Reprinted (in slightly shortened form) in: *Proceedings of the fourteenth West Coast Conference on Formal Linguistics*, eds. José Camacho, Lina Choueiri, & Maki Watanabe. 1996. CSLI Publications, Stanford University. 477—492.

A Constraint-Based Theory of Reduplication Patterns[*]

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0. Introduction

McCarthy and Prince (1994a) offer a comprehensive account of reduplication. A point only marginally addressed in that paper is what determines the prosodic shape of the reduplicant ($\mathcal{R}$). Traditionally this has been the domain of templates. McCarthy (1979) and Marantz (1982) assume these to be composed of a CV skeleton. McCarthy & Prince (1986) replace them with prosodic categories. In these works reduplicating affixes are assumed to be entered in the lexicon as an empty morpheme (RED) with a given prosodic shape, but no phonological features. A consequence is that since prosodic structure is generally predictable, templates would be the only instance of prosodic constituents in the lexicon. This makes the status of templates somewhat suspect.

Another interesting argument against templates comes from languages with multiple reduplication patterns. Consider the following data from West Tarangan (WT), a Malayo-Polynesian language spoken on Aru, in South Eastern Maluku. The data here is taken from a detailed study of the language by Nivens (1992, 1993). Nivens describes four related dialects of WT. I will focus on the reduplication system in two of these: Popjetur, and Kalar-Kalar[1]. Popjetur WT has two patterns one in the form of a light syllable, and one a heavy syllable.

Popjetur West Tarangan (Nivens 1992, 1993)[2]

(1) *two patterns:*

CV	ˈbakay	baˈbakay	‘small’
	ɛ-r-ˈlayar	ɛrlaˈlayar	‘3s-R-glow’
CVC	ˈkɛy	ˈkɛyˈkɛy	‘wood’
	ˈborar	ˈborˈborar	‘small’

An even more sophisticated constellation of patterns is observed in the related Kalar-Kalar West Tarangan. Kalar-Kalar WT adds a third pattern to the light syllable and heavy syllable, a foot consisting of two light syllables.

[*]I would like to thank Junko Itô, Armin Mester, Jaye Padgett and Cheryl Zoll for comments and helpful discussion. Thanks also to the audiences of WCCFL XIV held at USC, Los Angeles, and the 3rd Trilateral Phonology Weekend (UC Berkeley-Stanford-UC Santa Cruz), where versions of this paper were presented. Special thanks go to Paul Lassettre. All errors are mine.

[1]These dialects were formerly also referred to as Plains (Popjetur) and Coast (Kalar-Kalar).

[2]The transcription is that used by Nivens. [j] represents a palatal affricate [d͡ʒ], while [y] represents the palatal glide. [p] is realized as a bilabial fricative [ɸ]. Stress is deduced from the description.

Kalar-Kalar West Tarangan (Nivens 1992, 1993)

(2) *three patterns:*

CV	ɛ-y-ˈlɛka	ɛylɛˈlɛka	‘3s-R-play’
	ˈm-abak	maˈmabak	‘3s-pluck’
CVC	maˈnɛlay	maˈnɛlˈnɛlay	‘sour’
	ˈtɔp	ˈtɔpˈtɔp	‘short’
CVCV	i-ˈpara	iˈparaˈpara	‘3s-bake’
	i-ˈkɔlat	ˈkɔlaˈkɔlat	‘3s-spoon’

What is even more remarkable than the multiplicity of patterns is their distribution. Both of these languages use reduplication for a wide array of syntactic and morphological functions: nominalization, progressive aspect, subordination, negation, and less productively nominal derivation, forming of diminutives, and compounding. If templates were lexical items we might expect that each pattern be associated with a different function. This is not the case however. Each pattern can be used for all of these functions. Instead the choice of pattern is determined solely by the phonological shape of the base.

In this paper I will propose that language specific templates are replaced by the following set of universal constraints. In all of these definitions $\mathcal{R}$ refers to the reduplicant[3], the phonological exponent of the reduplicative morpheme RED.

(3) *Templatic Constraints:* R = PCAT

R = PRWD

$\exists\omega_{i,}$ ω_i is a prosodic word and Align-R ($\mathcal{R}$, ω_i) and Align-L ($\mathcal{R}$, ω_i)

R = F

$\exists F_{i,}$ F_i is a foot and Align-R ($\mathcal{R}$, F_i) and Align-L ($\mathcal{R}$, F_i)

R = σ

$\exists\sigma_{i,}$ σ_i is a syllable and Align-R ($\mathcal{R}$, σ_i) and Align-L ($\mathcal{R}$, σ_i)

With these constraints we can now propose the hypothesis in (4).

(4) All patterns of reduplication are a result of these three universal constraints

The reason that these constraints will be able to produce the observed wide variety of language particular reduplication patterns is that in general they will be interleaved in the constraint hierarchy that constitutes the phonology of the language. Some examples that demonstrate this basic principle are given in (5).

[3] The term reduplicant is originally due to Spring (1990).

(5) *Sample rankings:*

- heavy syllable reduplication
  R = F and R = σ undominated
- CVCV reduplication
  R = PRWD, NOCODA and NOLONGV >> R = σ
- 'core syllable' reduplication (cf. also Steriade 1988)
  R = σ, NOCODA, *COMPLEX, NOLONGV >> R = PRWD

etc.

The rankings in (5) are only intended as illustrations of the basic principle. Specific examples will always depend on the analysis given for the particular language.

1. Theoretical Background

The theoretical framework for this discussion will be Optimality Theory (Prince & Smolensky 1993, McCarthy & Prince 1993a), henceforth OT. In particular, I will be assuming the theory of reduplication set forth in McCarthy & Prince (1994a, henceforth M&P) 'Emergence of the Unmarked' (EoU).

