. The conditioning environment for each type of continuative formation acknowledged by Urbanczyk (1998) is introduced and discussed below.

Urbanczyk's account of reduplicative infixation (3a) as continuative formation is as follows: If the 'non-continuative' begins with a single consonant and a full stressed vowel, the 'continuative' is formed by CV-reduplication. This provides a conditioning environment for the appropriate type of continuative formation to apply. Urbanczyk's ranking that derives the optimal output for forms similar to (3a) is presented in (4).

(4) Max-io » *Struc-Syll, NoCoda » Max-br (Urbanczyk 1998)

/RED$_{cont}$ + wíqəs/	Max-io	*Struc-Syll	NoCoda	Max-br
a. ☞ wíwəqəs		σσσ	*	qəs
b. wíqəwəqəs		σσσσ!	*	s
c. wíqwəqəs		σσσ	**!	əs
d. wíqwəq	*!*	σσ	**	
e. wíwəqə	*!	σσσ		qə

Any syllable in the output incurs a violation of *Struc-Syll (Zoll 1996). The intention of this constraint is to eliminate any possible candidate that copies more than one syllable of the base in the reduplicant. Thus, every candidate that does not lose segmental material from the base, which would incur a fatal violation of Max-io, violates *Struc-Syll twice, as the base is disyllabic. This is a size-restricting gradient constraint. Suboptimal candidates (4d) and (4e) lose on violations of high ranking Max-io. Candidate (4b) loses on the fact that it has four syllables, violating *Struc-Syll four times, candidate (4c) loses on two violations of NoCoda, and finally optimal candidate (4a) wins, even though it violates low ranking Max-br more than any other candidate.[1]

The second conditioning environment for continuative formation is if the 'non-continuative' begins with a sonorant-stressed schwa sequence, then the 'continuative' is formed by *hə* prefixation and the initial schwa of the base is lost, as in (3b). Urbanczyk introduces constraints from Kenstowicz (1996) dealing with stress markedness on vowels.

(5) Sonority-Driven Stress (Kenstowicz 1997)
*P/ə » *P/i,u » *P/e,o » *P/a
*M/a » *M/e,o » *M/i,u » *M/ə

[1] Urbanczyk (1998) counts the *ə* of the reduplicant as corresponding to the stressed *i* of the base. Because MAX-BR ranks low, even if *ə* did not correspond to *i*; the same output candidate would be selected as optimal.

These constraints essentially state that *ə* makes the worst peak and the best margin (of the vowels), while *a* makes the best peak and the worst margin.

(6) RV…Stems (Urbanczyk 1998)[2]

/RED$_{cont}$ + wíqəs/	*P/ə	*M/i,u
a. ☞ wíw̲ə̲qəs		
b. hə́wiqəs	*!	*!

(6) illustrates that because the example from (3a) does not begin with a sonorant-stressed schwa sequence, when the constraints introduced in (5) are implemented, it does not alter continuative formation, and reduplicative infixation remains optimal. The sonority driven stress constraints eliminate the *hə* prefixation, selecting (2a) as optimal.

(7) *P/ə, *M/i,u » *SonOnset » Max-br (Urbanczyk 1998)

/RED$_{cont}$ + wíqəs/	*P/ə	*M/i,u	*SonOnset	Max-br
a. ☞ wíw̲ə̲qəs			**	qəs
b. hə́wiqəs	*!	*!		həwiqəs
/RED$_{cont}$ + mə́q'ət/				
aa. ☞ hə́mq'ət	*			mq'ət
bb. mə́məq'ət	*		*!*	q'ət
cc. mə́mq'ət	*		*!	q'ət

Tableau (7) shows that, unlike in (6), when a sonorant-stressed schwa sequence is initial, the *hə* prefixed candidate is selected, as in (7aa). Suboptimal candidates (7bb) and (7cc) lose because they contain sonorant onsets, violating *SonOnset.

[2] These constraints deal with stress rather than the syllabic position of the particular vowel. Thus, peak obviously refers to tonic vowels, and margin does not refer to syllable boundaries but rather to non-tonic vowels. Otherwise *i* would not incur a violation of *M/i,u as it is occupying a medial position and not a margin.

The final two types of reduplication analyzed by Urbanczyk (1998), (3c) and (3d), are not of particular interest here, however, they are briefly introduced and the ranking from Urbanczyk (1998) is presented.[3] For forms like those found in (3c), if the 'non-continuative' stem has non-initial stress, the continuative is formed by shifting the stress to the word-initial syllable. The ranking is presented in (8):

(8) Stress Shift
*P/ə, *M/i,u » DISTINCT[4] » DEP-IO-C » MAX-BR

The last case of continuative formation from Urbanczyk (1998) was vowel lengthening. If the 'non-continuative' stem begins with a glottal, *h ʔ*, then the 'continuative' is formed by lengthening the first vowel of the stem. If the first vowel is *ə*, then there is a change in quality. The ranking for this alternation is below in (9).

