

K. D. Harrison and E Raimy. (2004). "Reduplication in Tuvan: exponence, readjustment and phonology." In *Proceedings of WAFL 1: Workshop in Altaic Formal Linguistics* by A. Csirmaz, Y. Lee and M. A. Walter. MITWPL 46, Cambridge, MA.

Reduplication in Tuvan: Exponence, Readjustment and Phonology

*K. David Harrison and Eric Raimy
Swarthmore College*

This paper addresses issues about the grammatical sources of the surface patterns of reduplication. Tuvan provides evidence for a distributed analysis of reduplication that divides the explanation for surface patterns between the morphology and phonology components of grammar. Analyses based on Raimy (2000) show that two reduplication patterns in Tuvan result directly from the spell-out of a vocabulary item. A third reduplication pattern shows that the general phonology of Tuvan provides crucial explanation of the surface pattern of vowel overwriting in total reduplication. The implications of these analyses with respect to different views and models of reduplication are discussed.

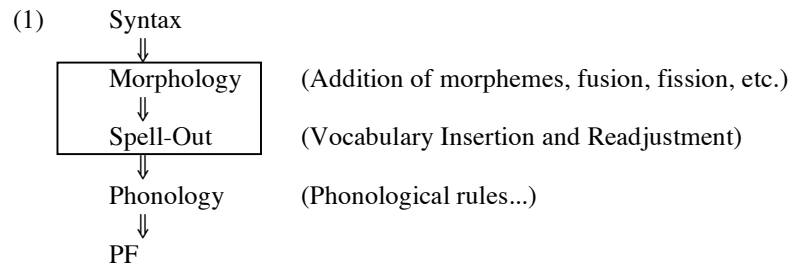
1. Introduction

Reduplication has been the subject of vigorous research over the last ten years due to the empirical success of analyses based in Correspondence Theory (McCarthy and Prince 1995). This paper addresses issues with respect to reduplication that we believe have been neglected during this period of research. These neglected issues raise basic questions about the grammatical mechanisms of reduplication. Specifically, what determines the surface characteristics of a particular pattern of reduplication? How is reduplication actually accomplished? What benefits do we gain by attending to these questions? All of the answers to these questions hinge on the relationship between morphology and phonology. The main purpose of this paper is to explore and provide answers to these questions. The layout of the paper is as follows. Section 2 provides a background discussion of Distributed Morphology (Halle and Marantz 1994) to clarify the difference between exponence, readjustment and pure phonology in reduplicative patterns. Section 3 presents a short summary of distinct positions advanced in the literature about the morphological status of reduplication. Section 4 introduces three distinct reduplication patterns present in Tuvan, the relevant phonology of Tuvan and provides analyses of these data. Section 5 summarizes the conclusions from the previous sections and discusses answers to the questions put forth in this introductory section.

2.0 Distributed Morphology

We assume Distributed Morphology (henceforth DM) as the framework for the organization of grammar in which the analyses in section 4 will be grounded. The main reason for this choice is the explicit modularity of grammar espoused

by DM. DM is not unique as a morphological theory in assuming modularity of grammar but it provides unusually clear distinctions between modules and operations that reside in a particular module. Consider, for example, the modular organization presented in (1).



The focus of interest with respect to reduplication is the *spell-out* operation that takes place in the morphology and the following phonology and phonetics modules. Prior to *spell-out* the representations are syntactic in nature in that they consist solely of morpho-syntactic features and the relations that hold among them. There is no phonological material at this point in the derivation. *Spell-out*, in its simplest form, is an operation within the morphology module that swaps morpho-syntactic features and syntactic relations for corresponding phonological representations. Since syntactic representations are being converted into phonological ones we must be careful to distinguish between the morphological pieces in each type of representation. Bundles of morpho-syntactic features that are present in and manipulated by the syntax are referred to as *morphemes*. The phonological representations that correspond to these *morphemes* are referred to as *vocabulary items*.

Given the distinction between morphemes and vocabulary items, we can begin to ask questions about the phonological reflexes of reduplication by querying whether the surface occurrence of reduplication can result directly from a *vocabulary item*. In other words, is there some piece or set of phonological material that by itself can cause reduplication? Anderson (1992) concludes that the answer to this question is no and that reduplication provides strong evidence that morphology in general is *procedural* in nature and not an *item and arrangement* schema. DM avows primarily an *item and arrangement* model of morphology that deploys readjustment rules to account for procedural types of morphological effects. Thus, readjustment rules are a second source of the addition or manipulation of phonological material within the morphology module. Given this background, we want to revisit the question as to whether reduplication is necessarily the result of *procedural* morphology and ask whether reduplication might be understood instead as a result of *item and arrangement* morphological processes.