In OT, a grammar consists of a set of ranked constraints. The constraints are assumed to be universal, only the ranking is language particular. Of special importance is a subset of constraints, the faithfulness constraints (henceforth FAITH), which enforce resemblance between input and output. An important consequence of the setup of OT is that any constraint ranked below all the relevant FAITH constraints will have no observable effect in the phonology of the language.

An important qualification of this statement is observed in reduplication. Typically the constraints imposed on the shape of reduplicants are more stringent than those imposed on other forms of the language. M&P hold that this is to be expected since reduplicative morphemes do not have underlying forms. As a result they are immune to the effects of FAITH, and they will be sensitive to the constraints ranked below FAITH in addition to those ranked above. Because of this, in reduplication phonologies, only those forms will surface that are unmarked with respect to the particular constraint. M&P call this the 'emergence of the unmarked.'

(6) *Emergence of the Unmarked* (McCarthy & Prince 1994)

… constraints …	>>	FAITH	>>	… constraints …	>>	MAX
phonology				'special' reduplication phonology		

The constraint MAX enforces the resemblance between base and reduplicant. As such it plays a role, in reduplication, parallel to that played by FAITH in regular phonological processes. MAX will generally favor any candidate where the reduplicant completely copies the base. A point that remains to be investigated is why Max always seems to be ranked below Faith (cf. Padgett, class discussion).

A reduplicative morpheme RED may be freely assigned phonological content by GEN. This content is referred to as the reduplicant $\mathcal{R}$ by M&P. Although the assignment is free, it is subject to a number of wellformedness constraints. The key concept that permits the formulation of these constraints is a correspondence relation from reduplicant to base. The base is the material immediately adjacent to $\mathcal{R}$, either to the right if RED is a prefix, or to the left if RED is a suffix.

(7) *Reduplication as correspondence relation* $f: \mathcal{R} \rightarrow \mathcal{B}$

$\underline{k}_i\ \underline{ɔ}_j\ \underline{l}_k \quad k_i\ ɔ_j\ l_k\ a\ t$

We say for any element $\rho \in \mathcal{R}, \beta \in \mathcal{B}$, ρ corresponds to β iff $\beta = f(\rho)$

In the example in (7) the subscripts are used to identify corresponding segments. Along with the phonological content GEN also assigns each candidate a correspondence relation. The constraints that M&P assume to regulate the wellformedness of the correspondence relation are given (informally) below in (8).

(8) *Reduplication Wellformedness Constraints:*
(For formal definitions see M&P 1994ab)

Anchoring Left/Right
: The left/rightmost element in $\mathcal{R}$ corresponds to the left/rightmost element in $\mathcal{B}$.

Contiguity
: Adjacent elements in $\mathcal{R}$ correspond to adjacent elements in $\mathcal{B}$.

Linearity
: The linear order of elements in $\mathcal{R}$ is identical to the linear order of their corresponding elements in $\mathcal{B}$.

BaseDependence
: Every Element of $\mathcal{R}$ has a correspondent in $\mathcal{B}$, i.e. Dom$(f) = \mathcal{R}$

Max
: Every Element of $\mathcal{B}$ has a correspondent in $\mathcal{R}$, i.e. Range$(f) = \mathcal{B}$

In order to explain the working of these constraints, I will use a simple example that illustrates a violation for each case. Consider for example the case of WT /kɔlat/ ‘spoon’. GEN will provide us with a multitude of candidates, some of which are listed in (9).

(9)		Example	Constraint violated	Explanation
	a.	lat kɔlat	*ANCHORING (LEFT)	reduplicant does not start with [k]
	b.	kat kɔlat	*CONTIGUITY	skipping of [ɔl]
	c.	lɔk kɔlat	*LINEARITY	linear order of [kɔl] reversed
	d.	kɔʔ kɔlat	*BASEDEPENDENCE	[ʔ] not present in base
	e.	kɔl kɔlat	*MAX	[at] not present in reduplicant

In the examples in (9) the reduplicant is marked with an underline. Since this reduplication is prefixing, the base is all the material to the right of the reduplicant. For expository purposes I am assuming that, for each candidate above, each segment of the reduplicant corresponds to the identical segment of the base, and I have therefore left out the indices.

Example (9a) illustrates Left Anchoring, which requires that the leftmost element of the reduplicant, and the leftmost element of the base be in correspondence. Here the leftmost element of the reduplicant is /l/ and the leftmost element of the base is /k/, and they are not correspondents, thus violating Left Anchoring.

Example (9b) violates Contiguity, since the reduplicant consists of /k/, corresponding to the /k/ in the base, followed by a, corresponding to the a of the base. The segments /k/ and a in the base are however not next to each other, in violation of Contiguity.

Linearity is at stake in (9c), since /l/, which precedes /k/ in the reduplicant, corresponds to a segment that follows the correspondent of /k/ in the base. Thus linear order is not preserved.

Example (9d) illustrates a violation of BaseDependence. In this case there is a segment in the reduplicant that does not have a correspondent in the base, namely the glottal stop.

Finally (9e) shows a violation of Max. This is due to the lack of any element in the reduplicant that could correspond to the /a/ and the /t/ of the base. In fact all of the candidates (9a-d) violate Max as well. Only total reduplication will satisfy Max.