(9) Vowel Lengthening
DISTINCT, *ʔə], *ʔ]σ » IDENT-IO-μ, DEP-IO-μ, *VV, MAX-BR

4. Problematic Cases

The example in (3a), evaluated in (4), is of primary interest to this paper. The analysis presented by Urbanczyk (1998) in (4) appears to prove inadequate in two instances. First, according to the ranking, nothing is motivating reduplication.

(10) MAX-IO » *STRUC-SYLL, NOCODA » MAX-BR (Urbanczyk 1998)

/RED$_{cont}$ + wíqəs/	MAX-IO	*STRUC-SYLL	NOCODA	MAX-BR
a. ☞ wíwəqəs		σσσ!	*	qəs
b. ☹ wíqəs		σσ	*	wiqəs

Tableaux (10) illustrates that an output that has not undergone reduplication, while remaining faithful to the input proves to be optimal according to

[3] Consult Urbanczyk (1998) for a comprehensive analysis the non-reduplicative patterns of continuative formation in Upriver Halkomelem.
[4] DISTINCT states that every morpheme in the input must have some phonological realization in the output. Thus, output candidates that are identical to the input, if it calls for affixation are not selected as optimal.

Urbanczyk's ranking. MAX-BR, because it ranks below *STRUC-SYLL, fails to eliminate suboptimal candidate (10b). However, if MAX-BR was ranked higher, say tied with NOCODA and *STRUC-SYLL, then suboptimal candidate (4c), **wîqwəqəs*, would prove to be optimal or at least tied with the optimal candidate (4a). Thus, a constraint that does not penalize the optimal output, but eliminates (10b), must be introduced into the ranking.

Another problem that arises out of Urbanczyk's paper is the alignment of the reduplicant. The ranking in (4) makes no mention to the alignment of the reduplicant. This proves problematic because of forms not accounted for in Urbanczyk (1998). These forms, from Galloway (1993), are introduced below in (12) and contrasted with forms similar to (3a) represented in (11).

(11) C^1*ə* after V^1 of the root (similar to (3a)) (Galloway 1993)

Base	Reduplicated Form	Gloss
a. p'ɛ́θ	p'ɛ́p'əθ	'sew' – 'sewing'
b. jíq	jíjəq	'fall' – 'falling'
c. xʲíwə	xʲíxʲəwə	'urinate'- 'urinating'
d. cá kʷ	cácəkʷ	'get distant' – 'getting distant'
e. kʷíməl	kʷíkʷəməl	'get red' – 'getting red'
f. mát'əs	mámət'əs	'point' – 'pointing'
g. t'íləm	t'ít'ələm	'sing' – 'singing'
h. lámət	láləmət	'throw at s.t.' – 'throwing at s.t.'

(12) C^1*ə* prefixed to C^1 of the root (unaccounted forms)(Galloway 1993)

Base	Reduplicated Forms	Gloss
a. kʷíj	kʷəkʷíj	'climb' – 'climbing'
b. xʷɛ́	xʷəxʷɛ́	'starve' – 'starving'
c. mɛ́	məmɛ́	'come off' – 'coming off'
d. t'ɛ́t	t'ət'ɛ́t	'taste s.t.' – 'tasting s.t.'
e. xʷáθət	xʷəxʷáθət	'starve oneself' – 'starving oneself'
f. xîlt	xəxîlt	'write' – 'writing'
g. θ'ɛ́:m	θ'əθ'ɛ́:m	'chew' – 'chewing'
h. s-q'ámət	s-q'əq'ámət	'come with s.o.' – 'coming with s.o.'

Notice that the reduplicants in (11) and those in (12) exhibit the same semantic contribution to the root. In fact, the pattern in (12) is quite common. Furthermore, any phonological distinction between the bases found in (11) and those in (12) is not apparent; thereby, creating an allomorphy conditioning statement is not possible. In both sets of data, the base forms illustrate initial stress (with the exception of (12d)) and contain both sonorant and non-sonorant initial consonants. Moreover, all the vowels that occur in the initial syllable of the forms in (11) also occur in the initial syllable of the forms in (12). The ranking for cases like those found in (11) will be presented below in §5. Since allomorphy cannot be determined in the examples presented above, a distinct ranking for the forms in (12) will be introduced in §6, analyzed, and compared to the ranking for the forms in (11).

