The Reduplicative Template in Tonkawa*

Maria Gouskova

New York University

1 Introduction

One of the goals of Prosodic Morphology is to explain restrictions on morpheme shape, known as templates, in terms that have relevance elsewhere in phonological theory. According to McCarthy and Prince's (1986) Prosodic Morphology Hypothesis, templates are defined in terms of prosodic constituents such as syllable (light or heavy) and metrical foot rather than in terms of segmental CV slots (McCarthy 1981, Marantz 1982) or X-slots (Levin 1985). This view is recast in Optimality-Theoretic terms in McCarthy and Prince (1993b), where templatic shapes are dictated by violable templatic constraints. Generalized Template Theory (GTT) moves away from templates altogether, taking as its fundamental claim that templatic morpheme shapes arise from the interaction of independently motivated phonological constraints and that there is no need for any templatic machinery in Prosodic Morphology (McCarthy and Prince 1994b, Gafos 1998, Spaelti 1997, Urbanczyk 2006 inter alia). In addition to theoretical parsimony, GTT brings a solution to the problem of templatic backcopying, which was first pointed out by Rene Kager and Philip Hamilton: if templatic constraints were real, they could interact with base-reduplicant faithfulness constraints to produce a pattern where the size restrictions on the reduplicant can be copied to the base—a pattern thought to be unattested. In this paper, I present an example of backcopying from Tonkawa (Coahuiltecan, extinct). The evidence from Tonkawa suggests that GTT is too weak as a theory of templates. To account for the pattern, the theory has to allow constraints to be specific to reduplicative morphemes.

Tonkawa reduplication has not been previously brought to bear on the issue of reduplicative templates. The reduplicative prefix of Tonkawa is limited to a single light syllable, CV. This templatic requirement is unusual in two respects: first of all, it does not apply to other prefixes, and second, an initial light syllable is a marked structure in Tonkawa, which actually prefers heavy syllables in word-initial position. Moreover,

*I would like to thank Tuuli Adams, Lisa Davidson, Laura Downing, Kathryn Flack, Kyle Major, John McCarthy, Joe Pater, Kevin Roon, Jason Shaw, John Singler, the associate editor of Phonology, and the Phonology/Phonetics Reading Group at NYU for helpful feedback on this and related work. Special thanks go to the associate editor of Phonology and the anonymous reviewers for engaging with the issues and providing extremely constructive suggestions.

the short length of the reduplicative vowel is backcopied onto the reduplicative base—a result impossible in a GTT analysis. I propose that Tonkawa imposes specific restrictions on the shape of the reduplicative affix, whose interaction amounts to a light syllable template. These restrictions are formalized as markedness constraints that are lexically indexed to the reduplicant.

The evidence from Tonkawa bears on recent proposals to derive small morpheme size (one light syllable or smaller) from non-reduplication-specific constraints, including *Struc constraints and their ilk[1] (Walker 2000, 1998, 2002, Spaelti 1997, Gafos 1998, Kennedy 2005, Urbanczyk 2006) and an Output-Output version of Dep (Gouskova 2004a). Some of this work discusses cases of truly atemplatic reduplication. In atemplatic reduplication, the size of the reduplicant varies depending on the environment (Gafos 1998): for example, in Rebi West Tarangan, the same reduplicative affix can be realized as either a single consonant, a CVC syllable, or a CV syllable, depending on the phonological context (Nivens 1993, Spaelti 1997, Gouskova 2004a). Tonkawa reduplication is the opposite of this pattern: its reduplicative morpheme is invariantly small, even though the otherwise well-supported constraints of the language favor larger structures. In GTT, there is no formal distinction between atemplatic reduplication and reduplication that exhibits shape invariance: the latter is is simply a special case of constraint interaction. Shape invariance can indeed be derived without templatic constraints in some cases, but not in Tonkawa. The Tonkawa pattern suggests that small reduplicant size cannot always be attributed to general principles of economy or markedness.

The discussion is also relevant to the issue of whether base-reduplicant identity effects necessitate a separate set of faithfulness constraints dedicated to reduplication (McCarthy and Prince 1993b, 1995), which is argued to be unnecessary in some theories of reduplication (e.g., Inkelas and Zoll 2005). Tonkawa reduplicative shortening is not sensitive to morphological context or indeed to phonological context; instead, base-reduplicant identity rules the system.

I start by presenting some background on syncope and shortening in Tonkawa. The underapplication of syncope and overapplication of shortening in reduplication is examined in §2. This section also presents the lexically indexed constraints whose interaction derives the light syllable template. In §3, I demonstrate why GTT cannot account for these facts, examining affix shapes in Tonkawa (§3.1) and considering two kinds of atemplatic analyses that have been proposed in OT, as well as several potential alternatives (§3.2). Section 4 addresses templatic backcopying in the theory, and §5 concludes.