All of these constraints work together to ensure that reduplicants look like exact copies of the base, they are attached to. If however another constraint dominates one of these wellformedness constraints a mismatch can occur. Such mismatches will generally lead to the elimination in the reduplicant, of some marked aspect of the base, and it is this elimination of markedness in reduplication that M&P call emergence of the unmarked. In this paper I will argue that West Tarangan constitutes a case of this emergence of the unmarked, and that it is this attempt to avoid markedness that leads to the variation in template shape.

2. Popjetur West Tarangan (Nivens 1992, 1993)

Reduplication in all dialects of WT is infixing reduplication. The reduplicant is always infixed directly before the main stress of the word and the stress foot forms the base for reduplication. Examples that show this are given in (10).

(10)	ˈborar	ˈborˈborar	‘small’
	ɛ-laˈjir	ɛlajirˈjir	‘3s-white’
	taˈporan	taporˈporan	‘middle’

A case such as /borar/ ‘small’ shows that the reduplication is basically prefixing. The other examples however show that the prefixation ignores unstressed material even if it is part of the root. This is therefore a case of prefixation to a foot (cf. Broselow & McCarthy 1983). RED in this language is an affix that subcategorizes for a prosodic constituent, and this can be handled by the language specific constraint in (11). Since this constraint is strictly observed in the language, we conclude that it is undominated.

(11) *Language specific reduplication wellformedness constraint: “prefix to foot”*

ALIGN(RED,F)

Align(RED,R,Foot,L)

Popjetur WT has two patterns of reduplication: heavy syllable (CVC) and light (CV). In general the heavy syllable is the default pattern, and most bases seek to meet this pattern. The heavy syllable pattern is also characterized by the fact that it receives a full primary stress, a fact that indicates that it has prosodic word status.

(12) *Pattern 1:* CVC reduplicant (base permitting)

a.	CVC bases	ˈkɛy	ˈkɛyˈkɛy	‘wood’
	CVCV(C) bases	ˈborar	ˈborˈborar	‘small’
b.	VCV(C) bases	ˈɛpar-ay	ˈɛpˈɛparay	‘good-3p’

The examples in (12) illustrate this basic pattern. WT generally does not permit long vowels, and vowel sequences are consistently heterosyllabic. Therefore the heavy syllable pattern can only be met with a CVC sequence. If the base begins with a CVC sequence the pattern can be met, and a heavy syllable reduplicant is the result (12a). Note that the glides /y/ [j] and w count as consonants. Support for this comes from the fact that they are realized as /j/ [dʒ] and g respectively in foot initial position[4].

The status of vowel initial bases (12b) is somewhat unclear. Working within a copy and associate model of reduplication, Nivens assumes that reduplication copies a VC syllable, giving the intermediate form /.ɛp.ɛ.pa.ray./ ‘good-3p’. He then resyllabifies the copied /p/ as an onset, which would leave the reduplicant a light syllable. Elsewhere in a footnote he gives the transcription [ˈɛˈpɛparay] for such a form, indicating that the reduplicant receives full word stress. Such a situation would represent a rather marked form of stress clash. It seems plausible therefore to assume that the reduplicant forms a VC syllable even in the output, and

[4]Nivens argues the opposite, that the glide should be the underlying form. His reasons for believing this is a morpheme structure constraint, against word final voiced obstruents. In a surface oriented framework this argument receives a different slant.

that resyllabification is at best a phonetic effect.

Under the present analysis the effect of a heavy syllable template is derived by having both R = PRWD and R = σ ranked above Max. The only way for R to meet both constraints is to take the form of a heavy syllable. This is because only a heavy syllable, as opposed to a light syllable, can form a foot, and therefore a prosodic word, on its own.

(13) ˈborar ‘small’ ˈborˈborar

	R = σ	R = PRWD	MAX
a. [.bo.ra.]borar	*!		r
b. ☞ [.bor.]borar			ar
c. .bo.borar		*!	rar

The tableau in (13) illustrates the basic case. A candidate where the reduplicant forms a disyllabic CVCV foot (or larger constituent) such as (13a) will violate R = σ. On the other hand a candidate such as (13c) where the reduplicant is a light syllable violates R = PRWD. Only in the case of a heavy syllable reduplicant are both met (13b). At this point there is no argument for the ranking of R = σ over R = Prwd.

There are however a number of cases that do not reduplicate a heavy syllable, but only a light syllable. A first group is shown in (14). These cases reduplicate only a light syllable for a simple reason. They do not have the necessary phonological material to form a heavy syllable, and as a result can only partially meet the heavy syllable target.

(14) *Pattern 2:* CV reduplicant (1st group)

CV bases	*ju	juˈju	‘cockroach (sp.)’
CVV(C) bases	ˈrua	ruˈrua	‘two’

In all these cases the base does not begin with a CVC sequence. Thus the reduplicant will be as much of the CVC pattern as possible, without violating the constraints against long vowels, and tautosyllabic vowel sequences. The cases in (14) illustrate this. For example the root /ju/ ‘cockroach’ consists of only a light syllable and there is no consonant available to form a coda to help the reduplicant meet the heavy syllable requirement. In the case of /rua/ ‘two’ the same problem occurs, the extra vowel being of no help when trying to maximize the syllable. Tableaux for these cases are provided in (15) and (16).

(15) juˈju ‘cockroach’

		R = σ	R = PRWD	MAX
a. ☞ .ju.ju			*	
b. [.ju.]ju	*FTBIN			
c. [.juː.]ju	*NOLONGV			
d. [.juʔ.]ju	*BASEDEPENDENCE			

(16) ˈrua ‘two’ ruˈrua

		R = σ	R = PRWD	MAX
a. ☞ .ru.rua			*	a
b. [.ru.a]rua		*!		
c. [.ru.]rua	*FTBIN			a
d. [.ruː.]rua	*NOLONGV			a
e. [.rua.]rua	*NODIPHTHONG			
f. [.ruʔ.]rua	*BASEDEPENDENCE			a

Both of these tableaux show that any attempt to turn the reduplicant into a heavy syllable violates an undominated constraint, such as that against monomoraic feet (FTBIN P&S 1993), those against long vowels and diphthongs (Rosenthall 1994, Sherer 1994), or Base Dependence discussed above. In addition (16) shows that when faced with the choice of meeting either R = σ, or R = PRWD, the language chooses to meet the former. This provides us with an argument for ranking R = σ over R = PRWD.