According to previous accounts (McCarthy & Prince 1994, 1995; Urbanczyk 1995, 1998), based on a set of constraints, the size, shape and position of the reduplicant should be determined by a single constraint ranking. In other words, reduplication and infixation should be a-templatic, or without a prespecified template or position.[5] If reduplication is a-templatic, then a problem arises. This is exemplified in the following tableaux (13).

(13) Problematic Cases (ranking from Urbanczyk 1998)

/RED$_{cont}$ + wíqəs/	MAX-IO	*STRUC-SYLL	NOCODA	IDENT-BR
a. ☞ wíwəqəs		σσσ	*	qəs
b. ☹ wəwíqəs		σσσ	*	qəs
/RED$_{cont}$ + q'áwəl/				
aa. ☞ q'əqáwəl		σσσ	*	wəl
bb. ☹ q'áq'əwəl		σσσ	*	wəl

In tableaux (13), (13a) and (13aa) are the more harmonic output candidates; however, there seems to be no logical reason why the reduplicant is infixed in (13a) and prefixed in (13aa). To recall, Urbanczyk (1998) stated that if the 'non-continuative' began with a single consonant and a full stressed vowel, then there is a CV reduplicant. However, no mention is made the alignment of the reduplicant. The constraints *STRUC-SYLL and NOCODA are intended to limit the size of the reduplicant; however, adopting Urbanczyk's ranking from (4), there is

[5] There are constraints on the vowel system of UH that are not discussed but briefly here. UH does not allow more than one full vowel per word, and unless stress shift is triggered then the stress in the base remains fixed, at least in terms of the processes here. Thus, it could be argued, in keeping with full a-templaticism that the real reduplicant in UH is C^1V^1 and the reduplicant vowel is forced to *ə*, as initial full non-stressed vowels do not appear.

no reason as to why optimal candidates (13a) and (13aa) should be optimal when evaluated against (13b) and (13bb). Simply stated, how does one determine whether the reduplicant is prefixed or infixed?

5. Reevaluation

There are two questions that will be answered in this section in response to Urbanczyk (1998). First, what motivates the reduplication? Second, what determines the alignment of the reduplicant?

To answer the first question, (10) should be recalled, whereby the output candidate with no reduplicant, *wíqəs*, was in fact more optimal than the actual optimal candidate, *wí<u>wə</u>qəs*, according to Urbanczyk's ranking. The answer to this question appears quite simple, and does not require much attention. A constraint stating that for each morpheme in the input, the output must contain some element that can be interpreted as its realization should be instantiated into the ranking. Moyna and Wiltshire (2000) label this constraint OVERTEXPONENCE, and it effectively eliminates (10b, 14d) from optimal status, forcing the ranking to select the optimal candidate (10a, 14a).

(14) NOCODA, OVERTEXPONENCE » ALIGN-RED-L » MAX-BR

/RED$_{cont}$ + wíqəs/	NOCODA	OVERTEXP	ALIGN-RED-L	MAX-BR
a. ☞ wí<u>wə</u>qəs	*		*	qəs
b. wíqə<u>wəqə</u>s	*		**!	s
c. wíq<u>wəq</u>əs	**!		*	əs
d. wíqəs	*	*!		wiqəs

Furthermore, by introducing ALIGN-RED-L into the ranking, which states that the left edge of the reduplicant must be aligned with the left edge of the output, the optimal output is arrived at.

(15) **ALIGN-RED-L**
Align the left edge of the reduplicant with the left edge of the PrWd (McCarthy & Prince 1993a)

Output candidates that lost base segments from the input, violating MAX-IO, are not included here, as it is still assumed MAX-IO is ranked high, eliminating candidates similar to (4d) and (4e). In (14), the previously problematic output candidate (14d) is eliminated on a violation of OVERTEXPONENCE, as it displays no material corresponding to the reduplicant morpheme in the input. Candidate (14a) wins despite minimal violations on NOCODA and ALIGN-RED-L.

The next question to be addressed is how the alignment of the reduplicant is accounted for. To recall the ranking from (4), no mention was made to the alignment of the reduplicant in Urbanczyk's analysis. For now, a ranking integrating alignment and the ranking from (14) will be introduced.

In (13), it was illustrated that a candidate with the reduplicant infixed would fare just as well as a candidate where the reduplicant is prefixed according to Urbanczyk's ranking. For the present purposes, a ranking that selects (13a; 16a) over (13b; 16e), is introduced below in (16).

