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*Quantity, stress and reduplication in Washo**

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Plural internal reduplication in Washo has generated much interest in the phonological literature. This study presents a novel analysis that unifies the treatment of a set of seemingly disparate aspects of this plural reduplication pattern (e.g. variation in the placement and size of the reduplicant, contrastive vowel length in stressed syllables, post-tonic gemination, and vowel-length inheritance in reduplication), relying on the interaction between constraints on weight assignment, affix anchoring and stress assignment. In particular, the odd placement of the plural reduplicant in roots with internal consonant sequences and the restricted distribution of long vowels in Washo can be attributed to a previously unnoticed emerging preference for heavy stressed syllables on the surface. The results of this study have implications for theories of reduplication and theories of weight phenomena in general.

1 Introduction

Plural internal reduplication in Washo has generated much interest in the phonological literature. The main problems centre on the nature of the reduplicant and its distribution. On the surface, the plural reduplicant generally appears in a CV sequence as the penultimate syllable. However, several complications involving vowel length, root-internal clusters and vowel alternation obscure this simple pattern. Traditional analyses assume that the reduplicant is VCV in shape (Winter 1970, Broselow & McCarthy 1983; see also Jacobsen 1964), while more recent treatments advocate a CV or monomoraic view of the reduplicant. The placement of the reduplicant has also been a subject of much debate. Some argue that the reduplicant appears before the stressed vowel (Jacobsen 1964, Winter 1970), while others contend that the reduplicant appears after the first consonant (Broselow & McCarthy 1983) or after the first CV (Urbanczyk 1993) of the root.

Recent work has shown that many phonological patterns can be more insightfully understood as emergent properties from the interactions of

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basic constraints. For example, contextually dependent coda consonant weight and other coerced weight phenomena, as Morén (2001) calls them, are the consequence of constraint interaction that determines the moraicity of vowels and consonants (e.g. Rosenthall & van der Hulst 1999, Morén 2000, 2001). Similarly, much discussion in recent years has focused on eliminating the need for a templatic approach to reduplication (e.g. McCarthy & Prince 1994b, Urbanczyk 1996, Spaelti 1997, Walker 2000). Size restriction on reduplicants, for example, has been viewed as a property resulting from the emergence of the unmarked ranking pattern, where the effect of a size-restricting constraint that minimises structure emerges in situations where input–output faithfulness is not relevant (McCarthy & Prince 1994b, Spaelti 1997, Walker 2000, Kurisu 2001).

This paper draws on the insights of these studies and argues for a unified and a-templatic approach to Washo reduplication. I show that the placement and the size of the plural reduplicant depend crucially on the interaction between constraints on affix anchoring, stress and weight assignments. In particular, I propose that the reduplicant must be anchored to the left edge of the stressed syllable. It always appears in the penult, because main stress must be on the penult in polysyllabic words in Washo. Variable coda weight also plays a significant role in the distribution of the reduplicant, despite the fact that closed syllables do not attract main stress. The analysis advanced in this paper thus offers a unified treatment of four seemingly disparate aspects of plural reduplication (variation in the placement and size of the reduplicant, contrastive vowel length in stressed syllables and vowel-length inheritance in reduplication) relying on general cross-linguistically motivated constraints. This analysis goes beyond previous analyses not only in terms of its empirical coverage but also in eliminating the need for a host of unnecessary stipulations (e.g. a set of complicated vowel-coalescence and vowel-deletion rules) characteristic of earlier analyses. The results of this study also have implications for theories of reduplication and theories of weight phenomenon in general.

This study begins with the presentation of some background information on Washo in §2.1. The basic pattern of Washo plural formation is presented in §2.2. In §3, I offer an a-templatic analysis of the plural formation couched within Optimality Theory (McCarthy & Prince 1993, 1995, Prince & Smolensky 1993). §4 looks at previous analyses of this phenomenon and argues that none is sufficient in capturing the full range of generalisations. The conclusion appears in §5.

2 Aspects of Washo phonology and morphology

2.1 Washo: the basics

Washo is a severely moribund language spoken in an area around Lake Tahoe, California and Nevada. Data cited in this study are accompanied by their source. The principal source of data is Jacobsen's (1964) dissertation on the grammar of Washo. Examples are cited with the code ‘Jx’, where ‘x’ is a page number. Earlier works on the Washo language, such as Kroeber’s (1907) grammatical sketch of Washo (cited as ‘Kx’), have also been consulted. Additional data are based on my own fieldwork. Examples cited in the paper are given in broad IPA transcription.

The phonemic inventory of Washo consonants is shown in (1). In the coda position, the three-way laryngeal contrast neutralises toward voicelessness.

(1)	p	t			k	ʔ
	b	d	dz		g	
	p’	t’	ts’		k’	
		s		ʃ		h
	m̥				ŋ̊	
	m	n			ŋ	
	w̥	ɬ		j̊		
	w	l		j		

The phonemic inventory of Washo vowels is given in (2) (Jacobsen 1964, 1996). While the glides [j w] are in complementary distribution with the short high vowels [i u], there is no alternation that supports analysing glides as underlying high vowels. Moreover, given that there are no voiceless vowels in Washo, glides are also better analysed as consonantal, by reason of symmetry in the voiced and voiceless sonorant series.

(2)	i	iː	ɨ	ɨː	u	uː
	e	eː			o	oː
			a	aː		

Stress is assigned to stems and is generally on the penultimate syllable (see further discussion in §3.1). Long vowels are found only in stressed syllables.

2.2 Plural reduplication in Washo

Washo employs partial reduplication to denote plurality in nouns and pluractionality in verbal domains:[1]

[1] Most monomorphemic roots are disyllabic and many contain identical vowels, which suggest that there might be vowel harmony in Washo, at least root-internally. Disharmonic roots (e.g. /ˈwulpi/ (a man’s name), /ˈts’otgiʔ/ ‘blackbird’) are not uncommon, however. There seems to be some suggestive evidence that vowel harmony was productive at an earlier point in time. For example, certain prefixes show root-governed allomorphy where an allomorph with the vowel /a/ is selected when the first vowel of the root is /a/ or /o/, otherwise the allomorph with /e/ is selected (e.g. /daˈwaːlaʃ/ ‘his bread’ but /deˈʃuyep/ ‘his noise’). A full-scale treatment of the status of vowel harmony in Washo would take us too far afield at this point. Since vowel harmony has no direct bearing on plural formation, I leave the topic for further research.

(3) *singular*	*plural*		
ˈdaʔa	daˈʔaʔa	‘mother’s brother’	J323
ˈʔelel	ʔeˈlelel	‘mother’s father’	J325
ˈgewe	geˈwewe	‘coyote’	J335
ˈbɨk’ɨ	bɨˈk’ɨk’ɨ	‘grandmother’s sister’	J326
ˈsukuʔ	suˈkukuʔ	‘dog’	J326
ˈguʃuʔ	guˈʃuʃuʔ	‘pet’	J326
ˈguʔu	guˈʔuʔu	‘mother’s mothers’	J326
ˈdamal	daˈmamal	‘to hear’	J325
ˈbokoŋ	boˈkokoŋ	‘to snore’	J323
ˈbiŋil	biˈŋiŋil	‘to try’	J336
ˈp’isew	p’iˈsesew	‘ear’	J326

The reduplicant is generally CV in shape. Reduplication never copies derivational or inflectional prefixes or suffixes (e.g. /ˈt’eːliw/ ‘to be a man’ (J325) *vs.* /t’eˈliːliw/ ‘to be a man.PL’ (J325); /ˈt’eːliw-hu/ ‘man’ (K272) *vs.* /t’eˈliːliw-hu/ ‘men’ (K272)). At first glance, Washo plural formation appears to be a straightforward instance of root-final syllable reduplication with final-consonant extrametricality. That is, /p’iˈsesew/ ‘ear’ can be parsed as /p’iˈse-se-w/. Kroeber (1907) advocates this line of analysis, arguing, for example, that the reduplicated form of /ˈgewe/ ‘coyote’ is /geˈwe-we/ ‘coyotes’. Several aspects of the plural reduplication formation obfuscate this simple analysis.

To begin with, when a root contains an internal consonant sequence, the reduplicant is lodged before the sequence (the reduplicant is underlined).

(4)			
ˈʔew.ʃiʔ	ʔeˈʃiw.ʃiʔ	‘father’s brothers’	J292
ˈnen.t’uʃ	ne.ˈt’un.t’u.ʃ-u	‘old women (-u = NOMINALISER)’	J289
ˈsak.sag	sa.ˈsak.sag	‘father’s father’s brother’	J330
ˈmok.go	mo.ˈgok.go	‘shoe’	J336

The suffixing reduplication with final consonantal extrametricality analysis described above predicts the reduplicated form of /ˈʔewʃiʔ/ ‘father’s brother’ to be */ʔewˈʃiʃiʔ/, which is incorrect. The attested form is /ʔeˈʃiwʃiʔ/, suggesting that the reduplicant is infixed much further inward than is expected under an extrametricality analysis. To be sure, the reduplicant cannot be analysed as appearing before the final syllable, since the expected plural form of a root with internal consonant sequence like /ˈmokgo/ would have been */mok.ˈgo.go/. The actual attested forms, e.g. /mo.ˈgok.go/, would always appear one consonant away from the last syllable.

What motivates this seemingly odd distribution of the reduplicant? The answer seems to be connected to the fact that the first consonant of the internal consonant sequence always serves as the coda consonant of the stressed syllable. I call this the CODA ATTRACTION PUZZLE – the stressed syllable appears to attract coda consonants.

Another puzzling feature of Washo plural reduplication is the behaviour of vowel length. As noted above, long vowels are found only in the stressed syllable, which is generally on the penult. When a root with a long vowel is reduplicated, the long vowels in the singular and the plural forms do not match (5b).

	singular	*plural*		
(5) a.	ˈʔelel	ʔeˈ<u>le</u>lel	‘mother’s father’	J335
	ˈsukuʔ	suˈ<u>ku</u>kuʔ	‘dog’	J336
	ˈguʃuʔ	guˈ<u>ʃu</u>ʃuʔ	‘pet’	J336
	ˈdamal	daˈ<u>ma</u>mal	‘to hear’	J336
	ˈbokoŋ	boˈ<u>ko</u>koŋ	‘to snore’	J336
	ˈbiŋil	biˈ<u>ŋi</u>ŋil	‘to try’	J336
b.	ˈʔaːt’u	ʔaˈ<u>t’oː</u>t’o[2]	‘older brother’	J341
	ˈmaːgu	maˈ<u>goː</u>go	‘sister’s child’	J341
	ˈmoːk’o	moˈ<u>k’oː</u>k’o	‘knee’	J325
	ˈt’eːliw	t’eˈ<u>liː</u>liw	‘to be a man’	J325
	ˈmeːhu	meˈ<u>huː</u>hu	‘to be a boy’	J325
	ˈʔeːbu	ʔeˈ<u>buː</u>bu	‘mother’s father’s brother’	J325
	ˈwaːʃiw	waˈ<u>ʃiː</u>ʃiw	‘Washo’	J325

For example, in the singular form of the word meaning ‘Washo’, the long vowel is /aː/, yet in the plural, thus reduplicated, form, the long vowel is /iː/. What mechanism accounts for this transfer of vowel length? Quantitative transfer in reduplication has been documented in the literature (e.g. in Mokilese; Levin 1983, McCarthy & Prince 1986). That is, the vowel length of the base is copied in the reduplicant. However, in the case of Washo, the base of reduplication does not contain a long vowel (for example, the base of reduplication in /waˈʃiːʃiw/ ‘Washos’ is /-ʃiw/, which does not contain a long vowel). It appears that vowel length prefers to be maintained on the penult, no matter what the melodic content is. I refer to this property as MORAIC STABILITY.[3]

The final intriguing aspect of Washo reduplication is the nature of the reduplicant itself. As reviewed above, the reduplicant may surface as either a monomoraic syllable (3) or a bimoraic syllable (5b). Yet, when the stem is vowel-initial (6), the reduplicant is merely an onset consonant.

[2] The alternation of underlying /o/ with /u/ will not be discussed in this paper. The reader is referred to discussion in Urbanczyk (1993) for more information.

[3] For other cases of moraic stability, see Urbanczyk (1993).

(6) a.	ˈahad	ˈh̲ahad	'across'	J327
	ˈaŋkaʃ	ˈk̲aŋkaʃ	'hollow'	J330
	ˈemts'i	ˈt̲s̲'imts'i-ji	'they wake up (-i = IMPERF)'	J292
b.	ˈakd	ˈk̲akd	'slowly'	J331
	ˈawd	ˈw̲awd	'over the summit'	J331
	ˈaʔm	ˈʔ̲aʔm	'to the west, from the east'	J332
c.	ˈaːm	ˈm̲a̲ːm	'to hit with body part'	J332
d.	ˈim	ˈm̲e̲m[4]	'out from'	J339
	ˈiw	ˈw̲ew	'in a certain direction'	J339

Let us now summarise what has been discussed thus far. In this section, I have introduced the three main puzzles concerning Washo plural formation.