3.0 Morphological Analyses of Reduplication

The core issue of interest for this paper is whether reduplication within DM is the result of the spell-out of a vocabulary item (VI) or whether it is the result of

a readjustment rule (RR). To place this question in a more theory neutral way, if reduplication is the result of a VI then it should behave like other types of affixation (prefixation and suffixation) and could be accounted for in a like manner in an *item and arrangement* morphology. If reduplication is on the other hand a readjustment, then it remains in the realm of *procedural* morphology and should share characteristics with other types of procedural morphology. A second consequence of identifying reduplication as a readjustment is that these cases of reduplication are then not the primary exponence of the morpho-syntactic features. Besides accounting for procedural type morphological effects, RRs account for secondary or additional phonological changes that accompany a VI that is the spell-out of a morpho-syntactic feature. For example, the vowel changes that occur with past tense and participle marking on strong verbs in English are readjustments. Consider the data in (2).

(2) <i>with readjustment</i>			<i>without readjustment</i>		
<u>present</u>	<u>past</u>	<u>participle</u>	<u>present</u>	<u>past</u>	<u>participle</u>
sing	sang-Ø	sung+Ø	put	put+Ø	put+Ø
bind	bound-Ø	bound+Ø	hit	hit+Ø	hit+Ø
tell	tol-d	tol-d	yell	yell-ed	yell-ed
flee	fle-d	fle-d	need	need-ed	need-ed

The vowel changes in (2) can be doubly dissociated from the exponence of past tense and participle marking. Whether a strong verb undergoes the vocalic change or not does not affect its marking as either past tense or a participle which can itself be a zero morpheme (Ø). Because the vocalic change is not the exponence of the VI for the morpho-syntactic past or participle, it must then be the result of a readjustment rule. Forms like *tell~told* and *flee~fled* suggest that readjustment rules are *gratuitous* in that they modify VIs in ways that are unnecessary to indicate morpho-syntactic distinctions. Many cases of reduplication share this characteristic and thus should be considered as examples where reduplication is the result of a readjustment rule. Consider the data in (3).

- (3) a. Bella Coola Diminutives (Nater 1984, Bagemihl 1991)
- | | | | |
|----------|----------|---------------|-------------------|
| qayt | 'hat' | qa-qayt-i | 'toadstool'(Dim.) |
| silin | 'kidney' | sil-slin-i | Diminutive |
| t'ix-ala | 'robin' | /i-t'ix-ala-y | Diminutive |
- b. Tagalog Occupational Noun Prefix /maN/ (Carrier 1979)
- | | |
|--------------|-----------|
| mam-ba-bayan | 'citizen' |
| man-la-laro/ | 'player' |
| maN-gu-gupit | 'barber' |
- c. Ilokano Progressive Reduplication (Hayes and Abad 1989)
- | | |
|--------------|---------------|
| /ag-bas-basa | 'be reading' |
| /ag-da-dait | 'be sewing' |
| /ag-ad-adal | 'be studying' |

All of the reduplicated forms in (3) show additional affixation: Bella Coola reduplicates and suffixes /i/, Tagalog reduplicates and prefixes /maN/ and Ilokano reduplicates and prefixes //ag/. It appears that the reduplication in the patterns in (3) is unnecessary since there is an affix that is the primary exponence (and VI)

of the morpho-syntactic distinction. Other patterns of reduplication lack such concurrent affixation as shown in (4).

- (4) a. Malay (Muhadjir 1981)
- | | | | |
|--------|-----------|---------------|----------------------------|
| duduk | 'to sit' | duduk-duduk | 'to sit w/no def. purpose' |
| koNko | 'to chat' | koNko-koNko | 'to chat a lot or ...' |
| Nendon | 'to stay' | Nendon-Nendon | 'to stay in one place...' |
- b. Afrikaans (Botha 1988)
- | | | | |
|---------|-------------|-----------------|-------------------------|
| bottels | 'bottles' | bottels-bottels | 'bottles and bottles' |
| heuwels | 'hills' | heuwels-heuwels | 'hill upon hill' |
| ente | 'stretches' | ente-ente | 'quite a few stretches' |
- c. Tohono O'odham (Saxton, Saxton and Enos 1989, Zepeda 1983)
- | | | |
|--------|-----------|------------|
| hon | ho-hon | 'the body' |
| pualt | pu-puالت | 'a door' |
| podoni | po-podoni | 'to thump' |

The patterns in (4ab) show total reduplication with no other affixation and (4c) shows partial reduplication also with no additional affixation. At this point there are at least two possible morphological analyses of the data like that in (4). The first is to claim that there is always a zero morpheme present when reduplication is the only phonological change that accompanies a morpho-syntactic distinction. According to this position, reduplication is always the result of a readjustment rule. The second possibility that will be considered in this paper is that 'bare' reduplication is the primary exponence of a VI that corresponds to the morpho-syntactic distinction being spelled out. To better understand these two positions we will briefly review current and prior views on this issue.

3.1 Reduplication = readjustment

Carrier (1979), Frampton (2002) and Halle (2003) all argue that all cases of reduplication result from the application of a readjustment rule. Although differing in details and theoretical assumptions, all three authors hold the position that reduplication is a special type of operation which is distinct from prefixation and suffixation. Carrier (1979) specifically argues that reduplication is accomplished via a transformational rule which must occupy a special place in the morphological module. Halle (2003) argues that VIs must be strictly linear. Thus the representations for reduplication proposed in Raimy (2000) cannot be considered VIs since they are non-linear. Frampton (2002) proposes a juncture based model of reduplication and argues against the representational proposals in Raimy (2000). Consequently, the representations in Raimy (2000) are not legitimate grammatical objects in Frampton's opinion and the junctures that Frampton proposes to account for reduplication are all inserted via readjustment rules.