(16) ANCHOR-IO, NOCODA, OVERTEXPONENCE » ALIGN-RED-L » MAX-BR

/RED$_{cont}$ + wíqəs/	ANCHOR-IO	NOCODA	OVERT EXP	ALIGN-RED-L	MAX-BR
a. ☞ wíwəqəs		*		*	qəs
b. wíqəwəqəs		*		**!	s
c. wíqwəqəs		**!		*	əs
d. wíqəs		*	*!		wiqəs
e. wəwíqəs	*!	*			qəs

(17) **ANCHOR-IO**
The left edge of the grammatical word must align in both the input and output (no epenthesis/deletion at the edges) (McCarthy & Prince 1995)

The introduction of ANCHOR-IO, which states that the edge of the grammatical word must align in the input and output, in other words, no epenthesis or deletion at the edges, eliminates candidate (16e) from contention, as the reduplicant is occupying the left edge in the output. This constraint, along with ALIGN-RED-L also effectively eliminate possible candidates that suffix the reduplicant.

Reduplication itself has been motivated through the addition of OVERTEXPONENCE in the ranking (see 14), and the alignment of the reduplicant, similar to the forms introduced in (3a) and (11), has been accounted for through the integration of ALIGN-RED-L and ANCHOR-IO (see 16). Next, the pattern of continuative reduplication overlooked by Urbanczyk (1998), whereby the reduplicant is prefixed, as in (12), as opposed to infixed, as in (3a) and (11), is analyzed in §6.

6. Prefixed Alignment

The ranking from (16) proves to select the optimal candidate for forms patterning like (3a) and (11), but how can it account for forms where the alignment of the reduplicant is different? For example, in the forms in (12), where the reduplicant is also contributing the continuative tense of the verb, the reduplicant is prefixed onto the base. If the ranking from (16) stands, the would-be optimal candidate would obviously incur a violation of Anchor-IO. This particular question potentially poses a threat to the notion of true a-templaticism, in the sense that one set of ranked constraints may not be able to select the optimal output.

These consequences will be addressed below, but first a ranking that sufficiently accounts for the prefixed reduplicant is introduced and discussed. To recall from the ranking in (16), where the reduplicant was infixed after the initial *CV* sequence of the base, Anchor-IO dominated Align-Red-L, forcing the reduplicant to be infixed, while retaining base alignment between input and output. However, in cases of prefixation, Align-Red-L must clearly dominate Anchor-IO, forcing the reduplicant to align at the left edge.

(18) Align-Red-L, NoCoda, OvertExp » Anchor-IO » Max-BR

/RED_{cont} + xʷáθət/	Align-Red-L	NoCoda	Overt Exp	Anchor -IO	Max-BR
a. xʷáθət		*	*!		*****
b. ☞ xʷəxʷáθət		*		*	***
c. xʷəθxʷáθət		**!		*	**
d. xʷáxʷəθət	*!	*			***
e. xʷəθəxʷáθət		*		**!	*

Illustrated in (18) is the ranking for forms patterning like those in (12), where high-ranking Align-Red-L forces the reduplicant to align at the left edge of the base. It is by ranking Align-Red-L high that we eliminate the would-be optimal candidate (18d) according to the ranking in (16). This candidate exhibits the same pattern found in the forms in (11), whereby *C*^{1}*ə* of the root is infixed after the first *CV* sequence of the base. Furthermore, by using Anchor-IO as a gradient constraint, marking a violation for every syllable to the left of the initial syllable of the base in the output, it limits the prefixed reduplicant to one syllable, and NoCoda prohibits the copying of *θ*, as in failed candidate (18c). Thus, as according to a-templaticism, the size and shape of the reduplicant is defined by the ranking. However, the alignment variance, addressed below in §7, is still not accounted for.

7. Varied Alignment[6]

In Urbanczyk's analysis of continuative formation in Upriver Halkomelem, she analyzed four types presented in (3a-d). She did not, however, account for a fifth type of productive continuative formation that closely resembles that of (3a); however, the alignment of the reduplicant differs. Both forms exhibit the same shape for the reduplicant, that of *C¹ə*. Consequently, as it has already been discussed, the forms in (11) place the reduplicant after the first vowel of the base, whereas, the forms in (12) prefix the reduplicant onto the base. When different reduplicants exhibit different alignments or shapes and convey different semantic information, constraints that specifically address a particular morpheme based on its semantic function, for example the diminutive, are introduced into the ranking (Benua 1995; Coelho 1999; Urbanczyk 1995).

This proves inadequate here as both reduplicative patterns provide the same semantic content. Thus, a constraint such as Align-REDcont-L, which would state that the continuative morpheme must align at the left edge, is not possible because, although it would account for the prefixed forms, it would fail to motivate the optimal alignment of the infixed forms. The ranking for each alignment pattern is presented in (19).