(7) *Three puzzles of Washo plural formation*

a. *Coda Attraction*
A word-internal coda consonant appears to be attracted to the stressed syllable.
Consequence: The reduplicant appears before the root-internal consonant sequence, irrespective of the syllable boundary.

b. *Moraic Stability*
Vowel length remains in the stressed syllable regardless of the melodic content.
Consequence: The reduplicant is long when the input penultimate vowel is long.

c. *Size Variation*
The reduplicant may surface as CV, CVV or C.

In what follows, I argue for a theory that unifies the treatment of these puzzling aspects of Washo plural formation by appealing to the general properties of the metrical and moraic phonology of the language.

3 Reduplication and stress

Three novel observations regarding the tendencies of Washo phonology are paramount to the analysis advanced in this study:

(8) *Three tendencies in Washo phonology*

a. The plural reduplicant must lodge within the stressed syllable.
b. The stressed syllable must be heavy (i.e. CVV or CVC) in Washo.
c. Heavy syllables are only allowed in stressed positions.

[4] The alternation involving an underlying onsetless /e/ raising to /i/ will not be discussed in this paper. For more discussion of this phenomenon, see Urbanczyk (1993).

As I will establish below, the Moraic Stability effect falls out naturally from the combined effects of these properties of Washo. Vowel length occurs on the penult since stress is on the penult. Thus when a root with a long vowel is reduplicated, the reduplicant, which must appear within the stressed syllable, becomes the host of the length-contributing mora as well. The fact that the plural reduplicant lodges before the root-internal consonant sequence stems from the requirement that all stressed syllable must be heavy in Washo (i.e. the Stress-to-Weight constraint). Once again, since the reduplicant must be within the stressed syllable and since only the stressed syllable can host a moraic coda, the stressed syllable, which sponsors the monomoraic reduplicant, absorbs the coda of the initial syllable of root, thus satisfying Stress-to-Weight without sacrificing faithfulness or increasing markedness. Finally, the size of the reduplicant is restricted by the fact that the reduplicant is bounded by the stressed syllable. Given that stress is on the penult generally and that the reduplicant must draw its melodic content from the right, the size of the reduplicant must be no larger than a syllable, since the base of reduplication can be no larger than the final syllable.

In what follows, I provide a detailed account of how the various factors of Washo phonology interactions, using the framework of Optimality Theory (McCarthy & Prince 1993, 1995, Prince & Smolensky 1993). The presentation of the analysis begins with a preliminary discussion on stress assignment in Washo. This will set the stage for the remainder of this paper, which will develop further the analysis of stress and how it interacts with plural formation in Washo.

3.1 Stress assignment in Washo: some preliminaries

An examination of the available data reveals that stress is a property of the stem, which for the present purpose is defined maximally as a reduplicated root. Inflectional affixes generally do not receive stress. For example, as illustrated in (9), both the 1st person possessive prefix /le-/ and the attributive-possessive suffix /-iʔ/ are unstressed.[5] Stress remains on the stem-initial syllable.

(9)	ˈʔelel	‘mother’s father’	J476
	le-ˈʔelel-iʔ	‘my daughter’s child (of a man)’	J413
	ˈguʔu	‘mother’s mother’	J476
	le-ˈguʔu-jiʔ	‘my daughter’s child (of a woman)’	J413

However, reduplication is within the domain of stress assignment. As illustrated in (10), primary stress is consistently penultimate, despite the

5 The derivatives of the attributive suffix are ‘the reciprocal kinship terms for the corresponding relatives of the descending generations’ (Jacobsen 1964: 475). For example, /leˈʔeleliʔ/ ‘my daughter’s child (man speaker)’ literally means ‘the one who has me as mother’s father’.

fact that the segmental content of the stressed syllable in the singular form does not always match that of the plural form.

(10)	*singular*	*plural*		
	ˈdamal	daˈmamal	‘to hear’	J336
	ˈbokoŋ	boˈkokoŋ	‘to snore’	J336
	ˈbiŋil	biˈŋiŋil	‘to try’	J336
	ˈp’isew	p’iˈsesew	‘ear’	J326
	ˈʔaːt’u	ʔaˈt’oːt’o	‘older brother’	J341
	ˈmaːgu	maˈgoːgo	‘sister’s child’	J341
	ˈmeːhu	meˈhuːhu	‘to be a boy’	J325

As shown in (11), stress remains on the penult of the reduplicated stems, rather than on the penult of the inflected forms.

(11)	ˈʔelel	‘mother’s father’	J476
	le-ˈʔelel-iʔ	‘my daughter’s child (of a man)’	J413
	le-ʔeˈlelel-iʔ	‘my daughter’s children (of a man)’	J413
	ˈbɨk’ɨ	‘grandmother’s sister’	J476
	le-ˈbɨk’ɨ-jiʔ	‘my sister’s child (of a woman)’	J413
	le-bɨˈk’ɨk’ɨ-jiʔ	‘my sister’s children (of a woman)’	J413

While main stress is generally on the penult (e.g. /maˈsat’i/ ‘flint arrowhead’; J84), it may surface on the final syllable if the final syllable contains a long vowel.

(12)	guˈkuː	‘owl sp.’	J84
	muˈdaːl	‘winnowing basket’	J90
	dawmaʔˈgaːp	‘wet place’	J90
	t’uˈgiːs	‘basket sp.’	J90
	ʃuʔˈweːk	‘clam’	J413

Closed syllables do not in general attract stress, however. As shown below, main stress remains on the penult regardless of whether the antepenult (13a) or the final position (13b) contains a closed syllable.[6]

[6] To the best of my knowledge, the only lexical exception where stress is not on the penult and the stressed syllable does not contain a long vowel is the plural form of /ˈsesm/ ‘to vomit’, which has final stress: /seˈsesm/ (J338). The singular form is pronounced as /sesɨm/ in isolation but as /ˈsesmi/ when a vowel-initial suffix is added. The [ɨ] might be analysed as either underlying (and sometimes deleted post-tonically) or as epenthesised, to break up word-final clusters. While further investigation is needed, there is at least some suggestive evidence that the post-tonic deletion analysis is on the right track. Words transcribed with an alternating post-tonic /ɨ/ by Jacobsen (e.g. /ˈlahɨl/ ‘my leg’ (J234) *vs.* /ˈlahla/ ‘in my leg’ (J78)) are regularly pronounced by one of my Washo linguistic consultants with /ɨ/ retained, even when the root is followed by a vowel-initial suffix (e.g. [ˈlahɨla] ‘in my leg’). If this post-tonic vowel-deletion analysis is correct, the unusual stress assignment in /seˈsesm/ ‘to vomit.PL’ might be evidence that stress assignment is based on the unreduced variant /seˈsesɨm/, in which case the general penultimate assignment of main stress is maintained.

(13) a.	dewˈhiwi	‘thunder’	J79
	bukˈweweʔ	‘log’	J87
	dewesˈk’iʔim	‘cold wind’	J103
	meʃˈgits’et	‘arrow’	J104
	balˈŋats’aŋ	‘antelope brush’	J109
b.	p’uˈʃalaʔ	‘mouse’	J84
	daˈlaʔak	‘mountain’	J175
	daˈkajaw	‘black-faced’	J175
	p’aˈgaʔaw	‘soda spring’	J175

Formally, the assignment of stress on the stem-penultimate syllable can be captured in terms of the constraints in (14), all commonly found in other OT analyses of stress assignment. Following Kager (1999), I use the ‘cover constraint’ FtForm as a shorthand notation for two undominated constraints that together define the trochee as the only licensed foot structure in Washo.

(14) a. Anchor-R(HdFt, PWd) (Anchor-HdFt)
The right edge of the head foot has a correspondent with the right edge of the Prosodic Word.

b. FtForm
A foot must be trochaic.
i. FtBin: Feet are binary under moraic or syllabic analysis.
ii. RhType = T: Feet are left-headed.

c. Weight-to-Stress (WSP)
A heavy syllable must be stressed (Prince 1990).

d. Parse-σ
Every syllable must be footed.

The basic stress pattern of Washo can be accounted for by the following constraint ranking: FtForm, Anchor-HdFt, WSP ≫ Parse-σ. An illustration of this analysis is given in (15). To keep this illustration simple, the input, /maˈsat’i/ (J84), contains only CV syllables, with no internal consonant sequences or long vowels. Only candidates with faithful segment content are considered at this point.

(15)

/masat’i/	FtForm	Anchor-HdFt	WSP	Parse-σ
☞ a. ma(ˈsat’i)				*
b. ma(saˈt’i)	*!			*
c. (ˈmasa)t’i		*!		*
d. (ma)(ˈsat’i)	*!			

As illustrated, (15a) is the winning candidate. (15b) is ruled out by the grammar, since it has an iambic foot rather than a trochaic one. (15c) is eliminated since the right edge of the head foot does not correspond to the right edge of the Prosodic Word, thus incurring a fatal violation of ANCHOR-HdFt. While the ranking between FTFORM and ANCHOR-HdFt is not crucial, (15d) shows that FTFORM must outrank PARSE-σ. All syllables in (15d) are exhaustively parsed, but it is eliminated nonetheless, since the parsing of the initial syllable produces a foot in the output that fails the binarity requirement of FTFORM.

The importance of the Weight-to-Stress Principle is apparent when the input contains a long vowel. Main stress is on the last syllable, rather than the penult, since a candidate with penultimate stress would fatally violate WSP (16c). The final syllable can support a stressed foot since it is binary at the level of the mora. PARSE-σ violations can be avoided if the output is assigned a right-headed foot; however, such a candidate would fatally violate FTFORM.

(16)

/guku$_{\mu\mu}$/	FTFORM	ANCHOR-HdFt	WSP	PARSE-σ
☞ a. gu(ˈku$_{\mu\mu}$)				*
b. (guˈku$_{\mu\mu}$)	*!			
c. (ˈguku$_{\mu\mu}$)			*!	

The next section focuses on how stress is linked to the placement of the reduplicant.

3.2 Infixing reduplication by way of prosodic anchoring

As alluded to earlier, the reduplicant must anchor with respect to the stressed syllable, which I analyse here as the head of a stressed foot. In particular, the left edge of the plural morpheme must have a correspondent at the left edge of a stressed syllable. No special mechanism is needed to account for the infixing distribution of the plural morpheme. When the left edge of the stressed syllable coincides with the left edge of the output, the reduplicant appears as a prefix (e.g. /ˈakd/ → /ˈkakd/ 'slowly.PL'). However, the plural morpheme invariably appears as an infix when the output is longer than two syllables, since the plural reduplicant is left-anchored with respect to the stressed syllable, which is on the penult in most polysyllabic forms.[7] Thus, infixation obtains only when there is a mismatch between the edges of the output and of affix anchoring (see Yu 2003 for more discussion of the phonological subcategorisation approach to infixation). Since there is no evidence that

[7] This analysis predicts that the reduplicant will appear in the final syllable when stress is on the final syllable. However, to the best of my knowledge, none of the roots that receive final stress (see (12)) is ever reduplicated (cf. note 6 above). Unfortunately, since the semantics of plural reduplication is not fully understood, it is unclear at this point whether this gap is accidental or whether it reflects something more systematic about the distribution of the plural reduplicant.

ANCHOR(PL) is ever violated on the surface, this constraint is assumed to be undominated.

(17) ANCHOR-L(PLURAL, $\acute{\sigma}$) (ANCHOR(PL))
The left edge of the plural morpheme has a correspondent with the left edge of the stressed syllable.

The phonological exponence of the plural morpheme is assumed not to be lexically specified. Its segmental content is filled in by way of reduplication. In this section, I develop an analysis that accounts for the basic patterns of plural reduplication in Washo. I assume the correspondence model of faithfulness, as articulated in McCarthy & Prince (1995). However, a departure from the traditional treatment of reduplicative copying will be introduced in §3.2.2.

3.2.1 *Deriving the variation in the size of the reduplicant.* The variation in the size of the reduplicant is derived from the interaction of markedness and faithfulness constraints. There are various proposals presented in the literature on how exactly this can be accomplished. Generalised Template Theory (McCarthy & Prince 1994b, Urbanczyk 1996), for example, advocates the view that reduplicative morphemes are underlyingly specified for morphological category (e.g. affix or root) and are subject to morphology–prosody interface constraints specifying the unmarked prosodic shape of each morpheme category. Here I assume that the variation in the size of the reduplicant is the consequence of an emergence of the unmarked ranking pattern where the effect of a structure-minimising constraint emerges in situations where input–output faithfulness is not relevant (McCarthy & Prince 1994b, Spaelti 1997, Walker 2000, Kurisu 2001). In particular, reduplication is compelled by the ranking REALISE-$\mu \gg$ INTEGRITY-IO. REALISE-μ is a type of faithfulness constraint that requires every underlying morpheme to receive some phonological exponence (Kurisu 2001), while INTEGRITY-IO requires that the integrity of an input segment be preserved in the output. Reduplication is thus treated as a case of segmental fission (see Kurisu 2001 and Feng 2003 for similar proposals).