So far the pattern is straightforward. The constraints will basically drive reduplication to meet a heavy syllable shape, as long as the base contains the necessary material, and the restrictions of WT phonology are met. There are however further cases where the language resorts to a light syllable reduplicant. What is interesting about these cases is that the base does have sufficient material to achieve a heavy syllable, but does not form a heavy syllable for other reasons. Examples are given in (17).

(17) *Pattern 2:* CV reduplicant. (2nd group) If the base is of the form C_1VC_2… and

a.	$C_1 = C_2$	ˈraray	raˈraray	‘hot’
b.	$C_1 \approx C_2$	duˈbɛm	dubɛˈbɛm	‘seven’
c.	C_2 is [+high]	ˈbakay	baˈbakay	‘small’
		ɛ-r-ˈlayar	ɛrlaˈlayar	‘3s-R-glow’

The examples in (17) show that there are three cases when a light syllable reduplicant results rather than a heavy syllable. The first (17a) is the case where a geminate would be created. In WT geminates are prohibited, and as a result the light syllable is preferred. The second case (17b) is when the two consonants of the heavy syllable foot would be too similar. The third case, shown in (17c) is one where the coda consonant that would result under heavy syllable reduplication is [+high], i.e. either a velar consonant, or a glide.

First let us look more closely at the case of (17a). The tableau is given in (18).

(18) ˈraray 'hot' raˈraray

	NOGEMINATE	R = σ	R = PRWD	MAX
a. [.ra.ra.]ˈraray		*!		y
b. [.rar.]ˈraray	*!			ay
c. ☞ .ra.raray			*	ray

The constraint that disallows geminates is surface true in WT, and therefore undominated. This constraint knocks out the candidate (18b) which has a heavy syllable as the reduplicant. This leaves two options. Either reduplication of more than a heavy syllable, or less. Both options avoid the creation of a geminate cluster. The fact that the language chooses the light syllable option shows again that R = σ outranks R = PRWD. The winning candidate is (18c), which violates R = PRWD, but not R = σ.

Turning now to the other cases these seem to be due to restrictions on foot/prosodic word shape in WT that are not generally observed in the language, but emerge under reduplication.

The examples in (17b) are due to OCP type restrictions such as those discussed in Mester (1986) for Javanese. The restrictions are somewhat complex, and there are a number of gaps in the paradigm that remain to be filled (see Nivens 1993 for full discussion). The basic restriction seems to be against identical place specifications, but with further subdivisions among the coronals. The reason than that we do not get a reduplicated form *duˈbɛmˈbɛm for /duˈbɛm/ 'seven' is that /bɛm/ is a marked type of foot/prosodic word.

In (17c), the absence of a reduplicated form *ˈbakˈbakay for /ˈbakay/ 'small' is due to the markedness of [+high] segments, and the restriction is against [+high] segments in non-foot initial position. This means that the potential reduplicant /bak/ is a marked foot type. In Nivens [+high] is intended to cover the velars /k/ and /ŋ/, and the glides /y/ and /w/. Adopting the treatment of y and w as complex segments (cf. Keating 1988), I will assume this to be a restriction on [dorsal] rather than [+high].

Although this restriction on [dorsal] is not true of the language in general, there is some independent support from the phonology of the language for such a restriction, and demonstrating the markedness of dorsal segments in WT. For one, the glides /y/ and /w/ alternate with the voiced obstruents /j/ and /g/ respectively. The voiced obstruents appear foot and word initially, while the glides appear elsewhere. A second point is a general process of 'k-weakening', that optionally reduces /k/ between non-high vowels to glottal stop, or deletes it completely.

The constraints that I will adopt to account for these restrictions are given in (19).

(19) *Foot form constraints. Crucially ranked above* R = PRWD.

FOOT/DOR (cf. Lombardi 1995)
Align-Left ([dorsal], F)

ROOTOCP
"Identical place specifications in root consonants are prohibited"

Since both of these constraints are constraints on prosodic word shape, in order for them to be able to have an effect on reduplicant shape, they must be ranked above R = PRWD. In the following discussion I will be focusing on the [dorsal] cases. The analysis of the OCP cases is exactly parallel, except ROOTOCP replaces FOOT/DOR.

As was noted earlier the constraints in (19) are not surface true, since there are many words that violate it, e.g. /bakay/ 'small'. The reason why the constraints in (19) do not have any effect on such words is that they are ranked below the faithfulness constraints. The only way for such a form to avoid a FOOT/DOR restriction would be to not parse the segment or the place of the dorsal /k/, thereby violating a higher ranked faithfulness constraint. The dorsal segment thus survives. This can be illustrated with the help of the tableau in (20)[5].

(20) FOOT/DOR *is not active in the phonology* ˈbakay 'small'

	PARSESEG	PARSEPLACE	FOOT/DOR
a. ☞ (.ba.ka.)y			k
b. (.ba.a.)y	*!		
c. (.ba.ʔa.)y		*!	

In contrast to forms that stem from underlying material, reduplicants are not subject to the faithfulness constraints. As a result they will be forced to obey FOOT/DOR. This means that WT will only reduplicate dorsal segments if they are foot initial.