[1]Effects similar to those of *Struc can be obtained from the interaction of gradient Alignment constraints (Spaelti 1997:38ff, Gouskova 2003:34ff). There are good reasons to think that Con includes neither gradient constraints nor *Struc, however (Gouskova 2003, McCarthy 2003b).

2 Syncope, shortening, and reduplication in Tonkawa

As shown in (1), the Tonkawa reduplicant constitutes a CV syllable regardless of the shape of the word that is reduplicated: initial CVC, CVV and CVVC[2] syllables in bases all reduplicate as CV- (the reduplicative morpheme is underlined):

(1) Tonkawa CV- reduplication, in brief (Hoijer 1933, 1946, 1949)[3]

	Base form	*Reduplicated*	*Gloss*
CVCV-	to.poˀs	to-to.poˀs	'I cut it/rep.'
CVCCV-	sal.koˀs	sa-sal.ke.noˀs	'I pull/rep. cont.'
CVVCV-	naa.toˀs	na-na.toˀs	'I step on it/rep.'
CVVCCV-	soop.koʔ	so-sop.koˀs	'he swells up/I swell up (rep.)'

We will see shortly that this pattern is anomalous when seen in the larger context of the phonology of Tonkawa: second vowel syncope normally closes the initial syllable, and long vowels normally do not shorten in initial position. The analysis presented here will make sense of both facts.

2.1 Background on stress, footing, and vowel length

Tonkawa vowels undergo a rich set of fairly complex rules of shortening and deletion, which have received considerable attention in the generative phonology literature (Phelps 1975, Kenstowicz and Kisseberth 1979, Kisseberth 1970, McCarthy 1986, Gouskova 2003). Much of this work has been devoted to identifying the constraints that block the application of vowel deletion, and the findings are well-known: like many languages, Tonkawa bans hiatus, tautosyllabic consonant clusters, and sequences of identical adjacent consonants, and syncope must obey these restrictions. It has been less clear, however, why Tonkawa vowels shorten and delete in the first place. Since understanding both of these processes is crucial to the argument for the light syllable template, I start with the analysis of the relevant aspects of the non-reduplicative phonology of Tonkawa.

Gouskova (2003) argues that both syncope and shortening in Tonkawa are conditioned by metrical foot structure. According to Hoijer's description, "Tonkawa utterances consist of a succession of more or less evenly stressed syllables" (1946:292).[4] This characterization is consistent with iterative footing. Although Hoijer does not mark stress on his examples, further evidence from the distribution of long vowels (see (2)) points to trochaic feet. Long vowels in Tonkawa occur in initial syllables, but they shorten following an

[2] Throughout the paper, "VV" stands for long vowels, equivalent to Vː in IPA.

[3] Hoijer revised his transcriptions of Tonkawa in his (1946) grammar sketch and (1949) dictionary; whenever I cite from his original (1933) grammar, the transcriptions have been modified in accord with his later work: {b, d, g, c, gw, xw, dj/tz/tc} have been changed to {p, t, k, s, k^w, x^w, c} respectively. For example, *dobo'c* is re-transcribed as *topo's*.

[4] Hoijer is not very definite about the position of primary stress, but it is not crucial to the present discussion.

initial CV syllable. Shortening does not apply outside of this context, so long vowels are free to occur later in the word[5]—including after an initial CVC or CVV syllable, which is expected if footing is iterative. If feet were iambic (H́, LĹ or LH́, where H=heavy and L=light), then it would be difficult to explain why shortening consistently applies to the second vowel of an initial LH sequence. On the other hand, if Tonkawa has trochaic H́, H́L, and ĹL feet,[6] the context of shortening is simple to state: it applies to the vowel that ends up in the weak branch of a trochaic foot.

The examples in (2) show the surface distribution of long vowels, as well as a few typical alternations. The first syllable in examples (2a-j) either contains a long vowel or is closed, and the following vowel can be long if it is long underlyingly. Note also that there are long vowels later in the word. When a CV- prefix is added to the word, the underlyingly long vowel shortens. This sensitivity of shortening to the preceding context is crucial to the argument for a metrical analysis; the vowel shortens not just in any second syllable but in a second syllable after a light initial syllable. There is no shortage of long vowels in Tonkawa; they can occur in sequences of two or more syllables in a row (2 d-f) and can be either underlying or derived (as in (2e) /ew/→oo).[7]

[5] A reviewer asks whether shortening applies to even-numbered syllables other than the second one. It is difficult to find data that bear on this question, since syncope regularly eliminates the contexts where shortening could apply, but I have found one form that suggests the answer is "no": *yacoxˀan-ˀ<u>aa</u>lak yaacoˀs* "I see the tipi" (Hoijer 1933:25).