(18) a. REALISE-μ
Let α be a morphological form, β be a morphosyntactic category and F(α) be the phonological form from which F($\alpha+\beta$) is derived to express a morphosyntactic category β. Then REALISE-μ is satisfied with respect to β iff F($\alpha+\beta$) $\neq$ F(α) phonologically (Kurisu 2001 : 39).

b. INTEGRITY-IO
No element of the input has multiple correspondents in the output (McCarthy & Prince 1995).

As illustrated in (19), despite incurring several violations of the INTEGRITY constraint, (19a) crucially satisfies REALISE-μ by maintaining the contrast between the singular and the plural forms by expanding the size of the input through segment duplication.

(19)

/p’is$_i$e$_j$w, PL/	REALISE-μ	INTEGRITY
☞ a. p’i(ˈ<u>s$_i$e$_j$</u>s$_i$e$_j$w)		**
b. (ˈp’is$_i$e$_j$w)	*!	

This approach to reduplication is similar in spirit to recent treatments of phonological duplication (e.g. Rose 1997, Kawu 2000, Ussishkin 2000, Goad 2001, Bissell 2002, Zuraw 2002, Feng 2003, Nelson 2003, Yu 2003, 2004, 2005, Inkelas 2005, Inkelas & Zoll 2005). In phonological duplication, the force that drives segmental fission is phonological, such as for reasons of syllable markedness or prosodic templatic requirement satisfaction.

The actual size of the reduplicant is determined by the interaction between REALISE-μ, ANCHOR(PL), and two other markedness and faithfulness constraints: *STRUC, a markedness constraint that penalises the presence of any phonological structure on the surface, and MAX-IO(seg), a constraint that penalises deletion of input materials on the surface.

(20) a. *STRUC
Assign a violation to each segment present in the output.

b. MAX-IO(seg)
An input segment must have an output correspondent.

An emergence of the unmarked ranking pattern, REALISE-μ, ANCHOR(PL), MAX-IO(seg) ≫ *STRUC, is realised due to the dominance of MAX-IO(seg) over *STRUC. The tableau in (21) illustrates how the constraints interact with each other.

(21)

/p’isew, PL/	REALISE-μ	ANCHOR(PL)	MAX-IO(seg)	*STRUC
☞ a. p’i.(ˈ<u>se</u>.sew)				*******
b. p’i.(ˈ<u>sew</u>.sew)				********!
c. (ˈp’i<u>w</u>.sew)		*!		******
d. (ˈp’i.sew)	*!			*****
e. p’i.(ˈ<u>se</u>.se)			*!	******

Candidate (21b), where the reduplicant (underlined) faithfully copies the entire final syllable, illustrates the minimising function of *STRUC. Reduplicative copying is on an as-need basis. All else being equal, the grammar prefers candidates that duplicate less material. The constraint REALISE-μ, which requires all morphemes to have some phonological exponent, must dominate *STRUC, otherwise reduplication would not obtain (21 d). As illustrated by (21e), MAX-IO(seg) must dominate *STRUC, since segmental deletion is not a viable strategy to minimise phonological complexity in the output; segments in the input must also be faithfully reproduced in the output.[8]

The main advantage of this analysis is that it accounts for the variation in the size of the reduplicant, despite the fact that no templatic constraint regulating the size of the reduplicant is assumed. That is, when the input is consonant-initial, the reduplicant must be at least a CV sequence, due to the combined effect of ANCHOR(PL) and *STRUC. When the root is vowel-initial, however, this analysis correctly predicts that the size of the reduplicant is a single onset consonant. When competing candidates are equally well-formed from the perspective of the dominating constraints (i.e. REALISE-μ, ANCHOR(PL) and MAX-IO(seg)), as illustrated in (22), the candidate that duplicates less material is always the winner.

(22)

/ahad, PL/	*STRUC
☞ a. ˈhahad	*****
b. aˈhahad	******!

Now consider an input with a word-internal sequence of consonants:

(23)

/ʔewʃiʔ, PL/	ONSET	ANCHOR(PL)	*STRUC
☞ a. ʔe.(ˈʃi-w.ʃiʔ)			********
b. ʔew.(ˈʃiʔ.ʃiʔ)			*********!
c. ʔew.(ˈʃi.ʃiʔ)[9]		*!	********
d. ʔe.(ˈwiʔ.ʃiʔ)		*!	********
e. ʔew.(ˈʃiʔ.ʃi)		*!	********
f. ʔe.(ˈwi.ʃiʔ)		*!	*******
g. ʔe.(ˈiw.ʃiʔ)	*!		*******

Once again, candidates such as (23b), where the reduplicant faithfully copies the entire final syllable, is ruled out due to the constraint *STRUC. The plural morpheme anchoring constraint alone effectively rules out any non-penultimate placement of the reduplicant (i.e. (23c–e)), since stress must be penultimate in polysyllabic forms without long vowels. The failure of (23f) is significant here. (23f) is ruled out despite the fact that it has fewer segments on the surface than (23a). This shows that it is more important to satisfy the anchoring requirement of the reduplicant

[8] REALISE-μ cannot be satisfied by non-reduplicative epenthetic segments. According to the Consistency of Exponence hypothesis articulated in McCarthy & Prince (1993), epenthetic elements posited by GEN will have no morphological affiliation.

[9] The phonetically identical, but analytically different, candidate [ʔew(ˈʃiʃiʔ)] is left out of this evaluation for expository reasons. We shall discuss its significance in (34) and resolve the problem raised by such a candidate in (45).

than to minimise structure (i.e. ANCHOR(PL) ≫ *STRUC). Like (23f), (23g) has fewer segments than the winning candidate. Its reduplicant is also properly anchored. Yet it is ruled out, due to the effect of ONSET. Since ONSET is an exceptionless requirement in Washo, it will not be considered further in the subsequent evaluations, in order to simplify the tableau presentation. Finally, assuming the base of reduplication is always to the right of the reduplicant (see discussion below), ANCHOR(PL) also has the interesting effect of restricting the size of the reduplicant to no larger than a syllable, since the base of the reduplicative copy always coincides with the final syllable, given that the reduplicant must be on the penult. Proper anchoring *per se* does not generate the correct output, however. The problem lies in the fact that the base of reduplication has yet to be specified in the analysis. Consider the tableau below:

(24)

/ʔ$_i$ewʃiʔ$_j$, PL/	REALISE-μ	ANCHOR(PL)	MAX-IO(seg)	*STRUC
☞ a. ʔ$_i$e.(ˈ$\underline{\text{ʃi}}$w.ʃiʔ$_j$)				********
☹ b. ʔ$_i$e.(ˈ$\underline{\text{ʔ}_i\text{e}}$w.ʃiʔ$_j$)				********

The analysis thus far provides no mechanism for distinguishing candidates (24a) and (24b), where the reduplicant is properly anchored in both positions. The only difference between (24a) and (24b) is the melodic content of the respective reduplicants: (24b) draws its melodic content from the left, while (24a) draws its content from the right. To differentiate these two candidates, the grammar must know how the base of reduplication is determined and evaluated.

3.2.2 *Deriving the 'base' by directional surface correspondence.* Traditional OT models of reduplication assume that when the reduplicant is prefixing, the base is to its right; if the reduplicant is suffixing, the base is to its left (e.g. Kager 1999). Urbanczyk (1996, 2000) formalises this implicit assumption by appealing to the notion of 'tropism', which is used in referring to edges. A 'tropic edge' is the edge immediately following the reduplicant if the reduplicant is a prefix, or immediately preceding the reduplicant if it is a suffix (Urbanczyk 1996: 272). To capture Marantz's (1982) observation that the unmarked association for prefixes is from left to right, but from right to left for suffixes, she posits the Adjacent String Hypothesis, which states that the base is the string adjacent to the reduplicant, such that it begins at the tropic edge. While such an analysis works for most cases of reduplication, the issue is more complicated with infixing reduplication, since what constitutes the tropic edge is often difficult to establish in a principled way.

The present theory (i.e. a segmental fission approach to reduplication) calls for a new way of conceptualising the relationship between the 're-duplicant' and the 'base'. To this end, I adopt the surface correspondence method of evaluating the relationship between the 'reduplicant' and the 'base' (cf. Bat-El 2002, Zuraw 2002, Yu 2003, 2004, 2005).[10] The idea behind this approach is that identical output segments stand in a correspondence relationship (Hansson 2001, Rose & Walker 2004). Following Hansson and Rose & Walker, I assume that directionality is stated in a correspondence relationship.[11]

(25) IDENT(S_R, S_L)[12]

Let S_R be a segment in the output and S_L be any corresponding segment of S_R such that S_L precedes S_R in the sequence of segments in the output (L>R).

With these assumptions in mind, the problem in (24) can now be resolved. The constraint in (25) guarantees that the 'base' of reduplication must follow the reduplicant, not the other way around. Thus (26b) fails under IDENT(S_R, S_L), since the 'reduplicant' follows the 'base'. The 'copied' material is underlined. Theoretically, either set of the identical sequence can be considered the 'copied' material. However, candidates such as (26c), which satisfy IDENT(S_R, S_L), would also fail, since the segments identified as the 'reduplicant' are not within the stressed syllable, thus violating the dominating anchoring constraint. While (26d) is phonetically identical to (26a), it is nonetheless suboptimal, since the reduplicant is not left-anchored with the stressed syllable, nor is the 'base' to the right of the 'reduplicant'.

(26)

/ʔewʃiʔ, PL/	ANCHOR(PL)	IDENT(S_R, S_L)
☞ a. ʔe.(ˈ$\underline{ʃ_1 i_2}$w.$ʃ_1 i_2$ʔ)		
b. $ʔ_1 e_2$.(ˈ$\underline{ʔ_1 e_2}$w.ʃiʔ)		*!*
c. $\underline{ʔ_1 e_2}$.(ˈ$ʔ_1 e_2$w.ʃiʔ)	*!	
d. ʔe.(ˈ$ʃ_1 i_2$w.$\underline{ʃ_1 i_2}$ʔ)	*!	**

Another aspect of the nature of the reduplicant itself that must be clarified at this juncture is the issue of locality. What is of particular interest is why the reduplicant copies the first consonant in a postvocalic consonant sequence in monosyllabic roots, but the second consonant

[10] Since the main goal of this paper is to illustrate how stress and weight assignments may interact with reduplication, an in-depth discussion of the predictions and ramifications of a surface correspondence approach to reduplication in general would lead the discussion too far afield and thus will be left for another occasion (although see Yu 2005 for a recent discussion of these issues).

[11] The idea that directionality is crucial in a correspondence relationship has been pointed out previously for the input–output relationship (i.e. IDENT-IO *vs.* IDENT-OI; Pater 1999, Morén 2000, 2001) and in other applications of surface segmental correspondence, for example, in consonant harmony (Hansson 2001, Rose & Walker 2004).

[12] This constraint is a generalised version of the IDENT-CC(F) constraint proposed in Rose & Walker (2004).

in roots of larger size (e.g. /kakd/ 'slowly.PL' *vs.* /ʔeˈʃiwʃiʔ/ 'father's brother.PL'). It is assumed here that a LOCALITY constraint is operative in the language.

(27) LOCALITY

No segment that is not itself in a correspondence relation $\text{Morph}_1\ \Re\ \text{Morph}_2$ may intervene between two segments corresponding via $\Re$ – one violation is assigned per segment y that lies between a pair $x, x' \in S$, where $x \Re x'$, unless $\exists y' \in S$ and $y \Re y'$.

The copied portion of the base and the corresponding reduplicant must be adjacent (Riggle 2004).

Thus, in the monosyllabic roots, the reduplicant always copies the consonant closest to the root vowel, since the reduplicant and its source will only be minimally separated. (For the sake of clarity, LOCALITY violations are shown by the intervening segment(s).)

(28)

/akd, PL/	LOCALITY
☞ a. ˈkakd	a
b. ˈdakd	ak!

However, when the root is disyllabic, the second consonant in a consonant sequence is copied, since such a candidate better satisfies the σ-ROLE(CC) constraint in (29).

(29) σ-ROLE(CC)

Corresponding consonants (in the output) must have identical syllable roles (Rose & Walker 2004: 511).

As pointed out in Rose & Walker (2004), matching syllable roles contribute to segments' similarity. The σ-ROLE(CC) constraint is needed to rule out candidates such as (30b, c), where the reduplicant contains a copy of a coda segment in the onset position. (For the sake of clarity, violations of σ-ROLE(CC) are shown by the offending segment.)

(30)

/ʔewʃiʔ, PL/	σ-ROLE(CC)	LOCALITY
☞ a. ʔe.(ˈʃiw.ʃiʔ)		w
b. ʔe.(ˈwiw.ʃiʔ)	w!	ʃ
c. ʔe.(ˈʔ$_i$iw.ʃiʔ$_i$)	ʔ!	wʃ

While the relative ranking between σ-ROLE (CC) and ANCHOR(PL) is not crucial, REALISE-μ must dominate σ-ROLE (CC). As illustrated in (31), when a root is monosyllabic and vowel-initial (e.g. V(:)C or VCC), the reduplicative onset will always be copied from the coda. Yet plural reduplication remains possible, despite the fact that the attested form will always incur a σ-ROLE (CC) violation in such cases. Finally, LOCALITY must dominate σ-ROLE (CC), as illustrated by the failure of (31c). Discontinuous copying is not allowed even if its consequence would satisfy σ-ROLE (CC) completely.