3.2 Reduplication = affixation

Marantz (1982) argues that reduplication is the affixation of skeletal morphemes consisting of CVs, syllables or morpheme symbols. Two main motivations for this proposal are: (1) that the transformational analysis of reduplication proposed by Carrier (1979) posits morphological rules that never occur cross-

linguistically (Marantz 1982:435) and (2) that this affixation approach provides an analysis of reduplication based on autosegmental representations and cross-linguistic universals. Under Marantz's proposal, reduplication can be viewed as a VI since it consists of phonological material present in other VIs.


3.3 Unclear cases

McCarthy and Prince (1995) posit an abstract morpheme RED to account for reduplication. This position is clearly not readjustment because RED is clearly treated as an affix (or a root in some cases) within the OT literature. The correspondence theory of reduplication is not a purely 'Marantzian' model though due to the different computational assumptions of OT and the lack of a dominant theory of morphology.

Inkelas and Zoll (2000) argue for the *double stem selection* (DSS) model of reduplication. This is clearly not affixation since the model specifically claims that two stems are used in reduplicated structures. This does not make reduplication necessarily readjustment though due to differences in the assumed morphological models of DSS and DM.

3.4 Precedence Model

Raimy (2000) argues that reduplication results from looped precedence structures as in (5).

- (5) Tohono O'odham CV reduplication (Raimy 2000:113)
- | | | |
|----|--|--|
| a. | <i>root</i> 'the body' | # → h → o → n → % |
| b. | <i>root</i> 'the body' + <i>plural</i> | # → h → o → n → %
 |
| c. | <i>linearized</i> | [hohon] |

According to proposals in Raimy (2000), the morphology builds reduplicated structures by adding 'loops', as in (5b), to the precedence structure of a VI. Following the modular structure of DM, these representations are then passed onto the phonology. The phonology contains a *linearization* process that eliminates loops via repetition, as in (5c), as a *bare output condition* (Chomsky 1995). For discussion of *linearization* see Raimy (1999, 2000, 2003) and Fitzpatrick and Nevins (to appear). A fundamental claim of Raimy (2000) is that precedence relations (which are indicated by '→') constitute fundamental components of phonological representations. This means that precedence relations are equivalent to any other piece of phonological representation (such as features or timing slots). They form a necessary part of stored representations because they cannot be derived from other information. Additionally, precedence relations can be manipulated via readjustment or phonological rules as can any other part of phonological representation. Consequently, since precedence relations are part of stored VIs there is no reason not to allow a single bare precedence relation to be a VI itself. Granting this position, reduplication can be either a VI or a RR in PM. There is then a question as to whether reduplication without concurrent affixation, as in (4), is a VI or a readjustment. To put this another way, the

model of reduplication provided in Raimy (2000) provides the potential for a fully *item-and-arrangement* analysis of reduplication. This possibility suggests that reduplication does not necessarily lend evidence for a procedure based morphology.

4. Reduplication in Tuvan

Tuvan stands out among the Altaic and Turkic languages both in the wide range of types of reduplication it employs and the productivity of those types. A total of five types (four productive and one unproductive) of reduplication can be distinguished. This paper will offer analyses of p-reduplication, s-reduplication and total reduplication with vowel overwriting. The other two reduplication patterns found in Tuvan but not discussed here are total reduplication and lexicalized reduplication that instantiates one or more of the above types. No other Altaic language is yet reported to employ such an extensive repertoire of reduplication. Further, while certain types of reduplication such as p-reduplication are widely attested across Altaic and beyond, they are often strictly limited in their productivity. In most Turkic languages, for example, p-reduplication applies only to color terms or some similar closed class, while in Tuvan it has been productively extended to intensify all modifiers, and even extended to verbs to denote iterativity. These characteristics of reduplication in Tuvan make it an important source of information about how reduplication patterns can vary within a language family. Additionally, we will see that the particular patterns of reduplication we present provide evidence relevant to the issue of whether reduplication can be the result of a VI.

Before turning to analyses of particular patterns of reduplication in Tuvan some general facts about Tuvan phonology should be discussed. Tuvan has an 8-vowel inventory that contrasts ‘high/low’, ‘front/back’ and ‘round/unround’ in a symmetrical manner, in addition to a length distinction (Anderson and Harrison 1999, Harrison 2000) as in (6).