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[6] Stuart Davis (personal communication) suggested an exciting alternative analysis. Salishan languages in their stress systems often exhibit a dominant/recessive stem alternation that is lexically marked. The repercussions for this analysis is that possibly continuative reduplication does not exhibit this varied alignment, but is rather only prefixed onto the morpheme. If the stem is dominant, then it retains its stress and the reduplicant looks as if it is prefixed. However, if the stem is recessive then stress will shift onto the reduplicant's vowel and give the appearance of an infixed reduplicant after vowel reduction.

(i) /p'έθ/ → <u>p'έ</u>p'έθ → [<u>p'έ</u>p'əθ] 'sew' – 'sewing'

I would have opted for this approach had I been able to find independent evidence for this dominant/recessive alternative. This is not to say that it does not exist, but rather that it is inconclusive based on what I was (un)able to find. An important note is that although this does simplify the reduplication analysis, it does not remove any of the burden from the lexicon, as these dominant/recessive traits must be lexically marked.

(19) Different Rankings
a. Accounts for reduplicative infixation, as in (11)
ANCHOR-IO, NOCODA, OVERTEXP » ALIGN-RED-L » MAX-BR
b. Accounts for reduplicative prefixation, as in (12)
ALIGN-RED-L, NOCODA, OVERTEXP » ANCHOR-IO » MAX-BR

In order to address the two rankings presented in (19) properly the similarities should first be made apparent. Both rankings show NOCODA and ANCHOR-IO governing the size of the reduplicant, and OVERTEXPONENCE militating against the input faithful candidate from being selected as optimal, while MAX-BR ranks low.

However, the most important aspect between the two rankings is the differences. Essentially, ANCHOR-IO and ALIGN-RED-L reverse their position, as ANCHOR-IO ranks high for the infixed forms, while ALIGN-RED-L ranks high for the prefixed forms. The goal, now that the individual problems have been laid out, is to formulate a combinatorial ranking of those in (19a) and (19b) that selects the optimal output for both the infixed and prefixed forms.

8. Multiple Input-Output Faithfulness Relations

Because an allomorphy conditioning statement could not be constructed, as there are no phonological characteristics of the base to distinguish the infixed forms in (11) from the prefixed forms in (12), it must be that the lexical bases are prespecified to take on different reduplicative alignments and thus different rankings. However, the notion of a single invariant ranking maintained throughout the language, a central tenet of OT, is in conflict. I propose to adopt a model of lexical stratification projecting multiple IO faithfulness relations to ALIGN in order to provide a solution for the problem at hand. First, however, a brief background addressing the development of this model and how it accounts for multiple rankings in Japanese is presented and discussed based on prior work, namely Fukazawa (1997). Then, how this model provides a meaningful solution to the problem presented above will be discussed, and finally I will show how the model as adopted here is in fact parallel to how it accounts for the Japanese data. This parallel is based on the learnability of the independent rankings. Finally, the advantages and possible repercussions of stratifying the lexicon and creating stratum specific constraints is addressed.

8.1 Japanese

In Japanese, according to Itô and Mester (1995), five distinct lexical strata are present based on the nativity of the lexical item.[7] These five strata are labeled *Yamato*, *Sino-Japanese*, *Mimetic*, *Foreign (Assimilated)* and *Alien (Unassimilated)*. The strata are phonologically grounded in that different processes occur in different strata. Itô and Mester (1995) argue that reranking of faithfulness constraints occurs in movement from the core strata, *Yamato* and *Sino-Japanese*, outward to the peripheral strata, *Foreign (Assimilated)* and *Alien (Unassimilated)*. Furthermore, they argue the plausibility of this occurring in an OT grammar because it is only the faithfulness constraints being reranked, while the markedness constraints remain fixed, and only their relative position to the faithfulness constraints is being altered.

However, according to Fukazawa (1997) and Fukazawa, et. al (1998), any reranking is in conflict with a core notion of Optimality Theory, a single invariant language-specific ranking. Thus, she provides a model based on multiple IO faithfulness relations that adequately accounts for the cross-stratum reranking argued for by Itô and Mester (1995). The central idea of this model is that for each lexical stratum there is a subset of faithfulness constraints that converge into one large invariant ranking.

As it was previously mentioned, Japanese exhibits five individual lexical strata that each exhibit distinct phonological operations. For example, in the *Yamato* and *Mimetic* strata, the phonological phenomenon of post-nasal voicing (formulated as PNV) occurs. This is accounted for by PNV dominating IDENT-[voice]-IO (Itô & Mester 1995; Fukazawa, et. al 1998) in the *Yamato* and *Mimetic* strata. This is illustrated in (20) using the form /kam-ta/ 'bite-past.'

(20) PNV » IDENT-[voice]-IO (Fukazawa, et. al 1998)

/kam-ta/	PNV	IDENT-[voice]-IO
a. ☞kanda		*
b. kanta	*!	