(31)

/akd, PL/	REALISE-μ	LOCALITY	σ-ROLE(CC)
☞ a. ˈkakd		a	*
b. ˈakd	*!		
c. ˈkakad		ak!	

*STRUC must dominate LOCALITY, otherwise excess reduplication would obtain (32b).

(32)

/akd, PL/	*STRUC	LOCALITY
☞ a. ˈkakd	****	a
b. ˈakakd	*****!	

To summarise, in this section, I have developed an analysis of internal reduplication in Washo in which the shape of the reduplicant is derived solely by the interactions of constraints that are not only non-reduplication-specific but are also independently motivated to account for other phonological patterns in the world's languages. This analysis also provides further support for the a-templatic approach to reduplication. While the REALISE-μ constraint compels the reduplicative copying itself, the variation in the size of the reduplicant emerges from an emergence of the unmarked ranking pattern (McCarthy & Prince 1994a), where the effect of a size-restricting constraint, *STRUC, emerges where IO-faithfulness (i.e. REALISE-μ, MAX-IO(seg) ≫ *STRUC) is not relevant (cf. McCarthy & Prince 1994b, Spaelti 1997, Walker 2000, Kurisu 2001). The grammar does not care about the nature of the phonological content of the plural morpheme as long as it has some overt expression in the output. A summary of the constraint ranking developed in this section is given in (33). (IDENT(S_R, S_L) is not represented, since the relative ranking of this constraint with respect to the others cannot be established at this point.)

(33) REALISE-μ ANCHOR(PL) MAX-IO(seg) ONSET

INTEGRITY *STRUC

LOCALITY

σ-ROLE(CC)

Now that the basic analysis of the reduplicant itself is laid out, let us turn to one of the puzzles highlighted earlier, namely, the proper placement of the reduplicant in roots with an internal consonant sequence. Consider the tableau in (34).

(34)

/ʔewʃiʔ, PL/	LOCALITY
☞ a. ʔe(ˈʃ̲i̲w.ʃiʔ)	w!
☹ b. ʔew(ˈʃ̲i̲ʃiʔ)	

The analysis arrived at thus far predicts (34b) to be the winner, even though (34a) is the actual attested form. The only difference between these two candidates is the distribution of the medial consonant /w/. It appears in the initial syllable in (34b), but in the medial syllable in (34a). The current constraint ranking is incapable of differentiating the two candidates. This is the Coda Attraction puzzle noted above: why does the first consonant of an internal consonant sequence prefer to be part of the stressed syllable rather than the first syllable? The answer lies in the interpretation of the weight of coda consonants in Washo.

3.3 Coda-weight variability in Washo

The proposal defended in this section is that Coda Attraction is a corollary of a more general phenomenon in Washo, namely, that stressed syllables must be heavy. Washo corresponds to what Morén (2001) terms a 'coerced weight system' (see also Rosenthall & van der Hulst 1999); a closed syllable is only heavy when it is stressed on the surface. Coda attraction is, therefore, not a reduplication-specific phenomenon. This section begins with a review of the evidence that illustrates a conspiracy in Washo to keep the stressed syllable heavy (i.e. bimoraic) in §3.3.1. §3.3.2 develops an analysis that derives the coda-attraction effect from a set of weight-governing constraints that are independently motivated in Washo phonology.

3.3.1 *Evidence for the significance of the Stress-to-Weight Principle in Washo*. The evidence for a systemic requirement for stressed syllables to be heavy in Washo comes from several aspects of Washo phonology and morphology. The first set of evidence comes from the interaction between stress and segmental length. As noted earlier, long vowels are found only in the stressed syllable. While geminates are not contrastive in Washo, all consonants except voiced stops are lengthened intervocalically after a short stressed vowel. Forms with a short stressed vowel in §2.2 (e.g. the data in (3) and (5a)) are thus more accurately transcribed with a geminate intervocalic post-tonic consonant. For example, /ˈp'isew/ 'ear' is phonetically [ˈp'isːew], while its reduplicated counterpart is [p'iˈsesːew] (data in (35) are taken from Yu, to appear).

(35) a. *Singletons after a long stressed vowel*

ˈjaːsaʔ	[ˈjaːsaʔ]	'again'
ˈwaːʃiw	[ˈwaːʃiw]	'Washo'
ˈbaːmuʃ	[ˈbaːmuʃ]	'musk-rat'
ˈʔaːni	[ˈʔaːni]	'red ant'
ˈk'aːŋi	[ˈk'aːŋi]	'it's roaring'
ˈwaːlaʃ	[ˈwaːlaʃ]	'bread'
ˈp'aːwa	[ˈp'aːwa]	'in the valley'
dimˈlaːjaʔ	[dimˈlaːjaʔ]	'my wife'

b. *Geminates after a short stressed vowel*

ˈjasaŋi	[ˈjasːaŋi]	'it's hot'
ˈdaʃaŋ	[ˈdaʃːaŋ]	'blood'
ˈdamuʔ	[ˈdamːuʔ]	'skirt'
ˈtaniw	[ˈtanːiw]	'Miwok'
ˈkaŋa	[ˈkaŋːa]	'cave'
ˈʃalaʔ	[ˈʃalːaʔ]	'pitch'
ˈdawal	[ˈdawːal]	'buckberry'
ˈʔajɨs	[ˈʔajːɨs]	'antelope'

Before an intervocalic voiced stop, however, a short stressed vowel is lengthened.

(36)

ˈleːduŋ	'like me'	(l- (1PERS), -ˈi- (PRO), -duŋ 'like')	J309
ˈʔiːdaʔ	'he said ...'	(ʔ- (3PERS), -ˈid- 'to say', -aʔ (AORIST))	J309
ˈwiːdiw	'these (PL)'	(wi- (NEAR DEMONSTRATIVE STEM), -di- (DEMONSTRATIVE FORMATIVE), -w (PERS PL))	J309

The vowel in a monosyllabic stem is also lengthened in word-final position (37). Thus, while differences in vowel length may occur in the stressed syllable, short vowels never occur word-finally or before voiced stops.

(37)

/mi/	'you (SG)'	ˈmiː	J309
/da/	'there (PROX)'	ˈdaː	J309
/du/	'there (DIST)'	ˈduː	J309

These patterns point to a conspiracy in Washo to keep the stressed syllable heavy (i.e. bimoraic). Further supporting evidence for this conclusion comes from the morphology of the language.

Several prefixes in Washo (e.g. /mAl-/[13] 'to jump', /dul-/ 'with the hand') may cause the stressed vowel of the stem to be lengthened (38a).[14] No lengthening is observed, however, when the stressed vowel is underlyingly long (38b) or when the stem ends in a cluster (38c).

[13] *A* represents the alternation between /a/ and /e/ in the prefix. See also note 1.

[14] The roots are in bold and the relevant vowels underlined.

(38)	a.	mal-ˈ**aːŋaʔ**-i	< √ˈaŋaʔ	‘he’s jumping on it’	J308
		dul-ˈ**eːmiʔ**-i	< √ˈimiʔ	‘he’s sticking his hand out’	J308
	b.	dul-ˈ**iːk’ɨl**-i	< √ˈiːk’ɨl	‘she’s cooking’	J308
		dul-ˈ**aːgal**-am-i	< √ˈaːgal	‘he’s extending his hand towards the north’	J308
	c.	dula-k-ˈ**akd**-i	< √ˈakd	‘he’s moving his hands slowly’	J297
		mel-ˈ**eps**-i	< √ˈips	‘he’s jumping up’	J308

What the data in (38) illustrates is that stressed syllables with long vowels and stressed closed syllables are in complementary distribution. The fact that vowel lengthening is not applicable to closed syllables is evidence that closed syllables are heavy when stressed and that the maximal syllable is bimoraic in Washo. As a result, the floating mora contributed by the prefix cannot dock onto the stressed syllable when it already contains a moraic coda.

The stress-sensitive quantity alternations can be captured by the interaction of a set of constraints governing the distribution of syllable weight:

(39) a. Stress-to-Weight (SWP)
A stressed syllable must be heavy (Prince 1990).

b. DepLink-μ(V)
Assign a violation mark if an output vowel–mora association is not present in the input (Morén 2001).

c. DepLink-μ(C)
Assign a violation mark if an output consonant–mora association is not present in the input (Morén 2001).

d. MaxLink-μ(V)
Assign a violation mark if an input vowel–mora association is not present in the output (Morén 2001).

e. MaxLink-μ(C)
Assign a violation mark if an input consonant–mora association is not present in the output (Morén 2001).

The Stress-to-Weight Principle is undominated in Washo, since there is no surface exception, but the SWP can be satisfied in several ways, depending on the context and the segments involved. To understand the nature of the variable responses to SWP, a theory of weight coercion is needed. To this end, I adopt Morén’s theory of weight, which allows for the specification of sonority classes of segments with moraic faithfulness constraints (Morén 2001).[15] In order to avoid taking the discussion too far afield from the main focus of this study, in the remainder of this section I will only develop an analysis for the quantity alternations, to provide

[15] For a discussion of the vast literature arguing for the need to refer to markedness constraints for and against moraic segments of different sonority classes, I refer the reader to Morén (2001).

sufficient theoretical background for the analysis of Coda Attraction in the next section. An analysis of the morphophonological interaction in (38) will thus be left for another occasion.

Four moraic faithfulness constraints are most relevant to the present discussion: DepLink-μ(V) penalises any introduction of moraic association to vowels that is not already present in the input, while DepLink-μ(C) targets extra moraic association to consonants in the output; MaxLink-μ(V) penalises the deletion of vowel–mora associations in the output, while MaxLink-μ(C) targets the unfaithful realisation of input consonant–mora associations in the output. Following the Richness of the Base hypothesis (Prince & Smolensky 1993), the subsequent tableaux will show that regardless of whether the post-tonic consonant is underlyingly moraic or not in the input, the correct candidate will invariably be selected as a winner by the established constraint ranking. Thus, for example, when the stressed vowel is underlyingly short (i.e. monomoraic) and if the tonic vowel is not followed by an inorganic consonant cluster (40), the post-tonic consonant is predicted to be always weight-bearing. The illustration in (40) suggests that SWP and DepLink-μ(V) must dominate DepLink-μ(C), since the SWP generally cannot be satisfied by vowel lengthening. The relative ranking between SWP and DepLink-μ(V), and that between the other moraic faithfulness constraints, cannot be determined at this juncture. (C is a cover symbol for all consonants except voiced stops, which are represented by D. Following Hayes (1989), intervocalic geminates are considered moraic and ambisyllabic; geminates are represented as moraic consonants, C_μ, in the tableaux.)

(40) a.

/$V_\mu CV_\mu$/	SWP	MaxLink-μ(V)	DepLink-μ(V)	MaxLink-μ(C)	DepLink-μ(C)
☞ i. $'V_\mu C_\mu V_\mu$					*
ii. $'V_{\mu\mu} CV_\mu$			*!		
iii. $'V_\mu CV_\mu$	*!				

b.

/$V_\mu C_\mu V_\mu$/	SWP	MaxLink-μ(V)	DepLink-μ(V)	MaxLink-μ(C)	DepLink-μ(C)
☞ i. $'V_\mu C_\mu V_\mu$					
ii. $'V_{\mu\mu} CV_\mu$			*!	*	
iii. $'V_\mu CV_\mu$	*!			*	

Gratuitous post-tonic consonant lengthening is ruled out when the input contains a stressed vowel that is underlyingly long (41); concomitant realisation of a long stressed vowel and post-tonic geminate (41.iv) is prohibited by the high-ranking anti-trimoraic syllable constraint, $*\sigma_{\mu\mu\mu}$ (Morén 2001: 51) Post-tonic gemination is only needed when the stressed syllable is not heavy enough. The failure of candidate (41b.ii) establishes that MaxLink-μ(V) must dominate MaxLink-μ(C), since long vowels are preserved at the expense of geminate consonants in Washo.

(41) a.

/$V_{\mu\mu}CV_{\mu}$/	SWP	$*\sigma_{\mu\mu\mu}$	MAX LINK-μ(V)	DEP LINK-μ(V)	MAX LINK-μ(C)	DEP LINK-μ(C)
☞ i. $'V_{\mu\mu}CV_{\mu}$						
ii. $'V_{\mu}C_{\mu}V_{\mu}$			*!			*
iii. $'V_{\mu}CV_{\mu}$	*!		*			
iv. $'V_{\mu\mu}C_{\mu}V_{\mu}$		*!				*

b.

/$V_{\mu\mu}C_{\mu}V_{\mu}$/	SWP	$*\sigma_{\mu\mu\mu}$	MAX LINK-μ(V)	DEP LINK-μ(V)	MAX LINK-μ(C)	DEP LINK-μ(C)
☞ i. $'V_{\mu\mu}CV_{\mu}$					*	
ii. $'V_{\mu}C_{\mu}V_{\mu}$			*!			
iii. $'V_{\mu}CV_{\mu}$	*!		*		*	
iv. $'V_{\mu\mu}C_{\mu}V_{\mu}$		*!				