(6) Tuvan vowel inventory

	FRONT UNROUND	FRONT ROUND	BACK UNROUND	BACK ROUND
HIGH	i	ü	^	u
LOW	e	ö	a	o

Tuvan shows two distinct harmony processes. The first is backness harmony where all vowels within a harmonic domain must have the same feature for backness. The second is roundness harmony which only targets high vowels. All high vowels must have the same feature for roundness as the vowel in the initial syllable. Harrison and Kaun (2000) argue that harmonic stems in Tuvan are best analyzed by assuming underspecification where the harmonic features spread from the initial vowel to following underspecified vowel. They further argue that disharmonic stems are best analyzed by assuming all vowels to be fully specified in these forms. There are basically only two sources of disharmonic forms in Tuvan. One is through compounding where it appears that this

process does not disturb the harmony domains present in the compounded words. Examples of disharmonic compounds are: *ada-ije* ‘parents’ (N), *söNge-bashqa* ‘separate’ (ADJ), *siit-saan* ‘milk-producing livestock’ (Collective Noun), *tap-bileeleer* ‘to act slowly, unhurriedly’ (Verb), *tönmes-batpas* ‘unending’ (Verb+Verb compound, forms an Adjective) and *ödürek-dumchuq* ‘duck-bill’ (N). The other source of disharmonic forms is loanwords. Not all loanwords are necessarily disharmonic but there are ample cases where the loanword is not totally assimilated to Tuvan phonology and a disharmonic root results. Examples of disharmonic loanwords are: *apteeqa* ‘pharmacy’ (N), *tema* ‘topic’ (N), *tranzit* ‘transit’ (N), *mumija* ‘mummy’ (N), *natsija* ‘ethnos’ (N) and *signal* ‘signal’ (N). Disharmony results from fully specified vowels in these stems blocking the spread of backness and roundness features.

The relevance of Tuvan vowel harmony to the topics at hand is that only one of the reduplication patterns that is analyzed here interacts with vowel harmony in a non-trivial way. Providing a principled reason for why two of the reduplication patterns do not interact with vowel harmony but the third does is a desirable attribute for analyses of this data.

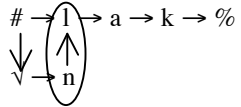
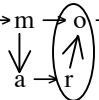
4.1 p-reduplication

The first reduplication pattern that we will consider consists of partial reduplication with a linking segment [p]. The semantics of this construction is: ‘emphatic’ for modifiers, and ‘emphatic’, ‘intensifying’ or ‘iterative’ for verbs. This pattern of reduplication is an areal feature widely attested across Eurasian languages including Buriat, Turkish and Armenian. The surface pattern consists of a copy of the initial (C)V followed by [p] and then the base, as seen in the data in (7).

(7)	<i>simple form</i>		<i>reduplicated form</i>	
	qara	‘black’	qa-p-qara	‘very black’
	nogaan	‘green’	no-p-nogaan	‘very green’
	q ^ˆ z ^ˆ l	‘red’	q ^ˆ -p-q ^ˆ z ^ˆ l	‘completely red’
	uzun	‘long’	u-p-uzun	‘very long’
	türgen	‘quick(ly)’	tü-p-türgen	‘very quick(ly)’
	tSiNge	‘thin’	tSi-p-tSiNge	‘very thin’
	borbaq	‘spherical’	bo-p-borbaq	‘completely spherical’
	xalaan	‘run’-PAST	xa-p-xalaan	‘ran really fast’
	körbeen	‘see’-NEG-PAST	kö-p-körbeen	‘did not see at all’
	saar	‘milk’-P/F	sa-p-saar	‘will definitely milk’
	sa/bas	‘milk’-NEG-FUT	sa-p-sa/bas	‘will definitely not milk’

Given the analysis of reduplication in Raimy (2000), the reduplication pattern in (7) can be understood as the affixation of a VI /p/ with precedence information for the VI being a combination of ‘infix’ and ‘prefix’. To better understand this point, consider the representations for prefixation and infixation proposed by Raimy (2000) presented in (8). Note that for reasons of space the full x-slot plus melody structure of segments is suppressed in representations where it is not relevant to the point in hand. It is assumed that precedence relations only occur

between x-slots and not on any other tier. All precedence relations are derived from reference to the x-slot tier.

- (8) a. prefixation (Raimy 2000:67-69)
 /un+lock/
 $\# \rightarrow l \rightarrow a \rightarrow k \rightarrow \%$

- b. infixation in Sundanese (Raimy 2000:71-74)
 /moek'n/ 'to dry' > [m-ar-oek'n]
 $\# \rightarrow m \rightarrow o \rightarrow e \rightarrow k \rightarrow ' \rightarrow n \rightarrow \%$


According to Raimy (2000) a prefix has the anchoring specifications of beginning the word (which is technically indicated by following # which indicates the beginning of a string of segments) and preceding the first segment of the word. The latter anchoring specification is indicated in (8a) by being circled. This is one of the anchoring points for p-reduplication. Infixation is accomplished within Raimy (2000) by specifying two anchoring points that are neither at the beginning nor end of a string. The Sundanese infixation pattern can be informally described as /ar/ 'follows the first segment and precedes the first vowel'. The important aspect of this analysis is that affixes may have anchoring points that make reference to prominent positions in a string of segments. For p-reduplication in Tuvan we must make reference to the first vowel and indicate that /p/ follows it. This is similar to the Sundanese pattern in (8b) in that the first vowel is part of the anchoring information but Tuvan p-reduplication differs in that instead of preceding the first vowel, /p/ follows the first vowel. See Yu (2003) for discussion of infixing patterns that place segments after the first vowel.