However, this same result does not occur in the *Sino-Japanese*, *Foreign*, and *Alien* stratums. Instead, IDENT-[voice]-IO dominates PNV, militating against

[7] McCawley (1968) originally acknowledged four lexical strata in Japanese. Itô and Mester (1995) later expanded upon these four, and created a fifth.

voicing identity loss in the output. This is illustrated in (21) evaluating the form /komp^{j}uutaa/ 'computer'.

(21) IDENT-[voice]-IO » PNV (Fukazawa, et. al 1998)

/komp^{j}uutaa/	IDENT-[voice]-IO	PNV
a. komb^{j}uutaa	*!	
b. ☞komp^{j}uutaa		*

Essentially, if the ranking from (20) were implemented here, the suboptimal output (21a), exhibiting post-nasal voicing, would be optimal. However, because the faithfulness constraint IDENT-[voice]-IO must be reranked into a dominating position over the markedness constraint PNV, voicing was retained from the input to the output.

According to Fukazawa, et. al (1998), however, a problem arises when a compound containing two bases from separate stratums is evaluated. One such example is [tombo-kenk^{j}uuka] 'a dragon-fly researcher', broken down as ([tombo]$_{\text{Yamato}}$ – [kenk^{j}uuka]$_{\text{Sino-Japanese}}$). In this 'hybrid', PNV must be ranked both high and low in order to contain the evaluation in one tableaux. It must be ranked high in order to compel post-nasal voicing in the *Yamato* form, and it must be dominated in the *Sino-Japanese* form, such that its effects cannot surface.

Therefore, Fukazawa (1997) proposes a model by which identity faithfulness constraints are composed of a subset of constraints each pertaining to one stratum. For example, for the constraint IDENT-[voice]-IO there exists:

(22) Split IO-faith for each stratum (Fukazawa, et. al 1998)

IO-Yamato	IDENT-[voice]-IO-Y
IO-Sino-Japanese	IDENT-[voice]-IO-SJ
IO-Mimetic	IDENT-[voice]-IO-M
IO-Foreign	IDENT-[voice]-IO-F
IO-Alien	IDENT-[voice]-IO-A

This simplifies the problem presented by compounds composed of bases from two distinct strata. In order to retain voicing in the *Sino-Japanese* base, IDENT-[voice]-IO-SJ must be ranked above PNV, which must be ranked above IDENT-[voice]-IO-Y, in order to motivate the post-nasal voicing in the *Yamato* compound. This is presented below in (23).

(23) IDENT-[voice]-IO-SJ » PNV » IDENT-[voice]-IO-Y (Fukazawa, et. al 1998)

/tompokenk^{j}uuka/	IDENT-[voice]-SJ	PNV	IDENT-[voice]-Y
a. tom**p**oken**k**^{j}uuka		**!	
b. tom**b**oken**g**^{j}uuka	*!		*
c. ☞tom**b**oken**k**^{j}uuka		*	*
d. tom**p**oken**g**^{j}uuka	*!		

The stratum-specific faithfulness constraints allow for phonological processes occurring in two distinct strata to surface in one ranking. By these means, it allows for a superior analysis over reranking because it calls for a single invariant constraint ranking standing throughout the language. A cost does exist, and that is in the marking of lexical items for their stratums. This cost, I believe, is not detrimental, but it is still of importance to discuss the advantages and ramifications of such a lexically dependent model. This is discussed in §8.4. Next, however, it will be illustrated how this model can be implemented to account for the Upriver Halkomelem data.

8.2 Multiple IO Faithfulness Relations in Upriver Halkomelem[8]

In the previous section, it was presented how a model of multiple input-output faithfulness relations (Fukazawa 1997; Fukazawa, et. al 1998) successfully captures one invariant constraint ranking that under previous analyses necessitated either reranking or multiple rankings.

In the Upriver Halkomelem data, it was found that the continuative reduplicant, formed when the base had non-sonorant initial consonant with a full stressed first vowel, took the shape of *Cˈə*. The size of the reduplicant was restricted by NOCODA and ANCHOR-IO.[9] However, it was also evident that the two patterns, both of which formed the continuative, displayed different alignments.

[8] Recently, I have become aware of Kurisu (2001), whereby the continuative reduplicant in UH is also analyzed, and an alternative to Urbanczyk (1998) is proposed. The analysis there is concerned with motivating the realization of the morpheme, and though the constraints and ranking differ from the analysis here, whereby all four patterns mentioned in §3 are accounted for, I believe that the same general result for the reduplication pattern is achieved.

[9] ANCHOR-IO only has size-limiting effects in forms similar to (12), where the reduplicant is prefixed.