[5]Note that the reason that the final glide does not violate the FOOT/DOR restriction has to do with the pervasive Final Exceptionality in WT, a point that will be discussed in more detail below.

(21) ˈbakay ‘small’ baˈbakay

	R = σ	Foot/Dor	R = PrWd	Max
a. [.ba.ka.]bakay	*!	kk		y
b. [.bak.]bakay		kk!		ay
c. ☞ .ba.bakay		k	*	kay

In (21) candidates (a) and (b) both violate the restriction on dorsal segments. As a result it becomes impossible to meet both of the reduplicant shape constraints, R = σ, and R = PrWd. The only option is the candidate with a light syllable reduplicant (21c), and it emerges the winner. This case shows that a constraint that is not true of the phonology of the language as a whole, nevertheless has effects in the case of reduplication. This constitutes a case of the emergence of the unmarked.

At this point we might recall that it was noted earlier that forms with a heavy syllable base always reduplicate to heavy syllables. This is in fact true even of cases where the base ends in a dorsal consonant. For instance /ˈkɛy/ ‘wood’ reduplicates as /ˈkɛyˈkɛy/ and not *kɛˈkɛy. This is due, I argue, to Final Exceptionality. By this I mean that the fact that the dorsal segment is final in the base exempts it from the effects of the constraint Foot/Dor. This is illustrated in the tableau in (22).

(22) ˈkɛy ‘wood’ ˈkɛyˈkɛy

	R = σ	Foot/Dor	R = PrWd	Max
a. ☞ [.kɛy.]kɛy				
b. .kɛ.kɛy			*!	y

In (22) the final glide in both the reduplicant and the base are stem final. As a result they are not subject to the constraint Foot/Dor, and do therefore not violate it. The optimal candidate is then chosen on the basis of the other constraints, i.e. those on reduplicant shape. This means that the candidate with the heavy syllable reduplicant (22a) wins.

Summary:

The discussion of Popjetur WT can be summarized as follows. The choice of reduplicant in Popjetur WT can be predicted on the basis of the constraint ranking:

R = σ, Foot/Dor >> R = PrWd

The two constraints, R = σ and R = PrWd, are both active in Popjetur WT. The result of their action is a reduplicant shape that meets both: the heavy syllable. If trying to meet both leads to a marked heavy syllable, then the higher ranked R = σ carries the day, and the reduplicant 'defaults' to a light syllable shape. In other words: "try to meet both R = σ and R = PRWD—a heavy syllable. If you can't meet both, meet R = σ rather than R = PRWD—a light syllable."

3. Kalar-Kalar West Tarangan (Nivens 1992, 1993)

The system of Kalar-Kalar WT is very similar to that of Popjetur WT, but is somewhat more elaborate. Instead of two patterns there are three: heavy syllable, light syllable, and foot consisting of two light syllables. Again the reduplication is a case of infixation, prefixation to the main stress foot of the word. Also the foot and heavy syllable patterns receive primary word stress. As in Popjetur WT, the heavy syllable pattern is the most basic, and it is chosen whenever there is sufficient phonological material. Typical examples are shown in (23).

(23) *Pattern 1:* CVC reduplicant (base permitting)

CVC bases	ˈtɔp	ˈtɔpˈtɔp	'short'
	ˈkɛy	ˈkɛyˈkɛy	'wood'
	ˈtok	ˈtokˈtok	'dance'
CVCV(C) bases	maˈnɛlay	maˈnɛlˈnɛlay	'sour'
	ɛ-taˈnira	ɛtaˈnirˈnira	'3s-have diarrhea'
	da-r-anat	daˈranˈranat	'3p-R-child'
CVCCV(C) bases	*gɔrsa	ˈgɔrˈgɔrsa	'coconut stem'

Whenever the base is of the form CVC… then the initial CVC will form the heavy syllable reduplicant. In many cases this will simply mean total reduplication such as in the case of /ˈtɔp/ 'short', which reduplicates to /ˈtɔpˈtɔp/. Longer cases on the other hand show only partial reduplication in order to fit the pattern.

As in Popjetur WT the status of vowel initial bases is somewhat unclear. I will again assume that they have a reduplicant with a VC heavy syllable shape.

(24)

VC bases	ɛ-taˈil	ɛtaˈilˈil	'3s-bounce'
VCV(C) bases	da-ˈɛla	daˈɛlˈɛla	'3p-go'
	da-ˈɛtar	daˈɛtˈɛtar	'3p-ride'

So far the situation is exactly as in Popjetur WT. Just as in Popjetur, under the present proposal the heavy syllable reduplicant is achieved by having both R = σ and R = PRWD ranked above MAX. The only way for the reduplicant to meet both of these constraints is to take the form of a heavy syllable.

A crucial difference between Popjetur WT and Kalar-Kalar WT is seen in the way they treat codas in reduplication. Both dialects have the same basic coda condition in their general phonology. Word internal codas allow only coronal approximants, i.e. /r/, /l/, and /y/. In word final position, however, all of the consonants of the language are permitted, with the exception of the voiced stops.

In Kalar-Kalar WT reduplication a stricter coda condition applies. This coda condition disallows any coda other than a coronal sonorant that is adjacent to another coronal sonorant in the following onset. Although this stricter constraint is generally violated in the language, its effects are observed in the domain of reduplication. This is again a case of the emergence of the unmarked. The restriction is given in (25).

(25) *Syllable form constraints. Crucially ranked above* R = σ.