We can now provide a representation for p-reduplication in Tuvan. The phonological structure that is built by the morphology for this pattern of reduplication is presented as (9).

- (9) $\# \rightarrow s \rightarrow a \rightarrow a \rightarrow r \rightarrow \%$ *linearize* > [sapsaar]


From the representation in (9) we can propose that p-reduplication is accomplished by the concatenation of a VI of the form in (10).

- (10) {EMPHATIC...} \Leftrightarrow ANCHOR 1 \rightarrow p \rightarrow ANCHOR 2
 ANCHOR 1: 'first vowel'
 ANCHOR 2: 'first segment'

The representation in (10) indicates that there is no separate reduplication process or readjustment that occurs with the affixation of [p]. The reduplication that

co-occurs with this segment is an inherent part of its phonological representation. The precedence information for this affix, as indicated in its anchor points, creates the looping structure that results in surface reduplication. It is also important to note that the anchor points in Raimy (2000) used to encode the precedence behavior of affixes are related to (if not the same as) *pivot* points of Yu (2003). The places where infixation occurs and where ‘loops’ occur to derive reduplication appear to be the same. This is important independent concurring evidence in favor of both the proposals in Yu (2003) and Raimy (2000).

A final note on this reduplication pattern is to point out that no interaction between harmony system in Tuvan and p-reduplication occurs. This falls out directly in this analysis because the VI in (10) only causes repetition of the first vowel. This vowel is fully specified since it determines the harmony behavior of the rest of the stem. Consequently, there is no way that repeating this first vowel can disrupt harmony or create a disharmonic form. Another way of looking at this point is that the learner only needs to learn the vocabulary item in (10) to acquire p-reduplication in Tuvan. The interaction of this reduplication pattern and the phonology of Tuvan is completely predictable given the present analysis.

4.2 s-reduplication

Another pattern of reduplication in Tuvan shows total copying with overwriting or insertion of [s] at the beginning of the second copy. The semantics associated with this reduplication pattern is ‘diminutive’ (or, in some cases, ‘augmentative’).

(11)	<i>simple form</i>		<i>reduplicated form</i>	
	aar	‘heavy’	aar-s-aar	‘heavyish’
	belen	‘easy’	belen-s-elen	‘easyish’
	belek	‘gift’	belek-s-elek	‘a gift or s.t. like it’
	borbaq	‘spherical’	borbaq-s-arbaq	‘sort of spherical’
	<i>lexicalized forms</i> (base form does not exist as independent lexeme)			
	uuruk	suuruq		‘simultaneously’
	boraN	saraN		‘bad weather (day)’

This pattern can be understood as the concatenation of an affix /s/ that is part ‘suffix’ and part ‘infix’. As with the p-reduplication pattern, s-reduplication contains precedence information that is utilized by suffixes and infixes. The /s/ acts like a suffix in that it must follow the stem and it acts like an infix in that it precedes the first vowel (just like infixation in Sundanese in (8)). Note that the overwriting or insertion behavior of the /s/ is directly captured since the /s/ must precede the first vowel. In cases like *aar* ‘heavy’ where there is no onset, the /s/ appears to be inserted. In cases like *belen* ‘easy’ where there is an onset, the /s/ does not overwrite or displace the onset. The /s/ becomes the onset of the second copy as part of the precedence structure built in the morphology as in (12). When this structure is linearized in the phonology, /s/ appears as the onset of the second copy. The VI for s-reduplication is presented in (13).

(12) # → b → e → l → e → n → % *linearize* > [belenselen]

(13) {DIMINUTIVE} ⇔ ANCHOR 1 → s → ANCHOR 2

ANCHOR 1: 'last segment'
 ANCHOR 2: 'first vowel'

We reach the same conclusion about s-reduplication as we did for p-reduplication. Reduplication is the direct result of the precedence relations that are part of the VI for s-reduplication. No readjustment is necessary. There is also no interaction (or acquisition burden) between s-reduplication and vowel harmony because the VI in (13) does not add any new vowels. P-reduplication and s-reduplication are identical on these points and the difference between the two patterns consist solely of the segment associated with them and the precedence relations of these segments.

4.3 Total reduplication

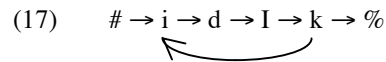
The final pattern of reduplication in Tuvan that we will be considering is total reduplication with overwriting of the first vowel of the stem in the second copy. The semantics associated this construction is 'X or something like X' and/or 'any old kind of X'.

(14)	<i>simple form</i>	<i>reduplicated form</i>	<i>gloss</i>
	nom	nom-nam	'book'
	er	er-ar	'male'
	is	is-as	'footprint'
	ög	ög-ag	'yurt'
	süt	süt-sat	'milk'
	q [^] s	q [^] s-qas	'girl'
	xol	xol-xal	'hand'
	at	at-ut	'name'
	aar	aar-uur	'heavy'

(14) presents data from monosyllabic stems. The result of overwriting the vowel in the second copy may produce a disharmonic form where the entire word does not agree in backness (e.g. *er-ar* 'male', *süt-sat* 'milk') and/or roundness (e.g. *xol-xal* 'hand', *ög-ag* 'yurt'). Vowel overwriting in reduplication sets up a second independent harmony domain similar to compounds and other disharmonic stems in Tuvan. This behavior can be captured by assuming that the overwriting vowel is fully specified for features, thus blocking harmony (Kaun and Harrison 2000, Clements and Sezer 1982). Vowel harmony applies in this new domain if the stem is harmonic, as seen in the polysyllabic stems undergoing total reduplication in (15). Vowel harmony *does not* apply in the second copy if it is a disharmonic stem though as shown in (16).