The pattern of tonic vowel lengthening before voiced stops is accounted for here by assuming that the phonological grammar of Washo does not license moraic voiced stops, a phonetically well-motivated and typologically common restriction on gemination (see e.g. Ohala 1983). As a consequence, SWP can only be satisfied by lengthening the vowel, since geminating a voiced stop (43.ii) would have fatally violated the high-ranking *μ(D), which penalises moraic voiced stops on the surface.

(42) *μ(D)

Do not associate a mora with a voiced stop.

As shown in (40), Washo generally prefers to satisfy SWP by lengthening the post-tonic consonant, rather than the tonic vowel. The fact that the tonic vowel is lengthened when the post-tonic consonant is a voiced stop suggest that *μ(D) must dominate DEPLINK-μ(V).[16] (43.iii) shows that SWP must dominate DEPLINK-μ(V), otherwise tonic vowel lengthening might not take place.

The analysis arrived at in (43) illustrates the importance of relativising moraic faithfulness constraints to sonority classes of segments. In Washo, the response to the pressure from SWP is not monolithic: depending on the context and the class of segments in question, the tonic vowel or the post-tonic consonant may lengthen. This variation is captured by allowing certain relativised moraic faithfulness constraints to dominate the others.

The analysis developed for the quantity alternations in Washo has serious implications for the analysis of Coda Attraction in reduplication. The main thesis defended in the next section is that Coda Attraction is really just another manifestation of the SWP in Washo. As noted earlier, coda consonants do not attract stress in Washo; words such as /dew'hiwi/

[16] Since there is no evidence that Washo disprefers other types of moraic segments, it will be assumed here that all other *μ constraints are ranked below the moraic faithfulness constraints and will not be mentioned further.

(43) a.

$/V_{\mu}DV_{\mu}/$	SWP	$*\sigma_{\mu\mu\mu}$	$*\mu$(D)	MAX LINK-μ(V)	DEP LINK-μ(V)	MAX LINK-μ(C)	DEP LINK-μ(C)
☞ i. $'V_{\mu\mu}DV_{\mu}$					*		
ii. $'V_{\mu}D_{\mu}V_{\mu}$			*!				*
iii. $'V_{\mu}DV_{\mu}$	*!						
iv. $'V_{\mu\mu}D_{\mu}V_{\mu}$		*!	*				*

b.

$/V_{\mu}D_{\mu}V_{\mu}/$	SWP	$*\sigma_{\mu\mu\mu}$	$*\mu$(D)	MAX LINK-μ(V)	DEP LINK-μ(V)	MAX LINK-μ(C)	DEP LINK-μ(C)
☞ i. $'V_{\mu\mu}DV_{\mu}$					*	*	
ii. $'V_{\mu}D_{\mu}V_{\mu}$			*!				
iii. $'V_{\mu}DV_{\mu}$	*!					*	
iv. $'V_{\mu\mu}D_{\mu}V_{\mu}$		*!	*		*		

'thunder' (J79) would be expected to have initial stress if all closed syllables are heavy and attract stress. As such, coda consonants are weight-bearing only when they are licensed by SWP, i.e. when they surface in a stressed syllable. Coda Attraction takes place when the circumstances allow an existing coda consonant to be recruited into the stressed syllable, thus avoiding the need for segmental gemination.

3.3.2 *The Coda Attraction puzzle explained.* Following the work of Rosenthall & van der Hulst (1999) and Morén (2000, 2001), the emergence of variable coda weight is derived through constraint interactions. Before we dive into the discussion, a note about the tableau presentation is in order. Since ANCHOR-HdFt, FTFORM and $*\sigma_{\mu\mu\mu}$ can never be violated by the optimal winning candidate, they will be assumed to be undominated; candidates that violate these constraints will not be considered further in the following discussions. In addition, wherever the faithfulness between input–output vowel–mora associations is not relevant for the discussion, DEPLINK-μ(V) and MAXLINK-μ(V) will also be left out of the evaluation, in order to simplify the presentation of the growing complexity of the constraint hierarchy.

As already established in §3.3.1, SWP must outrank DEPLINK-μ(C). In the present context, such a ranking has the desired effect of preventing candidates with a non-heavy stressed syllable from surfacing (see (44a.iii) in particular). WSP must dominate MAXLINK-μ(C) to rule out candidates that contain an unstressed heavy syllable (see (44b.ii) in particular). Candidate (44.v) would have been a viable contender, given that the stressed foot is trochaic and binary at the moraic level. This candidate is ruled out, however, due to the presence of unparsed materials in the output.

Coda consonants behave similarly in the reduplicated forms. Candidates with unstressed heavy syllables in the output are ruled out by WSP (e.g. (45.iv)). Candidates with light stressed closed syllables are ruled out by SWP (e.g. (45.ii)), while candidates with too many unparsed syllables are ruled out by PARSE-σ (45.v).

(44) a.

/ʔe$_{\mu}$wʃi$_{\mu}$ʔ/	SWP	WSP	Parse	MaxLink-μ(C)	DepLink-μ(C)
☞ i. (ˈʔe$_{\mu}$w$_{\mu}$.ʃi$_{\mu}$ʔ)					*
ii. (ˈʔe$_{\mu}$w$_{\mu}$.ʃi$_{\mu}$ʔ$_{\mu}$)		*!			**
iii. (ˈʔe$_{\mu}$w.ʃi$_{\mu}$ʔ)	*!				
iv. (ˈʔe$_{\mu}$w.ʃi$_{\mu}$ʔ$_{\mu}$)	*!	*			*
v. ʔe$_{\mu}$w.(ˈʃi$_{\mu}$ʔ$_{\mu}$)			*!		*

b.

/ʔe$_{\mu}$w$_{\mu}$ʃi$_{\mu}$ʔ$_{\mu}$/	SWP	WSP	Parse	MaxLink-μ(C)	DepLink-μ(C)
☞ i. (ˈʔe$_{\mu}$w$_{\mu}$.ʃi$_{\mu}$ʔ)				*	
ii. (ˈʔe$_{\mu}$w$_{\mu}$.ʃi$_{\mu}$ʔ$_{\mu}$)		*!			
iii. (ˈʔe$_{\mu}$w.ʃi$_{\mu}$ʔ)	*!			**	
iv. (ˈʔe$_{\mu}$w.ʃi$_{\mu}$ʔ$_{\mu}$)	*!	*		*	
v. ʔe$_{\mu}$w.(ˈʃi$_{\mu}$ʔ$_{\mu}$)			*!	*	

(45) a.

/ʔe$_{\mu}$wʃi$_{\mu}$ʔ, PL/	SWP	WSP	Parse	MaxLink-μ(C)	DepLink-μ(C)
☞ i. ʔe$_{\mu}$.(ˈʃ̲i̲$_{\mu}$w$_{\mu}$.ʃi$_{\mu}$ʔ)			*		*
ii. ʔe$_{\mu}$w.(ˈʃ̲i̲$_{\mu}$.ʃi$_{\mu}$ʔ)	*!		*		
iii. ʔe$_{\mu}$w$_{\mu}$.(ˈʃ̲i̲$_{\mu}$ʃi$_{\mu}$ʔ)	*!	*	*		*
iv. ʔe$_{\mu}$.(ˈʃ̲i̲$_{\mu}$w$_{\mu}$.ʃi$_{\mu}$ʔ$_{\mu}$)		*!	*		**
v. ʔe$_{\mu}$w.ʃi$_{\mu}$.ˈ(ʃ̲i̲$_{\mu}$ʔ$_{\mu}$)			**!		*

b.

/ʔe$_{\mu}$w$_{\mu}$ʃi$_{\mu}$ʔ$_{\mu}$, PL/	SWP	WSP	Parse	MaxLink-μ(C)	DepLink-μ(C)
☞ i. ʔe$_{\mu}$.(ˈʃ̲i̲$_{\mu}$w$_{\mu}$.ʃi$_{\mu}$ʔ)			*	*	
ii. ʔe$_{\mu}$w.(ˈʃ̲i̲$_{\mu}$.ʃi$_{\mu}$ʔ)	*!		*	**	
iii. ʔe$_{\mu}$w$_{\mu}$.(ˈʃ̲i̲$_{\mu}$ʃi$_{\mu}$ʔ)	*!	*	*	*	
iv. ʔe$_{\mu}$.(ˈʃ̲i̲$_{\mu}$w$_{\mu}$.ʃi$_{\mu}$ʔ$_{\mu}$)		*!	*		
v. ʔe$_{\mu}$w.ʃi$_{\mu}$.ˈ(ʃ̲i̲$_{\mu}$ʔ$_{\mu}$)			**!	*	

The remaining question that must be addressed at this point is why Washo employs Coda Attraction rather than post-tonic consonant lengthening or tonic vowel lengthening to satisfy SWP. Consider, for example, the evaluation in (46). Candidate (46.ii), which shows sibilant gemination, appears to be as well-formed as the actual attested candidate (46.i), which shows Coda Attraction.

(46) a.

/ʔe$_{\mu}$wʃi$_{\mu}$ʔ, PL/	SWP	WSP	Parse	MaxLink-μ(C)	DepLink-μ(C)
☞ i. ʔe$_{\mu}$.(ˈʃ̲i̲$_{\mu}$w$_{\mu}$.ʃi$_{\mu}$ʔ)			*		*
👎 ii. ʔe$_{\mu}$w.(ˈʃ̲i̲$_{\mu}$ʃ$_{\mu}$i$_{\mu}$ʔ)			*		*

b.

/ʔe$_{\mu}$w$_{\mu}$ʃi$_{\mu}$ʔ$_{\mu}$, PL/	SWP	WSP	Parse	MaxLink-μ(C)	DepLink-μ(C)
☞ i. ʔe$_{\mu}$.(ˈʃi$_{\mu}$w$_{\mu}$.ʃi$_{\mu}$ʔ)			*	*	
👎 ii. ʔe$_{\mu}$w.(ˈʃi$_{\mu}$ʃ$_{\mu}$i$_{\mu}$ʔ)			*	*[17]	

The fact that Coda Attraction is preferred over post-tonic consonant gemination suggests that, all else being equal, Washo prefers not to create geminates if alternative strategies for satisfying SWP are available. This intuition is captured by assuming that the constraint CrispEdge(σ), which rules out any linking across the edges of syllable (Itô & Mester 1999), such as the case in intervocalic consonant gemination, is responsible for breaking the tie between the candidates in (46). The failure of (47.ii), where the reduplicant is immediately adjacent to the 'base', demonstrates that Locality must be dominated by CrispEdge(σ). CrispEdge(σ) must be outranked by SWP and DepLink-μ(V), however, otherwise post-tonic gemination would never take place.

(47) a.

/ʔe$_{\mu}$wʃi$_{\mu}$ʔ, PL/	CrispEdge(σ)	Locality
☞ i. ʔe$_{\mu}$.(ˈʃi$_{\mu}$w$_{\mu}$.ʃi$_{\mu}$ʔ)		W
👎 ii. ʔe$_{\mu}$w.(ˈʃi$_{\mu}$ʃ$_{\mu}$i$_{\mu}$ʔ)	*!	
b. /ʔe$_{\mu}$w$_{\mu}$ʃi$_{\mu}$ʔ$_{\mu}$, PL/		
☞ i. ʔe$_{\mu}$.(ˈʃi$_{\mu}$w$_{\mu}$.ʃi$_{\mu}$ʔ)		W
👎 ii. ʔe$_{\mu}$w.(ˈʃi$_{\mu}$ʃ$_{\mu}$i$_{\mu}$ʔ)	*!	

Coda Attraction is preferred over tonic vowel lengthening, even when the input contains a voiced stop as the second member of an internal consonant sequence, because DepLink-μ(V) outranks DepLink-μ(C). The candidate with Coda Attraction, (48.i), has the advantage over the candidate with tonic vowel lengthening, (48.ii), since Coda Attraction satisfies the demand of SWP without incurring any fatal violations of DepLink-μ(V).

(48) a.

/mo$_{\mu}$kgo$_{\mu}$, PL/	DepLink-μ(V)	MaxLink-μ(C)	DepLink-μ(C)
☞ i. mo$_{\mu}$.(ˈgo$_{\mu}$k$_{\mu}$.go$_{\mu}$)			*
ii. mo$_{\mu}$k.(ˈgo$_{\mu\mu}$.go$_{\mu}$)	*!		
b. /mo$_{\mu}$k$_{\mu}$go$_{\mu}$, PL/			
☞ i. mo$_{\mu}$.(ˈgo$_{\mu}$k$_{\mu}$.go$_{\mu}$)			
ii. mo$_{\mu}$k.(ˈgo$_{\mu\mu}$.go$_{\mu}$)	*!	*	

[17] Only one violation is assigned here for the missing mora associated with the final glottal stop in the output. While the mora associated with the glide in the input is not associated with the glide in the output, no violation of MaxLink-μ(C) is incurred, since the said mora is still associated with a consonant in the output. For more discussion about the evaluation of moraic faithfulness constraints, see §3.4.