SonCoda
Word finally only sonorants are permitted, and only adjacent to a sonorant at the same place of articulation

A consequence of this restriction and the general ban on geminates in the language is that the two sonorants must also both be coronals. This is because coronal is the only place of articulation where WT has more than one sonorant, namely the nasal /n/ and the two liquids /l/ and /r/. Since the reduplicant generally forms a prosodic word in Kalar-Kalar WT, it will be subject to the constraint in (25).

We can now consider how this constraints works together with the templatic constraints R = PrWd and R = σ to form the pattern of reduplication observed. (26) shows the tableau for /ɛ-taˈnira/ ‘3s-have diarrhea’, which reduplicates as /ɛtaˈnirˈnira/.

(26) ɛ-taˈnira ‘3s-have diarrhea’ ɛtaˈnirˈnira

	R = PrWd	SonCoda	R = σ	Max
a. ɛta[.ni.ra.]nira			*!	
b. ☞ ɛta[.nir.]nira				a
c. ɛta.ni.nira	*!			ra

In (26) the ranking of the constraints is that of the final analysis, but has not been justified at this point. Ranking arguments will be provided below. Now considering the three candidates in detail we note that only (b), the candidate with the heavy syllable reduplicant, has a coda. It is therefore the only candidate in danger of violating the coda condition. The coda in (b) is however /r/, a sonorant, and it is adjacent to a segment /n/, another sonorant at the same place of articulation. It therefore passes SonCoda, and the decision between these three candidates is decided by the other constraints.

Of the three candidates (c), which has a light syllable reduplicant, fails the constraint requiring prosodic word status of the reduplicant. Candidate (a) on the other hand, with a disyllabic foot reduplicant, violates the requirement that the reduplicant be a single syllable.

The only candidate that passes all three constraints is (b).

Consider a further example, this time with a heavy syllable base:

(27) ˈtɔp ‘short’ ˈtɔpˈtɔp

	R = PRWD	SONCODA	R = σ	MAX
a. ☞ [.tɔp.]tɔp				
b. .tɔ.tɔp	*!			p

In this example the candidate with the heavy syllable reduplicant (a) would seem to violate SONCODA, since its coda /p/ is not a sonorant. However I am assuming that this is again an instance of final exceptionality, since the /p/ that is being copied is final in the base. As a result the candidate with the heavy syllable reduplicant (a) is no less favored than the candidate with the light syllable reduplicant (b). The decision between these two is therefore passed on again to the reduplicant shape constraints. Here the light syllable reduplicant is disfavored since it does not meet the prosodic word requirement. As a result the candidate with the heavy syllable reduplicant wins. As this case demonstrates, SONCODA has no effect in case the potential reduplicant coda is final in the base.

SONCODA does come into play in the next batch of examples, shown in (28). These are examples of the second reduplication pattern, those with a disyllabic foot reduplicant.

(28) *Pattern 2:* CVCV reduplicant

CVCV(C) bases	i-ˈpara	iˈparaˈpara	‘3s-bake’
	i-ˈjaban	ˈjabaˈjaban	‘3s-dried’
	i-ˈkɔlat	ˈkɔlaˈkɔlat	‘3s-spoon’

In contrast to the example /ɛ-taˈnira/ ‘3s-have diarrhea’, above many words with a base of the shape CVCV(C) show this pattern rather than the heavy syllable pattern. This occurs whenever the heavy syllable reduplicant that would result would violate SONCODA. So for example /iˈpara/ ‘3s-bake’ reduplicates not as *iˈparˈpara, but as /iˈparaˈpara/. This is because although the coda of the potential reduplicant /r/ is a sonorant, the adjacent consonant /p/ is neither sonorant, nor at the same place of articulation as /r/. In order to avoid the unfavorable coda there are two options: one is to reduplicate an extra vowel making the /r/ into an onset, the other is to not reduplicate the /r/ at all. The first option means the reduplicant will be a disyllabic foot, the second will leave the reduplicant a mere light syllable. Of these two the first is chosen. The situation is summarized in (29).

(29) i-ˈpara ‘3s-bake’ iˈparaˈpara

	R = PRWD	SONCODA	R = σ	MAX
a. ☞ i[.pa.ra.]para			*	
b. i[.par.]para		r!		a
c. i.pa.para	*!			ra

Candidate (b) has a heavy syllable reduplicant which is usually the favored type. In this case the reduplicant occurs a violation of the coda condition. The choice then falls to candidates (a) and (c). Candidate (c) has a light syllable reduplicant which violates R = PRWD, while (b) with the disyllabic foot reduplicant violates R = σ. Since (a) is the winner, this example shows that R = PRWD is ranked above R = σ in Kalar-Kalar WT. In other words the requirement that the reduplicant form a prosodic word outweighs the constraint forcing the reduplicant to be single syllable. Since SONCODA rules out the possibility of both of these constraints being met simultaneously, the candidate that meets the higher ranked R = PRWD is chosen (29a).

Finally we now turn to the third possible reduplication pattern: light syllable reduplication. This pattern is chosen in essentially the same cases that Popjetur WT chooses a light syllable pattern. As in Popjetur WT there a number of cases for which the choice of this pattern is simply due to the fact that they do not have the phonological material to meet the CVC requirement imposed by the undominated constraints of the language. Examples of this kind are shown in (30).