[6] This foot inventory comes from a fairly standard version of metrical theory (Hayes 1995, McCarthy and Prince 1986, Prince 1990), with the slight modification that (HL) trochees are allowed in addition to (H) and (LL) trochees (Mellander 2003, Rice 1992). An analysis without (HL) feet is also possible—it would need to assume (H)L(H) footing for words like *kaa.na.noʔ*. See Gouskova (2003) for further discussion.

[7] Tonkawa has shortening rather than lengthening because in, say, initial syllables vowels can be either short or long ([kal.ʔok] 'moustache' ∼[kaal.wan] 'deck of cards'); length is not predictable except in the shortening context. Additional, opaque evidence for an underlying distinction is that vowels alternating between short and long are resistant to syncope, whereas vowels that do not alternate in length do syncopate.

(2) Conditions for shortening in non-reduplicative phonology (Hoijer 1933, 1946, 1949)

No shortening in initial syllable or later in the word

a.	/kaa-na-oʔ/	(káa)(nóʔ)	'he throws it away'	1946:294
b.	/nes-kaa-na-oʔ/	(nés)(káa)(nóʔ)	'he causes him to...'	1946:294
c.	/kaa-na-n-oʔ/	(káa.na)(nóʔ)	'he is throwing it...'	1946:294
d.	/yaaloona-oʔ/	(yáa)(lóo)(nóʔ)	'he kills him'	1946:302
e.	/naahewe-an-haaʔas/	(náa)(hóo)(náa)(ʔás)	'town, city'	1949:24
f.	/yaace-oo-ka/	(yáa)(cóo.ka)	'you see him'	1933:19
g.	/yaace-aatewa-n-oˀs/	(yáa)(cáa.to)(nóˀs)	'I will see him'	1933:21
h.	/taa-notoso-oˀs/	(táa)(nót)(sóˀs)	'I stand with him'	1933:78
i.	/we-tasa-sooyan-oˀs/	(wét.sa)(sóo.ya)(nóˀs)	'I swim off with them'	1933:18
j.	/sool-tooxa-oʔ/	(sóol)(tóo)(xóʔ)	'it drips/defecates on him'	1933:58
k.	/sˀeelˀ-oˀs/	(sˀée)(lˀóˀs)	'I scratch it'	1933:13

Shortening after CV-

l.	/xa-kaa-na-oʔ/	(xá-ka)(nóʔ)	'he throws it far away'	1946:294	cf. (a), (b), (c)
m.	/ke-yaaloona-oʔ/	(ké-ya)(lóo)(nóʔ)	'he kills me'	1946:295	cf. (d)
n.	/ke-taa-notoso-oʔ/	(ké-ta)(nót)(sóʔ)	'he stands with me'	1933:78	cf. (h)
o	/we-sˀeelˀ-oˀs/	(wé.sˀe)(lˀóˀs)	'I scratch them'	1933:13	cf. (k)

I will assume here that footing is exhaustive in Tonkawa, i.e., that PARSE-σ is not violated. I also assume that only trochaic feet are allowed in Tonkawa (in other words, #LH́ is not an option), and that degenerate feet are prohibited—indeed there do not appear to be any light monosyllables. There is a pressure in Tonkawa for unstressed syllables to be light, which is due to the high ranking of the WEIGHT-TO-STRESS PRINCIPLE:

(3) WEIGHT-TO-STRESS PRINCIPLE (WSP): "If heavy, then stressed." (Prince 1990)

(4) PARSE-σ "syllables are dominated by feet." (Prince and Smolensky 2004)

If a vowel ends up in an unstressed syllable as a result of exhaustive footing, as in /xa-kaana-oʔ/, it shortens. Elsewhere, a long vowel can head its own (H) foot. This analysis is sketched out in tableau (8), which is presented in the comparative format (Prince 2002).[8]

[8] In comparative tableaux, each row presents a winner-loser pair, and for every constraint, the row shows whether it favors the winner (W) or the loser (L) in the comparison. Thus, WSP, for example, prefers the winner in (8b), i.e., (ké.ya)(lóo)(nóʔ), over the loser (ké.yaa)(lóo)(nóʔ), since the loser violates WSP to a greater extent than the winner. In the first comparison (8a), WSP does not distinguish the two candidates, so no mark appears in its cell. For the convenience of the reader, the extent of violation is shown with a subscript next to each W or L mark (for example, 0-1 means that the winner violates a constraint zero times and the loser—once). A ranking argument is established when a W mark precedes an L mark (provided, of course, that no higher-ranked constraint assigns a W mark to the winner).

First of all, there is a length distinction in Tonkawa, so IDENT-IO(length) (see (5)) must dominate NO-LONG-V (see (6)) and any other constraints that might favor shortening of adjacent long vowels, such as *CLASH.