To be sure, when Coda Attraction is not tenable, post-tonic consonant gemination will prevail over other alternatives such as overcopying. As illustrated in (49), both post-tonic gemination and the overcopying candidates satisfy the high-ranking SWP and WSP constraints and incur the same number of PARSE-σ violations. However, the overcopying candidate fails, since it incurs more *STRUC violations than the candidate with post-tonic gemination, by virtue of the extra copied segment on the surface; gemination does not increase segmental structure since it involves merely the insertion of a mora.

(49) a.

/p’i$_\mu$se$_\mu$w, PL/	*STRUC	CRISPEDGE(σ)
☞ i. p’i$_\mu$.(ˈ$\underline{\text{se}}_\mu$s$_\mu$e$_\mu$w)[18]	*******	*
ii. p’i$_\mu$.(ˈ$\underline{\text{se}}_\mu$w$_\mu$.se$_\mu$w)	********!	

b.

/p’i$_\mu$s$_\mu$e$_\mu$w$_\mu$, PL/		
☞ i. p’i$_\mu$.(ˈ$\underline{\text{se}}_\mu$s$_\mu$e$_\mu$w)	*******	*
ii. p’i$_\mu$.(ˈ$\underline{\text{se}}_\mu$w$_\mu$.se$_\mu$w)	********!	

The Coda Attraction puzzle is thereby resolved. Coda Attraction exists as a strategy to satisfy SWP without creating marked structures that do not exist in the input. Neither the reduplicant nor the moraic coda undergoes ‘movement’, however. The reduplicant appears where it is supposed to be, namely within the stressed syllable. The fact that the stressed syllable contains a coda consonant is of no consequence with respect to *STRUC, since the consonant in question is part of the input to begin with. This consonant undergoes no movement, since syllabification is not present in the input. Thus there is no change in syllable affiliation to speak of. No assumption about the moraicity of coda consonant is needed; it is only through the conspiratorial effect of SWP and other constraints governing weight distribution that the reduplicant is placed in such a way that output well-formedness is maximised and constraint violation minimised.

Several qualifications must be made at this juncture. To begin with, the fact that Washo allows coda consonants to be moraic in the stressed syllable in the output does not mean that codas are invariably preferred to be moraic. Coda consonants in non-reduplicated forms do not move in order to satisfy SWP, for example. This is guaranteed by the LINEARITY constraint.

(50) LINEARITY (McCarthy & Prince 1995)
Let $x, y \in S_1$ and $x, y' \in S_2$.
If $x \,\Re\, x'$ and $y \,\Re\, y'$, then $x < y$ iff $\neg(y' < x')$.
S_1 is consistent with the precedence structure of S_2, and *vice versa*.

[18] Syllabification will not be indicated whenever the syllable boundary is located within an ambisyllabic moraic intervocalic consonant.

(51) a.

/de$_{\mu}$shi$_{\mu}$wi$_{\mu}$/[19]	SWP	LINEARITY	*STRUC	CRISPEDGE(σ)
☞ i. de$_{\mu}$s.(ˈhi$_{\mu}$w$_{\mu}$.wi$_{\mu}$)			*******	*
ii. de$_{\mu}$.(ˈhi$_{\mu}$s$_{\mu}$.wi$_{\mu}$)		*!	*******	
iii. de$_{\mu}$s.(ˈhi$_{\mu}$.wi$_{\mu}$)	*!		*******	
iv. de$_{\mu}$s.(ˈhi$_{\mu}$s$_{\mu}$.wi$_{\mu}$)			********!	

b.

/de$_{\mu}$s$_{\mu}$hi$_{\mu}$wi$_{\mu}$/				
☞ i. de$_{\mu}$s.(ˈhi$_{\mu}$w$_{\mu}$.wi$_{\mu}$)			*******	*
ii. de$_{\mu}$.(ˈhi$_{\mu}$s$_{\mu}$.wi$_{\mu}$)		*!	*******	
iii. de$_{\mu}$s.(ˈhi$_{\mu}$.wi$_{\mu}$)	*!		*******	
iv. de$_{\mu}$s.(ˈhi$_{\mu}$s$_{\mu}$.wi$_{\mu}$)			********!	

LINEARITY is violated when the precedence relationships between segments in the output do not match those of the input. LINEARITY must outrank CRISPEDGE(σ), since LINEARITY prevents the post-initial-vowel consonant, /s/, from surfacing as the coda of the stressed syllable (see (51.ii)), even though such a transposition would have obviated the need to geminate the post-tonic consonant. To be sure, LINEARITY does not affect the selection of the correct optimal reduplicated candidate, since the precedence relationship of segments in the input remains unchanged in the reduplicated output. Despite the fact that the duplicates (underlined) in (52b), which correspond to segments 4 and 5, intervene between segments 2 and 3, LINEARITY is not violated, since there are correspondents of segments 4 and 5 obeying the precedence relationship with segment 3.

(52) a. /d$_1$e$_2$s$_3$.h$_4$i$_5$.w$_6$i$_7$/
*d$_1$e$_2$.ˈh$_4$i$_5$s$_3$.w$_6$i$_7$ (51.ii)

b. /ʔ$_1$e$_2$w$_3$.ʃ$_4$i$_5$ʔ$_6$, PL/
ʔ$_1$e$_2$.ˈ<u>**ʃ$_4$i$_5$**</u>w$_3$.**ʃ$_4$i$_5$**ʔ$_6$ (45.i)

Also illustrated in (51) is the fact that post-tonic gemination cannot be avoided by copying a coda consonant from elsewhere in the word, since such copying will invariably increase the segmental count of the output. Post-tonic gemination only increases the moraic count of the output, a symptom also shared by the coda copying candidate (51.iv).

The addition of moraic considerations also has no effect on stress assignment in general. As illustrated in (53), regardless of whether a coda consonant is assumed to be moraic or not, stress is always on the penult, since final stress always incurs a fatal violation of PARSE-σ (53.ii). Candidates with an anti-rhythmic trochee (LH) are ruled out by SWP and WSP (53.iii). The candidate without post-tonic gemination fatally violates SWP (53.iv).

[19] The input is a hypothetical example constructed based on the word /dewhˈiwi/, an actual attested word in Washo.

(53) a.

/p'i$_\mu$se$_\mu$w/	SWP	WSP	PARSE	MAXLINK-μ(C)	DEPLINK-μ(C)
☞ i. (ˈp'i$_\mu$s$_\mu$e$_\mu$w)					*
ii. p'i$_\mu$(ˈse$_\mu$w$_\mu$)			*!		*
iii. (ˈp'i$_\mu$se$_\mu$w$_\mu$)	*!	*			*
iv. (ˈp'i$_\mu$se$_\mu$w)	*!				

b.

/p'i$_\mu$s$_\mu$e$_\mu$w$_\mu$/	SWP	WSP	PARSE	MAXLINK-μ(C)	DEPLINK-μ(C)
☞ i. (ˈp'i$_\mu$s$_\mu$e$_\mu$w)				*	
ii. p'i$_\mu$(ˈse$_\mu$w$_\mu$)			*!	*	
iii. (ˈp'i$_\mu$se$_\mu$w$_\mu$)	*!	*			
iv. (ˈp'i$_\mu$se$_\mu$w)	*!			*	

Finally, the analysis developed in this section also captures the data concerning the vowel-initial roots. As an illustration, let us consider a root that ends in a consonant cluster. As noted in §3.2, the reduplicants of vowel-initial roots are invariably monoconsonantal, due to the structure-minimising effect of *STRUC. As shown in (54), the inclusion of more root materials in the reduplicant either incurs a fatal SWP violation (54.iii) or more *STRUC violations (54.iv, v). No prosodic advantage can be gained by duplicating more root segments in the output. In terms of the prosodic structure of the winning candidate itself, as illustrated by (54.ii), a monosyllabic output cannot be trimoraic, as it violates the binarity restriction imposed by the constraint FTFORM (see also discussion on maximal syllable in §3.3.1).

(54) a.

/a$_\mu$kd, PL/	FTFORM	SWP	*STRUC	MAX LINK-μ(C)	DEP LINK-μ(C)
☞ i. ˈk̲a$_\mu$.k$_\mu$d)			****		*
ii. (ˈk̲a$_\mu$.k$_\mu$d$_\mu$)	*!		****		**
iii. (ˈa̲$_\mu$.k̲a$_\mu$kd)		*!	*****		
iv. (ˈa̲$_\mu$k̲$_\mu$a$_\mu$kd)			*****!		*
v. (ˈa̲$_\mu$k̲$_\mu$.d̲a$_\mu$kd)			*****!*		*

b.

/a$_\mu$k$_\mu$d$_\mu$, PL/	FTFORM	SWP	*STRUC	MAX LINK-μ(C)	DEP LINK-μ(C)
☞ i. (ˈk̲a$_\mu$.k$_\mu$d)			****	*	
ii. (ˈk̲a$_\mu$.k$_\mu$d$_\mu$)	*!		****		
iii. (ˈa̲$_\mu$.k̲a$_\mu$kd)		*!	*****	**	
iv. (ˈa̲$_\mu$k̲$_\mu$a$_\mu$kd)			*****!	*	
v. (ˈa̲$_\mu$k̲$_\mu$.d̲a$_\mu$kd)			*****!*	*	

In this section, I have advanced an analysis of Washo internal reduplication that explains the first of three puzzles in Washo, Coda Attraction. The full ranking concerning the treatment of Coda Attraction is shown in (55).

(55) MAXLINK-μ(V) *μ(D) ANCHOR-HdFt WSP SWP LINEARITY

DEPLINK-μ(V)

MAXLINK-μ(C) DEPLINK-μ(C) PARSE(σ) CRISPEDGE(σ)

The core idea behind this analysis is that Coda Attraction is a manifestation of a systematic preference for the stressed syllable to be heavy in Washo. It predicts that a coda consonant is attracted to the stressed syllable whenever the opportunity arises (e.g. in reduplication), even though coda consonants do not generally affect the placement of stress. In the next section, I show that the second puzzle of Washo reduplication, namely Moraic Stability, follows naturally from the analysis developed in this section. The puzzles are really two sides of the same coin.

3.4 Moraic Stability explained

In this section, I show that the distribution of vowel length, both within and outside reduplication contexts, emerges from the constraint ranking established in the previous section. In particular, the fact that a length-contributing mora must appear in the stressed syllable follows naturally from the dominance of SWP. Recall the examples from (5b), repeated in (56), where long vowels are found in both the singular and the plural forms:

(56)	*singular*	*plural*		
	ˈʔaːt’u	ʔaˈt’oːt’o	‘older brother’	J341
	ˈmaːgu	maˈgoːgo	‘sister’s child’	J341
	ˈmoːk’o	moˈk’oːk’o	‘knee’	J325
	ˈt’eːliw	t’eˈliːliw	‘to be a man’	J325
	ˈmeːhu	meˈhuːhu	‘to be a boy’	J325
	ˈʔeːbu	ʔeˈbuːbu	‘mother’s father’s brother’	J325
	ˈwaːʃiw	waˈʃiːʃiw	‘Washo’	J325

The peculiarity observed here is that a long vowel invariably appears in the penultimate, stressed syllable, but the melody of the long vowels in the singular and the plural forms does not match. However, as I will demonstrate in this section, this Moraic Stability effect is really a different manifestation of the same constraint ranking developed above, with minimal qualifications. (57) illustrates this point.[20] When a long vowel surfaces initially (i.e. when the length-contributing mora appears with its input melodic material in the output), such a candidate is ruled out either by the high-ranking SWP constraint, if the post-tonic consonant does not geminate (57b), or by DEPLINK-μ(C), if the post-tonic consonant does (57e). If stress were to be realised initially, such a candidate would fatally violate ANCHOR-HdFt, which requires the stressed foot to coincide with

[20] For ease of presentation, the moras of the stem are coindexed by number, while the mora of the reduplicant is left unmarked.

the right edge of the PrWd (57c). The non-realisation of the long vowel is not an option, however, since it fatally violates MAXLINK-μ(V), which penalises the deletion of a vocalic mora on the surface (57d). The only optimal solution is to allow the length-contributing mora to appear within the stressed syllable (57a). The winning candidate does not violate MAXLINK-μ(V), since the length-contributing mora, μ_2, is still associated with a vocalic segment, albeit a different vocalic segment from its input association. This interpretation of the moraic faithfulness constraints might at first glance seem to differ from the interpretation proposed in Morén (2001). There, a theory was articulated on how moraic faithfulness constraints should be evaluated when the sonority classes of moraic segments do not match between the input and output moraic association. That discussion left open the question of how moraic faithfulness should be evaluated when the mora in question is associated with a segment different from its input association (and *vice versa*), but nonetheless belong to the same sonority class. In this work, I adopt a liberal interpretation of the moraic faithfulness constraints: as long as an input mora is associated with a segment of the same sonority class as its input segmental associate, moraic faithfulness is satisfied.