(30) *Pattern 3:* CV reduplicant (1st group)

a.	CV bases	*dɛ	dɛˈdɛ	‘song’
		ˈpɔ	pɔˈpɔ	‘carry’
b.	CVV(C) bases	ˈrua	ruˈrua	‘two’
		ˈdɔam	dɔˈdɔam	‘pound’
		kaˈnɔur -ŋa	kanɔˈnɔur -ŋa	‘hungry-1s’

An interesting twist is added to the analysis, by the cases in (30b)[6]. The analysis presented so far would predict that an example such as /ˈrua/ ‘two’ should reduplicate as *ˈruaˈrua. This is because if the heavy syllable pattern is not possible, we expect the default to be a disyllabic foot if possible, since R = PRWD outranks R = σ. The reason this does not happen is presumably because such a reduplicant would duplicate an onsetless syllable, a marked structure in any language. As a result we can establish that ONSET is ranked over R = PRWD.

The further cases that require a light syllable are also familiar from Popjetur WT. In (31) we see the cases where a potential heavy syllable reduplicant would lead to a geminate

[6] Thanks to Jason Merchant for pointing this out.

cluster.

(31) *Pattern 3:* CV reduplicant (2nd group)
All bases

$C_1 = C_2$	i-ˈbɛbar	ibɛˈbɛbar	‘3s-afraid’
	ˈŋuŋim	ŋuˈŋuŋim	‘3s-damp’
	ɛ-maˈrɛr	ɛmarɛˈrɛr	‘3s-stand’

The constraint against geminates is surface true in WT (both Popjetur and Kalar-Kalar) and is therefore undominated. It is as a result of this constraint that the reduplicant may not be a heavy syllable. This situation is shown in (32).

(32) ɛ-maˈrɛr ‘3-s stand’ ɛmarɛˈrɛr

	NOGEMINATE	R = PRWD	R = σ	MAX
a. ☞ ɛma[.rɛr.]rɛr	*!			
b. ɛma[.rɛ.]rɛr		*		r

The two other cases which require a light syllable reduplicant are shown in (33). Both of these cases only become relevant with longer bases, where the reduplicant might surface as a disyllabic foot.

(33) CVCV(C) bases

a.	$C_1 \approx C_2$	da-ˈlɛray	dalɛˈlɛray	‘3p-sift’
		i-ˈsɛtak	isɛsˈɛtak	‘3s-sever’
		ˈm-abak	maˈmabak	‘3s-pluck’
b.	C_2 is [+high]	ɛ-y-ˈlɛka	ɛylɛˈlɛka	‘3s-R-play’
		ˈjaŋil	jaˈjaŋil	‘rotten-3s
		ɛ-r-gayat-na	ɛrgaˈgayat	‘3s-R-lying down-3s’

The first case (33a) is that where the two consonants of a prosodic word sized reduplicant would be too similar and incur an OCP violation. The exact nature of these similarity restrictions is somewhat complex, and there are a number of gaps in the paradigm that make conclusions tentative.

The second case is that where the second consonant of the reduplicant, i.e. the potential coda of a heavy syllable, or the potential onset of the second syllable of a disyllabic foot reduplicant, would be a [+high] segment, either a glide or a velar stop. Again I will assume that the constraint actually refers to [dorsal] rather than [+high].

As in the case of Popjetur WT, I will concentrate on only the first of these cases, the restriction on dorsal segments.

As in Popjetur the constraint against non-foot initial dorsals emerges in reduplication. Since it is a restriction on the foot/prosodic word, in order for it to have any effect it will need to be ranked above R = PRWD. The effects of this constraint are seen in a case such as /ɛyˈlɛka / '3s-R-play' which reduplicates as /ɛylɛˈlɛka /, and the tableau for this form is given in (34).

(34) ɛ-y-ˈlɛka '3s-R-play' ɛylɛˈlɛka

	FOOT/DOR	R = PRWD	SONCODA	R = σ	MAX
a. ɛy[.lɛ.ka.]lɛka	kk!			*	
b. ɛy[.lɛk.]lɛka	kk!		k		a
c. ☞ ɛy.lɛ.lɛka	k	*			ka

The situation here is that any candidate that copies the marked dorsal segment, in this case (a) and (b), will incur an additional mark with respect to FOOT/DOR. Both the candidate with the heavy syllable reduplicant (b) and the candidate with the foot reduplicant (a) create an additional instance of a dorsal segment that is not at the left edge of a foot. But this can be avoided with a reduplicant that is simply a light syllable, as in (c). Thus candidate (c) carries the day.

A final case to consider is again that where a heavy syllable CVC base ends in a dorsal segment. Such a case is shown in (35).

(35) ˈtok 'dance' ˈtokˈtok

	FOOT/DOR	R = PRWD	SONCODA	R = σ	MAX
a. ☞ .[.tok.]tok					
b. to.tok		*!			k

As was noted before, if we assume that the effect of FOOT/DOR is tempered by final exceptionality, in a case such as /ˈtok/ 'dance', reduplication of the final segment *k* will not incur any violation of FOOT/DOR, and therefore the lower ranked templatic constraints can assert their influence, insuring a heavy syllable reduplicant.

Since this account has made significant use of the notion final extrametricality, it becomes important to give the notion some content. In order to develop such an account it might be helpful to look at an account that does not work.

The standard account to explain the failure of a condition such as FOOT/DOR to apply in word final position, is to outrank it with a morphological alignment constraint, typically ALIGN-R[7]. Such an account is proposed in M&P (1993b) and Lombardi (1995). The first

[7]The full form of this constraint is usually given as ALIGN-RIGHT(Stem, σ). Occasionally it is also seen

problem is that ALIGN-R will not apply in this case since either the reduplicant is not a stem, or if we adopt the suggestion in M&P (1994b) the reduplicant will always be a stem, no matter what its phonological content. Either approach makes the effect of ALIGN-R vacuous.