(15)	<i>simple form</i>	<i>reduplicated form</i>	<i>gloss</i>	
	idik	idik-ad ^q	'boot(s)'	*adik
	inek	inek-anaq	'cow'	*anek
	ulu	ulu-al [^]	'dragon'	*alu
	ar [^]	ar [^] -uru	'bee'	*ur [^]
	uduur	uduur-ad ^{^r}	'sleep'-FUT	*aduur
	fiidik	fiidik-faad ^k	'video cassette'	*faadik
	nomdZuur	nomdZuur-namdZ ^r	'read'	*namdZuur
(16)	<i>simple form</i>	<i>reduplicated form</i>	<i>gloss</i>	
	maSina	maSina-muSina	'car'	
	*muSuna			
	ajbek	ajbek-ujbek	'Aibek'	*ujbak
	Ziguli	Ziguli-Zaguli	'Zhiguli'	*Zaguli
	aal=Ze	aal=Ze-uul=Ze	'yurt' ALL	*uul=Za

There are three main aspects of this reduplication pattern that must be explained. The first is that this pattern is total reduplication. Total reduplication occurs when there is a precedence link added from the 'last segment to the first segment' as shown in (17). The description of this added precedence link is an essential part of the VI for this reduplication pattern. Note that underspecified vowels that are targets of vowel harmony are presented as capital letters where /I/ indicates a high vowel that will harmonize according to the back and round features of a preceding fully specified vowel. Vowels that are in lower case are fully specified and will block or trigger harmony.

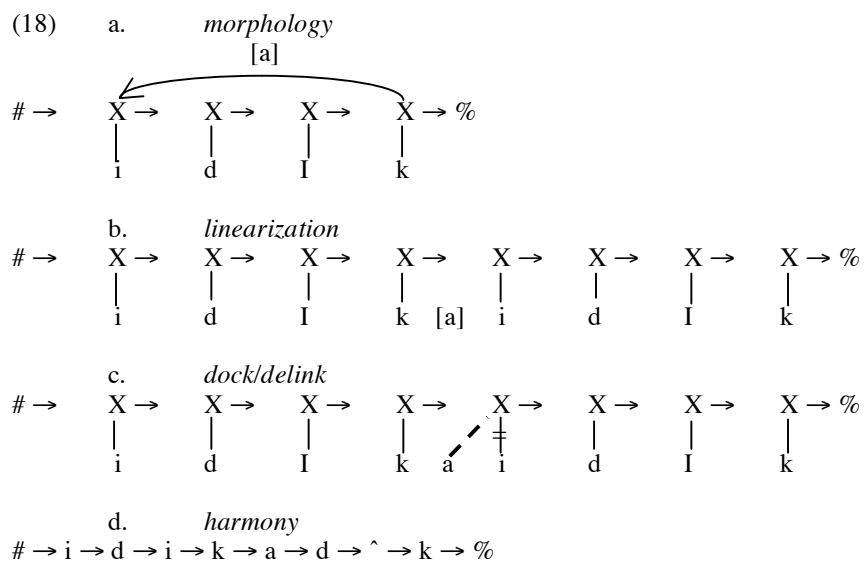


The second aspect is that the overwriting vowel shows allomorphy depending on whether the first vowel of the stem is /a/ as the first vowel or not. This appears to be a normal type of allomorphy in that we can define the /u/ allomorph as the special case in that it is only used if the first vowel of the stem is /a/ and the /a/ allomorph is the general elsewhere form. This too is an essential characteristic of the VI for this reduplication pattern.

The final aspect of this reduplication pattern is the placement of the overwriting vowel and the interaction of this introduced segment and vowel harmony in Tuvan. The placement of the overwriting vowel is complicated due to the fact that the vowel overwriting does not *overapply* (appearing in both copies), shows length transfer effects and does not dislodge a contrastive low pitch found on some stem forms. Each of these observations indicate that the overwriting vowel must be 'floating' in that it does not come with an association to an x-slot. The low pitch preservation facts require this because if the overwriting vowel were a complete segment (x-slot plus melody) there would be no reason for the tone to appear on the copy along with it. The length transfer effects also support this in that if the overwriting vowel associated with a single x-slot then it should appear at the surface as short (or conversely, if the overwritten vowel is associated to two x-slots it would surface as long). Finally, the

normal application of vowel overwriting indicates that it is not a readjustment to the stem triggered by the morpho-syntactic structure. If vowel overwriting were a readjustment, then it would have to overapply since there is only a single ‘copy’ of the stem present during the morphology. If the vowel were overwritten at this point in the derivation, then it would copy as this changed vowel and produce surface overapplication effects.