(57)

/meː$_{\mu1\mu2}$hu$_{\mu3}$, PL/	ANCHOR-HdFt	SWP	MAX LINK-μ(V)	DEP LINK-μ(C)
☞ a. me$_{\mu1}$(ˈ$\underline{\text{huː}}_{\mu\mu2}hu_3$)				
b. meː$_{\mu1\mu2}$(ˈ$\underline{\text{hu}}_{\mu}hu_{\mu3}$)		*!		
c. (ˈmeː$_{\mu1\mu2}$$\underline{\text{hu}}_{\mu}$)hu$_{\mu3}$	*!*			
d. me$_{\mu1}$(ˈ$\underline{\text{hu}}_{\mu}hu_3$)			*!	
e. meː$_{\mu1\mu2}$(ˈ$\underline{\text{hu}}_{\mu}h_{\mu}hu_{\mu3}$)				*!

To be sure, this analysis also captures the reduplicative behaviour of monosyllabic roots that contain a long vowel. As shown in (58), excessive reduplication incurs fatal violations of DEPLINK-μ(V) (58.iii).[21] Redistributing a vocalic mora to the coda consonant or deleting an input mora fatally violates MAXLINK-μ(V) (58.ii). As such, the most economical and prosodically well-formed candidate is (58.i).

(58) a.

/a$_{\mu\mu}$m, PL/	MAXLINK-μ(V)	DEPLINK-μ(V)
☞ i. ˈ($\underline{\text{m}}$-a$_{\mu\mu}$m)		
ii. ˈ($\underline{\text{m}}$-a$_{\mu}$m$_{\mu}$)	*!	
iii. (ˈ$\underline{\text{a}}_{\mu\mu}$.$\underline{\text{m}}$-a$_{\mu}$m)		*!

b.

/a$_{\mu\mu}$m$_{\mu}$, PL/		
☞ i. ˈ($\underline{\text{m}}$-a$_{\mu\mu}$m)		
ii. ˈ($\underline{\text{m}}$-a$_{\mu}$m$_{\mu}$)	*!	
iii. (ˈ$\underline{\text{a}}_{\mu\mu}$.$\underline{\text{m}}$-a$_{\mu}$m)		*!

[21] Excessive reduplication is also discouraged by *STRUC. See discussion in §3.2.1.

Remember that this analysis predicts that vowel length must surface in the stressed syllable in the output only when a length-contributing mora is already present in the input; the analysis does not encourage gratuitous creation of a long vowel in every stressed syllable, as already demonstrated in §3.3.1 (see (40) in particular).

In this section, I have argued that the Mora Stability effect in Washo is a natural consequence of the analysis developed in §3.3, which capitalises on the emerging preference for heavy stressed syllables in the language. A summary of the constraint hierarchies developed in this analysis is given below:

(59) a. *Reduplicative fission*
REALISE-μ ≫ INTEGRITY
REALISE-μ, ANCHOR(PL), MAX-IO(seg), ONSET, LINEARITY ≫ *STRUC ≫ CRISPEDGE(σ) ≫ LOCALITY ≫ σ-ROLE(CC)

b. *Stress and quantity*
FTFORM, WSP, ANCHOR-HdFt, SWP, *μ(D), MAXLINK-μ(V) ≫ DEPLINK-μ(V) ≫ PARSE, MAXLINK-μ(C), DEPLINK-μ(C), CRISPEDGE(σ)

For the remainder of this paper, I contrast previous analyses of Washo plural reduplication with my analysis and show why my stress-based reduplicant-placement analysis is preferable.

4 Previous analyses

As noted in the introduction, Washo internal reduplication has received a great deal of attention in the past. In this section, I review previous analyses of Washo plural formation, highlighting the commonality and differences between these earlier approaches and mine.

4.1 Jacobsen (1964)

The first analysis of Washo internal reduplication appeared in Jacobsen's (1964) dissertation. The approach taken is essentially to treat the set of possible reduplicants as a list of predetermined allomorphs. The shape of the reduplicant can be C, VC or VC^{V}.

(60)		*singular*	*plural*		
	a. C	ˈaːbab	b-ˈaːbab	'spotted'	J323
		ˈinkin	k-ˈinkin	'black'	J323
	b. VC	ˈbokoŋ	b-ok-ˈokoŋ	'to snore'	J323
		ˈdaʔa	d-aʔ-ˈaʔa	'mother's brother'	J323
	c. VC^{V}	ˈmeːhu	m-eh^{u}-ˈeːhu	'to be a boy'	J325
		ˈp'isew	p'is^{e}-ˈisew	'ear'	J326

The set of raised vowels, referred to by Jacobsen as vowel-colouring, are [$^{\text{e ɛ u a i ɨ}}$ E], and they enter into a set of coalescence/colouring rules with the following vowel. For example, the sequences /$^{\text{e}}$i/ and /$^{\text{e}}$u/ result in [e] (e.g. /ˈp’isew/ ‘ear’ → /p’-is$^{\text{e}}$-ˈisew/ → /p’iˈsesew/ (J326); /ˈduweʔ/ ‘to try to’ → /d-uw$^{\text{e}}$-ˈuweʔ/ → /duˈweweʔ/ (J286)).

Jacobsen’s analysis captures many important insights about plural reduplication in Washo. For example, it recognises the fact that the placement of the reduplicant is stress-related, albeit it assumes that the reduplicant is infixed before the stressed vowel, rather than left-anchored with the stressed syllable, as advanced in the present paper. The set of vowel-colouring rules illustrates an ingenious pre-generative phonology attempt to deal with the complexity of Washo allomorphy. However, the listing of the set of reduplicative allomorphs not only increases the set of morphs in Washo exponentially, but it crucially fails to take into account the fact that the shape and size of the reduplicant are predictable. In these respects, the analysis advanced in this paper is superior, since the shape and size of the reduplicant are treated as emergent properties of the grammar. No stipulation or pre-listing is needed.

4.2 VCV reduplication

The VCV approach to Washo reduplication, first proposed in Winter (1970), is an elaboration of Jacobsen’s original analysis. The crucial difference between Jacobsen’s and Winter’s approaches is the interpretation of vowel colouring: Winter assumes that whatever contributes to internal vowel alternations in reduplication is a full vowel, rather than some abstract morphophoneme, like a raised vowel. Broselow & McCarthy (1983) further develop Winter’s analysis by couching it in terms of Marantz (1982)’s autosegmental approach to reduplication (61).

(61) $C_1V_1C_2V_2C_3 \rightarrow C_1\text{-}V_1C_2V_2\text{-}V_1C_2V_2C_3$
e.g. mokgo ‘shoe’ m-[oko]$_{\text{RED}}$-okgo ‘shoes’

Broselow & McCarthy differ from previous authors, who assume that the reduplicant is lodged before the stressed vowel, and claim that the VCV reduplicant is lodged after the first consonant (62), instead of before the stressed vowel.

(62) a. +VCV+
b. $_{\text{Root}}$[(C) __ X] (taken from Broselow & McCarthy 1983: 50)

Broselow & McCarthy summarise Winter’s coalescence rules between the final vowel of the reduplicant and the stressed vowel of the root as follows:

(63) *Washo coalescence* (from Broselow & McCarthy 1983: 48)

a. $$\begin{bmatrix} \text{V} \\ \text{<+round>} \\ 1 \end{bmatrix} \begin{bmatrix} \text{V} \\ \text{+low} \\ 2 \end{bmatrix} \rightarrow \emptyset \begin{bmatrix} 2 \\ \text{<+round>} \\ \text{<+back>} \end{bmatrix}$$

b. $\text{V} \rightarrow \emptyset \; / \; \text{V} \_\_$

In addition, a deletion rule is required to account for the absence of the otherwise expected onsetless initial vowels in the reduplicant (see §4.2).

(64) $$\text{V} \rightarrow \emptyset \; / \; \# \begin{bmatrix} \text{—} \\ -\text{stress} \end{bmatrix}$$

Finally, an /o/-specific vowel harmony rule (Jacobsen 1964, Winter 1970) is invoked to account for why the final vowel of the reduplicant is always /o/ (e.g. /ˈt’ano/‘person’, according to Winter, ought to be */t’aˈnonu/). To summarise, the derivations using Broselow & McCarthy’s analysis of the reduplicated forms of /ˈahad/ ‘across’ and /ˈt’anu/ ‘person’ are given in (65).

(65)

underlying	ˈahad ‘across’	ˈt’anu ‘person’
reduplication: (C)+VCV+X	aha+ˈahad	t’+anu+ˈanu
Coalescence I (63a)	aˈhaahad	t’aˈnonu
Coalescence II (63b)	aˈhahad	—
initial unstressed vowel deletion	ˈhahad	—
o-*harmony*	—	t’aˈnono
output	ˈhahad	t’aˈnono

Broselow & McCarthy’s approach suffers from several shortcomings. To begin with, this theory erroneously predicts that the VCV reduplicant should appear after the first consonant of polysyllabic words. For example, the word /memˈdeːwi/ ‘deer’ is expected to be */me$\underline{\text{de}}$mˈdeːwi/. Yet the attested plural is /memdeˈ$\underline{\text{wiː}}$wi/ (J292). As shown in (66), the reduplicant always appears much closer to the end of the plural stem than to the beginning.[22]

[22] To the best of my knowledge, these are monomorphemic forms. Additional commentary is provided wherever it is available.

To avoid misinterpretation, the examples here are given in Kroeber’s orthography, since there are several inconsistencies in his transcription of the data. For example, ‘star’ appears as /malosañ/ on page 272, but as /ma’losañ/ on page 311; ‘bow’ as /baloxat/ on page 272, but as /balohat/ on page 310; ‘arrow’ as /meskitset/ on page 272, but as /meskitsEt/ on page 310. The segment *ñ* in Kroeber’s orthography corresponds to [ŋ] in Jacobsen (1964).

(66)

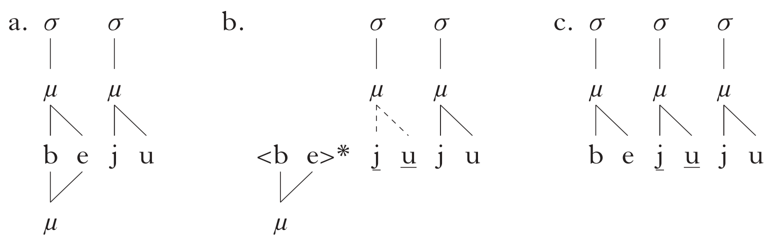
singular		*plural*		
hañakmuwe	K311	hañakmuwewe	K272	‘elks’
malosañ	K272	malosasañ	K272	‘stars’
meskitset[23]	K272	meskitsetsat	K272	‘arrows’
baloxat	K310	baloxaxat	K272	‘bows’
tamomo[24]	K308	tamomoomo[25]	K272	‘women’
memˈdeːwi	J292	memdeˈwiːwi	J292	‘deer’

De Haas (1988) argues that the coalescence rule claimed to be operative in Washo is anomalous when the general typology of vowel coalescence is taken into account. An analysis that can do without vowel coalescence is clearly superior. Broselow & McCarthy also fail to take into the account the parallelism between Moraic Stability and Coda Attraction: the behaviour of word-internal consonant sequences is handled by stipulating the direction of melodic association, while Moraic Stability is treated as part of the consequence of the vowel-coalescence and vowel-deletion rules. The account advanced in this paper, on the other hand, derives Coda Attraction through the same mechanism by which it derives the Moraic Stability effect.

4.3 Urbanczyk (1993): moraic circumscription

Urbanczyk (1993) rejects earlier VCV analyses, proposing instead a templatic analysis where the reduplicant is monomoraic (i.e. a light syllable). Using the theory of moraic circumscription, she argues that the initial CV sequence of the root is the kernel, thus circumscribed temporarily. The reduplicant is prefixed to the residue. Association to the template is from left to right. A derivation under this approach is given in (67).

(67)



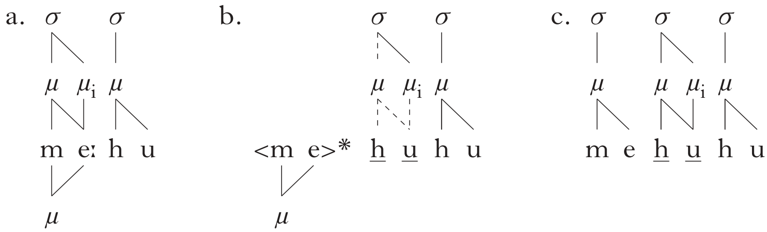
As shown in (67a), the circumscription of a mora targets the initial CV segments. The result of this parsing function can be seen in (67b). (67b) also shows the operation of prefixing the reduplicant, indicated by the

[23] Cited as /meʃˈgits’et/ by Jacobsen (1964: 104), who suggests (1964: 494) that /meʃg-/ might have been a prefix to the stem /ˈits’ed/ ‘to prick, sting’, even though this is the only word with this ‘prefix’.