The forms similar to those in (11) infixed the reduplicant, and the forms similar to (12) prefixed the reduplicant. Furthermore, no phonologically conditioned allomorphy was predictable, as there were no common phonological similarities within one set that made it distinct from the other set. Also, the items within each of the two sets did not display any semantic similarities. Thus, it must be that these two sets are lexically prespecified to take on different alignments as presented in (19). In other words, the allomorphy is morphologically conditioned. Inkelas, et. al (1997) argue that prespecification is indeed possible and favorable in an OT phonology over co-phonologies.

The central question of this paper is then, how can the varied alignment exhibited by the continuative reduplicants be accounted for in one invariant constraint ranking that would hold across the language? If different lexical classes and class/stratum-specific constraints are created, then the answer follows from the Japanese analysis in §8.1. It will be shown that, in fact, one single invariant ranking can be arrived upon.

Since the lexical items are prespecified to take different alignments, each set, (11) and (12), are marked in the lexicon as belonging to a distinct class. Furthermore, each of these class' rankings, namely the rankings in (19a) and (19b), combine to ultimately form one invariant ranking.

In (19), the two rankings responsible for continuative formation were compared to one another. It was noted that essentially, under a reranking perspective, ALIGN-RED-L and ANCHOR-IO would exchange dominance, whereby the ranking for the infixed forms in (11) exhibited ANCHOR-IO » ALIGN-RED-L and the ranking for the prefixed forms in (12) exhibited ALIGN-RED-L » ANCHOR-IO. Thus, these are the class-specific rankings discussed above and once again illustrated below in (24a) and (24b).

(24) Class/Stratum Rankings

(a) *S-cont^1*: ANCHOR-IO, NOCODA, OVERTEXP » ALIGN-RED$_{cont}^{1}$-L » MAX-BR

/RED$_{cont}^{1}$ + wíqəs/	OVERT EXP	NOCODA	ANCHOR-IO	ALIGN-RED$_{cont}^{1}$-L	MAX-BR
a. ☞ wíwəqəs		*		*	***
b. wíqəwəqəs		*		**!	*
c. wíqwəqəs		**!		*	**
d. wíqəs	*!	*			*****
e. wəwíqəs		*	*!		***

(b) *S-cont²*: ALIGN-REDcont²-L, NOCODA, OVERTEXP » ANCHOR-IO » MAX-BR

/REDcont² + xʷáθət/	ALIGN-REDcont²-L	OVERT EXP	NOCODA	ANCHOR-IO	MAX-BR
aa. xʷáθət		*!	*		*****
bb. ☞ xʷəxʷáθət			*	*	***
cc. xʷəθxʷáθət			**!	*	**
dd. xʷáxʷəθət	*!		*		***
ee. xʷəθəxʷáθət			*	**!	*

I arbitrarily label the infixed forms in class 1 and the prefixed forms in class 2. ALIGN-REDcont¹-L only evaluates class 1 verbs, and ALIGN-REDcont²-L evaluates only class 2 verbs. This is indicated in the tableaux by the shaded cells under the ALIGN constraints. It is this selective evaluation that allows the rankings to integrate into one, as exemplified by (25).

(25) ALIGN-REDcont²-L, OVERTEXP , NOCODA » ANCHOR-IO » ALIGN-REDcont¹-L » MAX-BR

/REDcont¹ + wíqəs/	ALIGN-REDcont²-L	OVERT EXP	NO CODA	ANCHOR-IO	ALIGN-REDcont¹-L	MAX-BR
a. ☞ wíwəqəs			*		*	***
b. wíqəwəqəs			*		**!	*
c. wíqwəqəs			**!		*	**
d. wíqəs		*!	*			*****
e. wəwíqəs			*	*!		***
/REDcont² + xʷáθət/						
aa. xʷáθət		*!	*			*****
bb. ☞ xʷəxʷáθət			*	*		***
cc. xʷəθxʷáθət			**!	*		**
dd. xʷáxʷəθət	*!		*			***
ee. xʷəθəxʷáθət			*	**!		*

The tableau in (25) provides a combinatorial ranking of the class-specific rankings, illustrating the ability for one invariant ranking to hold throughout the language when constraints are labeled class/stratum-specifically in cases of morphologically conditioned allomorphy. ALIGN-REDcont²-L ranked high successfully eliminates output candidate (25dd), which would otherwise force the necessity of two rankings. This illustrates that in forms similar to (12), the S^2 specific ALIGN-RED²-L forces the reduplicant to the left edge of the output in lexical items labeled for *residence* in S^2. These class specific constraints are only applicable to output evaluations where the input is labeled to *reside* in that stratum. Importantly, class 2 specific ALIGN-REDcont²-L does not evaluate class 1 inputs, which are evaluated against class 1 specific constraints. Again, NOCODA and ANCHOR-IO limit the size of the reduplicants to one *CV* syllable. By labeling the lexical items and creating ALIGN constraints that are essentially label specific, the goal of creating one invariant ranking is achieved.