In order to derive the surface behavior of the vowel overwriting we must posit a vowel melody that is coextensive with the precedence link needed for total reduplication. This vowel is ‘floating’ in that it is not associated with an x-slot but is restricted in its placement by the anchor points of the added precedence link. Since anchor points for the total reduplication link are ‘follows the last segment’ and ‘precedes the first segment’, the floating vowel melody will be positioned in this place when linearization occurs. The derivation in (18) presents how this floating vowel behaves and is incorporated into the phonological representation.



(18a) shows the phonological structure that is built by the morphology. The floating nature of the vowel /a/ is represented by being enclosed in square brackets for legibility. The lack of an association line between this segment and an x-slot is the actual cause of its floating behavior. (18b) shows the linearization of (18a). The floating /a/ is now placed between the two copies of the stem. The vowel will migrate rightward to the first vocalic slot due to the general rightwardness of spreading in Tuvan. Since the /a/ is fully specified it will delink the vowel (instead of lowering it) that is associated with the first vocalic slot. (18d) shows the application of vowel harmony where the first /I/ harmonizes to the stem initial /i/ and the second /I/ harmonizes with the overwritten /a/ producing a high back unrounded vowel /^. Vowel harmony will not occur in disharmonic stems because all vowels are fully specified. When the overwritten vowel is

added, the vowels following it are already fully specified and thus not potential targets for vowel harmony.

The length transfer effects seen in overwritten long vowels (e.g. *fiidik* > *fiidik-faad* 'k' 'video cassette', *aar* > *aar-uur* 'heavy', etc.) are directly captured by this floating vowel analysis. The floating vowel will dock to the first x-slot of the long vowel and dislodge the vowel melody from it. This new vowel melody will then automatically spread into the second x-slot of the long vowel because Tuvan does not allow diphthongs thus requiring the overwriting of the entire long vowel. Another possible reason for this effect is that the second x-slot of the long vowel is underlyingly empty.

The distinctive low pitch stability effects are also captured by the autosegmental floating vowel analysis. When a form contains distinctive low pitch (e.g. *àt* 'horse' > *àt-ùt*), this tone is copied as part of total reduplication. The association between the x-slot and this pitch is not affected by the docking of the new vowel melody. Consequently the low pitch is not affected. This fact about Tuvan is predicted by our analysis.

Now that the vowel overwriting behavior is best captured via a floating vowel is established, we can posit the representation in (19) as the VI for 'total reduplication'.

$$(19) \quad \{ \text{'x and the like'} \} \Leftrightarrow \left\{ \begin{array}{l} \text{ANCHOR 1} \quad \rightarrow \quad \text{ANCHOR 2} \\ \quad \quad \quad \text{[u]} \quad \quad \quad \text{/ stem w/ [a]} \\ \text{ANCHOR 1} \quad \rightarrow \quad \text{ANCHOR 2} \\ \quad \quad \quad \text{[a]} \quad \quad \quad \text{/elsewhere} \end{array} \right\}$$

ANCHOR 1: 'last segment'
ANCHOR 2: 'first segment'

The VI in (19) is sufficient to capture all of the behavior seen in this pattern of reduplication in Tuvan. Because there is a new vowel melody inserted as part of the concatenation of this VI we predict that this pattern of reduplication will interact with the harmony system of Tuvan. The interaction is totally predictable however, in that since a fully specified vowel is being added it will trigger a new harmony domain in the second copy in harmonic roots. Disharmonic roots contain fully specified vowels so the introduction of this new vowel will not trigger a new harmony domain. This behavior has nothing to do with the VI in (19), though. Vowel harmony in Tuvan is a phonological process that acts on the representations in the phonology. The reduplicated structures containing the VI in (19) only interact with vowel harmony because of the insertion of the new vowel melody and not because there is any special status for 'reduplicative' morphemes. This is an attractive aspect of the present analysis because it places no additional acquisition burden on the learner. The interaction between total reduplication with vocalic overwriting and vowel harmony falls out from learning the VI in (19) and the general vowel harmony patterns in Tuvan as separate entities.

5.0 Conclusion: Reduplication as a VI or Readjustment

This paper has presented reduplication data from Tuvan and corresponding analyses in hopes of addressing the issues raised in section 1 about what the grammatical sources of the surface patterns of reduplication are. The reduplication patterns in Tuvan support the idea from Marantz (1982) that reduplication is equivalent to affixation from a morphological point of view. The advances in representation proposed in Raimy (2000) provide a concatenative model of reduplication that avoids Anderson's (1992) objection that the copying mechanism in Marantz (1982) is reduplication specific. A reflex of this point is that some reduplication patterns do not require the utilization of readjustment rules. The reduplication patterns discussed here are accounted for by VIs and do not employ any readjustment rules. Some patterns of reduplication may require a readjustment analysis when reduplication is the secondary exponence of a morpho-syntactic feature as evidenced in (3). Note that this requirement does not make reduplication procedural in Anderson's sense nor does it support the arguments from Carrier (1979), Frampton (2002) or Halle (2003). This type of secondary exponence is equivalent to double affixation which is easily accounted for by *item and arrangement* means.