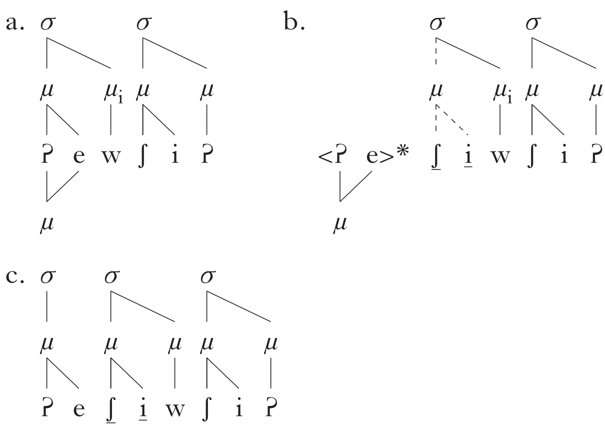
[24] /daʔˈmoʔmoʔ/ (J102).

[25] It is unclear why the plural has a long vowel here.

underline, to the residue with subsequent association to the template, as indicated by the dashed association lines. The reconcatenation appears in (67c). The main appeal of this approach is in its ability to answer the two main puzzles of Washo reduplication. (68) demonstrates how moraic circumscription handles the Moraic Stability effect: when the initial CV is circumscribed, the residue, which preserves the original prosodic structure, contains an 'orphaned' mora (i.e. one having no melodic content), indexed with a subscripted *i*. When the monomoraic reduplicant is prefixed to the residue, the length-contributing mora picks up the melody of the reduplicant (68b). As a result, the reduplicant contains a long vowel on the surface.

(68)


Coda Attraction is explained in a similar manner. Crucially, Urbanczyk assumes that the coda is weight-bearing in Washo. Thus, when the initial CV is circumscribed, the moraic coda becomes part of the residue to which the reduplicant is prefixed. While association to the template proceeds from left to right, as noted above, Urbanczyk's analysis must stipulate that the consonant closest to the vowel is associated to the moraic reduplicant, rather than the first consonant of the melody of the residue (i.e. /ʔe.ʃiw.ʃiʔ/, not */ʔe.wiw.ʃiʔ/).

(69)


While moraic circumscription offers a way to handle the Washo data, it nonetheless misses several important generalisations. To begin with, the apparent connection between the main stress, reduplicant placement and the restricted distribution of long vowel is lost in Urbanczyk's analysis. Moraic Stability is an artefact of the relative shortness of the forms considered. When longer stems are considered, moraic circumscription, like Broselow & McCarthy's theory, erroneously predicts second-syllable reduplication (i.e. the plural of /memˈdeːwi/ 'deer' is predicted to be */medemˈdeːwi/). Moraic circumscription also suffers a second empirical problem, namely, the plural of the VCC stems. As Urbanczyk (1993: 352) admits, 'if the first mora is circumscribed the residue will consist solely of consonants. There will be no vowel in the residue to associate to the template.' Consequently, she has to stipulate that moraic circumscription is not applicable to these VCC forms; the reduplicant is straightforwardly prefixing. No such stipulation is needed in the analysis advanced in this paper. The variation in the shape of the reduplicant in different stems is derived by one and the same constraint ranking. My analysis also sees the distribution of vowel length, the reduplicant and stress assignment as inextricably linked. Moraic Stability and Coda Attraction are the natural consequences of the proposed constraint hierarchy, not derivatives of some ad hoc stipulations. As a final point, Urbanczyk's treatment of Coda Attraction crucially assumes that the coda is weight-bearing. Yet no argument for this assumption is presented. Given that there is no evidence for across the board quantity-sensitivity in Washo stress assignment, the analysis advocated in this paper, which makes no special assumption about the moraicity of codas underlyingly, is preferable.

Before ending this section, it is worth noting that Washo internal reduplication was one of several case studies employed by Urbanczyk to argue for the technique of moraic circumscription. Thus the present study should not be taken as a refutation of moraic circumscription in general. A full-fledged re-examination of the case studies reviewed in that work would take the discussion too far afield. Thus I leave that important question for future research. It is sufficient to point out that, at least in the case of Washo internal reduplication, moraic circumscription falls short as a viable analysis, especially given the alternative proposed in this study.

5 Conclusions

A re-examination of the original sources provides evidence that reduplication in Washo does not operate in the fashion proposed by previous authors. The analysis advocated in this study capitalises on the emerging preference for heavy stressed syllables in the language. The main strength of this analysis is that it establishes a link between a set of seemingly disparate phenomena, namely the restriction of long vowels to the stressed syllable, post-tonic gemination, tonic vowel lengthening, the stability of vowel length in reduplication (i.e. the Moraic Stability puzzle) and the behaviour of word-internal coda consonant in the reduplicated forms (i.e. the Coda Attraction puzzle).

The current findings have implications for theories of reduplication and theories of weight phenomena in general. To begin with, plural reduplication in Washo is a-templatic; the shape of the reduplicant is neither VCV (Broselow & McCarthy 1993) nor CV (de Haas 1988, Urbanczyk 1993). The size variation of the reduplicant is a consequence of the interactions between constraints on the anchoring of the plural morpheme and stress assignment. No *a priori* assumption about the shape of the reduplicant is needed. This analysis thus lends further support to eliminating the need for templates in Prosodic Morphology (see McCarthy & Prince 1994b). The treatment of reduplicative fission adopted in this paper obviates the need to invoke any reduplication-specific constraints, including the need to stipulate the base of reduplication. This analysis thus echoes recent treatment of phonological duplication, where the 'base' of duplication itself is derived from constraints governing surface segmental correspondences (Zuraw 2002, Yu 2003, 2004, 2005).

Another insight of the present analysis is in the novel application of the constraint-based approach to weight phenomena, demonstrating how the intricate relationship between stress, syllable weight and reduplication can be handled in a unified and insightful way. The enabling factor that brings all these elements together is the discovery that the plural reduplicant must surface as the stressed syllable, not after the initial consonant (Broselow & McCarthy 1993) or preceding the stressed vowel (Jacobsen 1964, Winter 1970), as previous authors have claimed. The peculiar interactions between reduplication, stress assignment and syllable weight are shown to be a natural consequence of the interaction between constraints on affix anchoring, weight assignment and stress assignment. In particular, the odd placement of the plural reduplicant in roots with an internal consonant sequence and the restricted distribution of long vowels in Washo can be attributed to a previously unnoticed preference for heavy stressed syllables on the surface. No assumption about coda weight is needed in the final analysis, however. The correct output is predicted purely on the basis of the interaction between constraints governing weight distribution, a welcome result in light of recent work that argues for the viability of a purely constraint-based approach to weight phenomenon (Rosenthall & van der Hulst 1999, Morén 2000, 2001).

REFERENCES

Bat-El, Outi (2002). Hebrew reduplication: the interpretation of forms with identical consonants. Handout of talk presented at University of California, Santa Cruz.

Bissell, Teal (2002). Avoidance of the marked in Miya pluractional allomorphy. *MIT Working Papers in Linguistics* **42**. 1–22.

Broselow, Ellen & John J. McCarthy (1983). A theory of internal reduplication. *The Linguistic Review* **3**. 25–88.

Feng, Guanjun Bella (2003). Lexical category specific constraints: Mandarin verb versus adjective reduplication. *USC Working Papers in Linguistics* **1**. 1–12.

Goad, Heather (2001). Assimilation phenomena and initial constraint ranking in early grammars. In Anna H.-J. Do, Laura Domínguez & Aimee Johansen (eds.)

Proceedings of the 25th Annual Boston University Conference on Language Development. Somerville, Mass.: Cascadilla Press. 307–318.
Haas, Wim de (1988). *A formal theory of vowel coalescence: a case study of Ancient Greek*. Dordrecht: Foris.
Hansson, Gunnar (2001). *Theoretical and typological issues in consonant harmony*. PhD dissertation, University of California, Berkeley.
Hayes, Bruce (1989). Compensatory lengthening in moraic phonology. *LI* **20**. 253–306.
Inkelas, Sharon (2005). Morphological doubling theory: evidence for morphological doubling in reduplication. In Bernhard Hurch (ed.) *Studies on reduplication*. Berlin: Mouton de Gruyter. 65–88.
Inkelas, Sharon & Cheryl Zoll (2005). *Reduplication: doubling in morphology*. Cambridge: Cambridge University Press.
Itô, Junko & R. Armin Mester (1999). Realignment. In Kager *et al*. (1999). 188–217.
Jacobsen, William H., Jr. (1964). *A grammar of the Washo language*. PhD dissertation, University of California, Berkeley.
Jacobsen, William H., Jr. (1996). *Beginning Washo*. Carson City, Nevada: Nevada State Museum.
Kager, René (1999). *Optimality Theory*. Cambridge: Cambridge University Press.
Kager, René, Harry van der Hulst & Wim Zonneveld (eds.) (1999). *The prosody–morphology interface*. Cambridge: Cambridge University Press.
Kawu, Ahmadu (2000). Structural markedness and non-reduplicative copying. *NELS* **20**. 377–388.
Kroeber, A. L. (1907). The Washo language of East Central California and Nevada. *University of California Publications in American Archaeology and Ethnology* **4**. 251–317.
Kurisu, Kazutaka (2001). *The phonology of morpheme realization*. PhD dissertation, University of California, Santa Cruz.
Levin, Juliette (1983). *Reduplication and prosodic structure*. Ms, MIT.
McCarthy, John J. & Alan Prince (1986). *Prosodic morphology*. Ms, University of Massachusetts & Brandeis University.
McCarthy, John J. & Alan Prince (1993). Generalized alignment. *Yearbook of Morphology 1993*. 79–153.
McCarthy, John J. & Alan Prince (1994a). The emergence of the unmarked: optimality in prosodic morphology. *NELS* **24**. 333–379.
McCarthy, John & Alan Prince (1994b). An overview of Prosodic Morphology (Parts 1 & 2). Papers presented at the OTS/HIL Workshop on Prosodic Morphology, Utrecht.
McCarthy, John J. & Alan Prince (1995). Faithfulness and reduplicative identity. In Jill Beckman, Laura Walsh Dickey & Suzanne Urbanczyk (eds.) *Papers in Optimality Theory*. Amherst: GLSA. 249–384.
Marantz, Alec (1982). Re reduplication. *LI* **13**. 435–482.
Morén, Bruce (2000). The puzzle of Kashmiri stress: implications for weight theory. *Phonology* **17**. 365–396.
Morén, Bruce (2001). *Distinctiveness, coercion and sonority: a unified theory of weight*. New York & London: Routledge.
Nelson, Nicole (2003). *Asymmetric anchoring*. PhD dissertation, Rutgers University.
Ohala, John J. (1983). The origin of sound patterns in vocal tract constraints. In Peter F. MacNeilage (ed.). *The production of speech*. New York: Springer. 189–216.
Pater, Joe (1999). Austronesian nasal substitution and other NC̥ effects. In Kager *et al*. (1999). 310–343.
Prince, Alan (1990). Quantitative consequences of rhythmic organization. *CLS* **26:2**. 355–398.

Prince, Alan & Paul Smolensky (1993). *Optimality Theory: constraint interaction in generative grammar*. Ms, Rutgers University & University of Colorado, Boulder. Published 2004, Malden, Mass. & Oxford: Blackwell.

Riggle, Jason (2004). Nonlocal reduplication. *NELS* **34**. 485–496.

Rose, Sharon (1997). *Theoretical issues in comparative Ethio-Semitic phonology and morphology*. PhD dissertation, McGill University.

Rose, Sharon & Rachel Walker (2004). A typology of consonant agreement as correspondence. *Lg* **80**. 475–531.

Rosenthall, Sam & Harry van der Hulst (1999). Weight-by-Position by position. *NLLT* **17**. 499–540.

Spaelti, Philip (1997). *Dimensions of variation in multi-pattern reduplication*. PhD dissertation, University of California, Santa Cruz.

Urbanczyk, Suzanne (1993). Infixing and moraic circumscription. *University of Massachusetts Occasional Papers* **16**. 319–357.

Urbanczyk, Suzanne (1996). *Patterns of reduplication in Lushootseed*. PhD dissertation, University of Massachusetts, Amherst.

Urbanczyk, Suzanne (2000). The bases of double reduplication. *WCCFL* **19**. 518–531.

Ussishkin, Adam (2000). *The emergence of fixed prosody*. PhD dissertation, University of California, Santa Cruz.

Walker, Rachel (2000). Nasal reduplication in Mbe affixation. *Phonology* **17**. 65–115.

Winter, Werner (1970). Reduplication in Washo: a restatement. *IJAL* **36**. 190–198.

Yu, Alan C. L. (2003). *The morphology and phonology of infixation*. PhD dissertation, University of California, Berkeley.

Yu, Alan C. L. (2004). Reduplication in English Homeric infixation. *NELS* **34**. 619–633.

Yu, Alan C. L. (2005). Toward a typology of compensatory reduplication. *WCCFL* **24**. 397–405.

Yu, Alan C. L. (to appear). Prosodically-governed segmental fission in Washo. *BLS* **31**.

Zuraw, Kie (2002). Aggressive reduplication. *Phonology* **19**. 395–439.