One final note before moving on to the parallel between the Japanese and Upriver Halkomelem data. These constraints propagated into class/stratum specific constraints, should occur in each morphological category where morphologically conditioned allomorphy occurs. Constraint proliferation and the grammars heightened dependence on the lexicon is a cost, however, again I believe this cost is minimal for reasons discussed in §8.3 and §8.4.

8.3 Learnability Parallel

A serious question is the correlation between the Japanese data presented in §8.1 and the Upriver Halkomelem data presented in §8.2. In the Japanese data, the stratum specific faithfulness constraints were etymologically based. However, in the Upriver Halkomelem data, two productive patterns of reduplicative continuative formation appeared, and because no phonologically conditioned allomorphy of the alignment could be inferred, they were designated to separate classes.

The parallel between the two examples is drawn from the acquisition process. The learner has the ability to recognize and store different productive patterns with no prior linguistic knowledge as to the etymology of the particular morpheme, etc. In both cases the language learner is faced with multiple roots that sometimes do not exhibit identical patterns. For example, a child learning Japanese, will not have the capabilities to distinguish *kanda* from *komp^{j}uutaa*, where the former is native Japanese, and the latter is a borrowed form. Instead, they memorize the different rankings motivating the alternations and store them

(Fukazawa, et. al 1998). Then, why should the Upriver Halkomelem data deviate from this? The language learner of Upriver Halkomelem will be confronted with continuative reduplicants that take different alignments and will be forced to memorize and acquire them.

It appears the basis for creating classes or stratums is by no means contingent on etymology or class, so long as the allomorphy is not phonologically conditioned. Thus, if the forms must otherwise be memorized into different lexical classes, whether it be based on etymology or not, the lexicon must be stratified.

8.4 Advantages to Multiple IO Faithfulness Relations

In the previous sections, some possible ramifications for stratifying and expanding the lexicon were briefly discussed. In this section, these possible ramifications are expanded upon, and why they do not supercede the advantages this model creates is addressed.

Dividing the lexicon into classes or stratums causes a greater dependency of the grammar upon the lexicon, as well as forcing the language learner to memorize and store more information. Essentially, it forces the grammar to extract more information from the lexicon. This would undoubtedly impede the acquisition process. However, many languages exhibit similar cases in the form of classes. It has long been accepted in generative phonology that classes exist, and the learner is forced to memorize and store more than just lexical morphemes themselves, including the different morphological patterns they take on. Undoubtedly, in a non-Optimality Theoretic approach, classes would again need to be instantiated or recognized. Furthermore, if reranking was the method adopted here, lexical labels or stratums would still need to be recognized, just as they were in Itô and Mester (1995). Therefore, because these patterns were not phonologically or semantically conditioned, classes must be acknowledged, regardless of the framework or model adopted. Furthermore, the ranking in (25) allows for the two patterns to be evaluated in parallel.

Another advantage of adopting this model is that it operates within the notion of a-templaticism. No templates are recognized in the above analysis, only labels on lexical items and constraints. Thus, the notion of *CV* templates and their prespecified positions is escaped. The size, shape and position of the reduplicant are still entirely dependent upon the set of constraints, the core notion of a-templaticism. The stratum specific constraints do not infringe upon this notion of a-templaticism.

Finally, the need for reranking is eliminated. By stratifying the lexicon, and creating class/stratum-specific constraints, a single invariant constraint ranking holds across the language. Reranking causes a variant ranking after the acquisition process has been completed.

9. Conclusion

This paper has shown that an otherwise problematic pattern for Optimality Theory, that of multiple alignments for the same reduplicative morpheme, is sufficiently accounted for by stratifying the lexicon and creating class/stratum-specific constraints. In the analysis here, multiple class-specific ALIGN-RED-L constraints were created in order to account for the varied alignment exhibited by the continuative morpheme. Evidence supporting such a model was presented from Japanese, and it was shown that these cases were parallel based on the acquisition process. Even though the Japanese patterns were etymologically based and the Upriver Halkomelem patterns appeared class based, during the acquisition process the language learner is required to memorize the different patterns with no prior knowledge of the origin of the morpheme. The advantages and ramifications of this model were also assessed, illustrating that the positive aspects far outweigh the negative. Classes have long been acknowledged in language, and this model sufficiently and efficiently equips Optimality Theory to handle them. The propagation of multiple IO constraints acknowledges the existence of classes, while allowing for a single invariant ranking to hold across the language.

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