Other aspects of the analyses in section 4 call into question the strictly morphological approach to reduplication proposed by Inkelas and Zoll (2000). In this type of analysis where the surface pattern of reduplicated forms is determined by co-phonologies within the morphology the fact that reduplicated forms follow the general phonology of Tuvan is an accident. The co-phonologies for reduplicated forms could vary and exempt these forms from aspects of Tuvan phonology. A similar point can be made against the McCarthy and Prince (1995) model of reduplication. Since the set of Base-Reduplicant Faithfulness constraints is completely independent from the set of Input-Output Faithfulness constraints there is no way to predict the phonological behavior of reduplicated forms. It is an accident that reduplicated forms in Tuvan do not show emergence of the unmarked or over/underapplication effects. The analyses proposed here do not suffer from this arbitrariness which adds an acquisition burden on the learner. The analyses here have no acquisition burden in that once the VI for each type of reduplication pattern is learned, the reduplicated structures built by the morphology undergo the normal phonology of Tuvan. This is a desirable result for any analysis of reduplication.

References

- Anderson, Gregory D. S. and K. David Harrison (1999). *Tyvan*. München:Lincom Europa.
- Anderson, Stephen (1992). *A-morphous morphology*. Cambridge: Cambridge University Press.
- Bagemihl, Bruce (1991). Syllable structure in Bella Coola. *Linguistic Inquiry*, 22: 589–646.
- Botha, Rudolf P. (1988). *Form and Meaning in Word Formation: A Study of Afrikaans Reduplication*. Cambridge Studies in Linguistics: Supplementary Volume. Cambridge University Press.
- Carrier, Jill Louise (1979). *The Interaction Of Morphological And Phonological Rules In Tagalog*. Doctoral dissertation, MIT.
- Chomsky, Noam (1995). *The Minimalist Program*. Cambridge, Mass.: MIT Press.

- Clements, George N. and Engin Sezer (1989). Vowel and consonant disharmony in Turkish. In van der Hulst, Harry and Norval Smith (eds.) *The structure of phonological representations (part II)*. Dordrecht: Foris.
- Fitzpatrick, Justin and Andrew Ira Nevins (to appear). Linearizing nested and overlapping precedence in multiple reduplication. In *Proceedings to PLC 27*.
- Frampton, John (2002). Distributed reduplication. Ms., Northeastern University.
- Halle, Morris (2003). On reduplication. Ms., MIT.
- Halle, Morris and Alec Marantz (1994). Some key features of Distributed Morphology. *MIT Working Papers in Linguistics vol. 21*. Cambridge, Mass.: MIT Working Papers in Linguistics. pp. 275–288.
- Harrison, K. David (2000). *Topics in the Phonology and Morphology of Tuvan*. Doctoral dissertation, Yale University.
- Harrison, K. David and Abigail Kaun (2000). Pattern-responsive Lexicon Optimization. In *Proceedings from NELS 30, vol. 1*, pp. 327–339.
- Hayes, Bruce and May Abad (1989). Reduplication and syllabification in Ilokano. *Lingua* 77: 331–374.
- Inkelas, Sharon and Cheryl Zoll (2000). Reduplication as morphological doubling. Ms., UC Berkeley and MIT. ROA 412.
- Marantz, Alec (1982). Re reduplication. *Linguistic Inquiry*, 13:435–482.
- McCarthy, John and Alan Prince (1995). Faithfulness and Reduplicative Identity. In *University of Massachusetts occasional papers in linguistics 18: Papers in Optimality Theory*, GLSA. University of Massachusetts, Amherst. pp. 77–136.
- Muhadjir (1981). *Morphology of Jakarta Dialect: Affixation and Reduplication*. NUSA: Linguistic Studies in Indonesian and Languages in Indonesia, Volume 11.
- Nater, Henry (1984). *The Bella Coala Language*. Canadian Ethnology Service Paper 92. Ottawa: Museum of Man.
- Raimy, Eric (1999). *Representing Reduplication*. Doctoral dissertation, University of Delaware.
- Raimy, Eric (2000). *The phonology and morphology of reduplication*. Berlin: Mouton de Gruyter.
- Raimy, Eric (2003). Asymmetry and linearization in phonology. In Di Sciullo, Anna Maria (ed) *Asymmetry in grammar, vol 2: Morphology, phonology, acquisition*. Philadelphia: John Benjamins Publishing Company. pp. 129–146.
- Saxton, Dean, Lucille Saxton and Susie Enos (1983). *Papago/Pima-English, English-Papago/Pima Dictionary, 2nd edition*. Tucson: University of Arizona Press.
- Yu, Alan (2003). *The Phonology And Morphology Of Infixation*. Doctoral dissertation, UC Berkeley.
- Zepeda, Ofelia (1983). *A Papago grammar*. Tucson: University of Arizona Press.

Linguistics Department
 Swarthmore College
 500 College Ave.
 Swarthmore, PA 19081

dharris2@swarthmore.edu (Harrison)
eraimy1@swarthmore.edu (Raimy)