A further suggestion in M&P (1994b) is to use RIGHT ANCHORING in place of ALIGN-R. The problem with this suggestion in WT is that as was seen above, the constraint that limits the reduplicant size is ranked below FOOT/DOR. Our account of final exceptionality will require that RIGHT ANCHORING dominate FOOT/DOR. Finally, since WT reduplication is prefixation we know that LEFT ANCHORING is ranked above RIGHT ANCHORING. This gives us the following ranking overall:

LEFT ANCHORING >> RIGHT ANCHORING >> FOOT/DOR >> R = PRWD

However Left and Right Anchoring together have the effect of MAX, and as a result this ranking would predict total reduplication in all cases. Clearly this is an undesired result.

The diagram in (36) can help to clarify what the difference is between the two crucial cases. (36a) shows example (35). This is the case where the *k* 'escaped' the dorsal constraint due to final exceptionality. (36b) corresponds to example (34). This is the case where the *k* falls victim to the dorsal constraint.

(36) *Parafixal reduplication* (Mester (1986); cf. also Clements 1985)

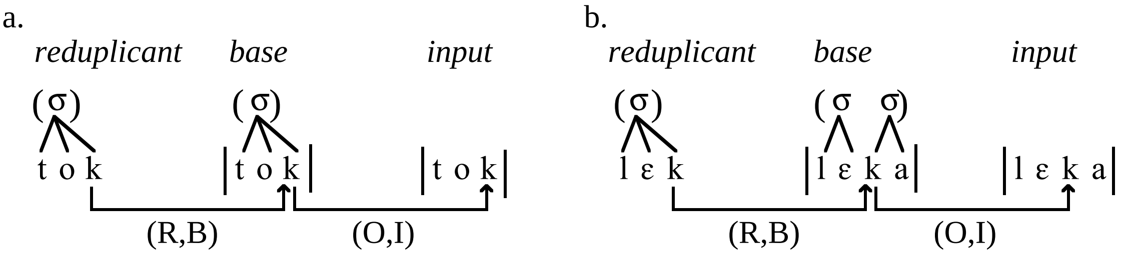
a. b.

As can readily be seen the difference between the two is that in (36a) the *k* is final in the base, while in (36b) it is not. This is exactly the idea behind the use of ALIGN-R to explain final exceptionality in M&P and Lombardi's account, since ALIGN-R refers to the stem. In the case of the usual underlying form/surface form pairing 'stem' simply means the underlying form.

Adopting McCarthy and Prince's (1994b) proposal which treats the relation between the underlying form (i.e. the input) and the surface form (i.e. the output) in a manner parallel to the relation between the reduplicant and the base leads to the following view.

in the form ALIGN-RIGHT(Stem, Prwd). McCarthy & Prince (1994b) propose a redefinition that has the effect of merging the two.

(37) *Correspondence theory* (McCarthy & Prince 1994ab)



In a system like the one illustrated in (37) the notion of 'stem final' in reduplication is entirely parallel to the notion stem final in the input/output relation. The concept of 'final exceptionality' can now be formalized in terms of the notion of licensing. A segment can be licensed by virtue of its being the correspondent of a stem final element. This idea bears a close resemblance to the notion of a SAFE PATH developed in Itô & Mester (1993). The constraint FOOT/DOR can now be reconstrued as a licensing condition:

LICENSE(DOR)
[dorsal] must have a safe path.

Paths that are considered safe for dorsal are:

- direct linkage to the head syllable of a foot. (= FOOT/DOR)
- direct linkage to a syllable (only in the case of the I/O relation)
- a path to a stem final segment. ('Final Exceptionality')

This formulation permits us to directly account for behavior of dorsal segments in a principled way.

Summary:

The discussion of Kalar-Kalar WT can be summarized as follows. The choice of reduplicant in Kalar-Kalar WT can be predicted on the basis of the constraint ranking:

FOOT/DOR >> R = PRWD, SONCODA >> R = σ

The two constraints, R = σ and R = PRWD, are both active in Kalar-Kalar WT. The result of their action is a reduplicant shape that meets both, the heavy syllable. If trying to meet both leads to a marked syllable type, then the higher ranked R = PRWD carries the day, and the resulting reduplicant forms a prosodic word in the shape of disyllabic foot. If this would lead to a marked foot type then the lower ranked R = σ will exert its influence and a light syllable reduplicant will result. In other words: "try to meet both R = σ and R = PRWD—a heavy syllable. If you can't meet both, meet R = PRWD rather than R = σ—a disyllabic foot. If that is not possible either, meet at least R = σ—a light syllable."

4. Conclusion

In this paper I have attempted to show that the phonologically conditioned choice of reduplication pattern in West Tarangan can be seen as an instance of ‘the emergence of the unmarked’ in the sense of McCarthy and Prince (1994a). A simple set of general constraints on reduplicant shape interact with the phonology of the language to create a seemingly complex pattern of allomorphy. In addition, the different patterns of allomorphy in two related dialects of West Tarangan, Popjetur and Kalar-Kalar, receives an explanation as an instance of constraint re-ranking. To see this consider the ranking diagrams in (38).

(38) a. *Popjetur WT* b. *Kalar-Kalar WT*

The diagram in (38a) shows the constraint ranking necessary for Popjetur WT. The system of Popjetur WT also corresponds more closely to the system of the ancestor language. The innovative system of Kalar-Kalar WT (38b) can be achieved by the simple reranking of the constraint R = σ below SONCODA.

This serves as confirmation of the analysis in two important respects. First, the fact that the re-ranking between two closely related dialects is minimal is consistent with our expectation that similar dialects share similar grammars. Second, the fact that both rankings of the two proposed constraints, R = PRWD and R = σ, are attested serves as a factorial typology in the sense of P&S (1993).

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March 17, 1999