(5) IDENT-IO(length): "Corresponding segments have the same length."[9]

(6) NO-LONG-V: "A vowel must not be associated with two moras." (McCarthy and Prince 1994b, Rosenthall 1994)

(7) *CLASH: "No adjacent strong syllables." (Alber 2005 and references therein)

When the long vowel finds itself in the second syllable following an initial CV, however, it must shorten. This comes about because the initial syllable must be footed (see (8c)), and the second syllable is unstressed and therefore should not be long in a trochaic foot (see (8b)). Thus, both PARSE-σ and WSP together favor shortening in the second syllable, but vowels may be long or short otherwise. The underlying representations for the two forms in the tableau are as shown in (2).

(8) Shortening in non-reduplicative contexts

	PARSE-σ	WSP	IDENT-IO(length)	NO-LONG-V
a. (yáa)(lóo)(nóʔ)$_{\text{winner}}$~(yá.lo)(nóʔ)$_{\text{loser}}$			$W_{0\text{-}2}$	$L_{2\text{-}0}$
b. (ké.ya)(lóo)(nóʔ)~(ké.yaa)(lóo)(nóʔ)		$W_{0\text{-}1}$	$L_{1\text{-}0}$	
c. (ké.ya)(lóo)(nóʔ)~ke(yáa)(lóo)(nóʔ)	$W_{0\text{-}1}$		$L_{1\text{-}0}$	

Under this analysis, a long vowel does not have to shorten in the third syllable, since it can head its own foot, and indeed long vowels do not shorten later in the word.

Although sequences of two light syllables arise as a result of shortening and in some other circumstances,[10] CVCV sequences are generally avoided and turned into heavy CVC syllables by syncope (see (9)). It should be noted that vowels in Tonkawa regularly delete and shorten, but there is apparently no epenthesis or lengthening, so the pressure to have heavy stressed syllables cannot be satisfied by lengthening vowels (or consonants). Syncope applies in a context similar to that of shortening (an insight originally due to Kisseberth (1970)), but it also applies outside of the #CVC_CV environment.

[9] IDENT-IO(length) is an oversimplification. The formulation of faithfulness to length in other terms, such as moras, is a controversial issue; see Bermudez-Otero (2001), Campos-Astorkiza (2004), Morén (1999), McCarthy (2000), and others for discussion.

[10] Systematic exceptions to syncope include root-final vowels, which do not syncopate, and vowels between identical consonants. See the cited works for various proposals regarding these exceptions.

(9) Syncope in the non-reduplicative phonology of Tonkawa (Hoijer's 1946, 1949, 1933 unless otherwise noted)

/notoxo-oʔ/	(nót)(xóʔ)	'he hoes it'	1946:294
/we-notoxo-oʔ/	(wén.to)(xóʔ)	'he hoes them'	1946:294
/ke-we-yamaxa-oo-ka/	(kéw)(yám)(xóo.ka)	'you paint our faces'	(Gleason 1955)
/yamaxa-oʔ/	(yám)(xóʔ)	'I paint his face'	1933:17
/he-yakapa-oˀs/	(héy.ka)(póˀs)	'I hit myself'	1946:304
/ke-netale-oˀs/	(kén.ta)(lóˀs)	'he licks me'	1933:6

The analysis of syncope involves metrical constraints such as the Stress-to-Weight Principle (see (10)) and Parse-σ, which both dominate Max-V (see (11)). A second vowel must delete to turn /CVCV/ into a heavy closed syllable CVC, since heavy stressed syllables are preferred to light ones despite the unfaithfulness. Not footing the first two syllables is ruled out by Parse-σ. This is shown in tableau (12).

(10) Stress-to-Weight Principle "stressed syllables are heavy" (Fitzgerald 1999, Prince 1990)

(11) Max-V: "Input vowels have output correspondents." (McCarthy and Prince 1995)

(12) Syncope in non-reduplicative contexts

/notoxo-oʔ/	Parse-σ	SWP	Max-V
a. (nót)(xóʔ)∼(nó.to)(xóʔ)		W_{0-1}	$L_{2\text{-}1}$
b. (nót)(xóʔ)∼no.to.(xóʔ)	$W_{0\text{-}2}$		$L_{2\text{-}1}$

The most important generalization to take away here is that in the regular phonology of Tonkawa, there is a pressure for the initial syllable of the word be heavy, which is accomplished by either syncope of the second vowel or being faithful to the length of initial long vowels. A full analysis of syncope and shortening is a bit more complicated than this; for example, long vowels shorten but do not delete even when they appear in the context for syncope.[11] The background presented so far, however, is sufficient for understanding the reduplication facts. One important thing to keep in mind about shortening and deletion is that they are quite general and apply in a variety of morphological contexts, affecting both root and prefix vowels. While there are some lexical exceptions to syncope, it is quite pervasive in Hoijer's corpus. I now turn to reduplication.

[11] I analyze this chain shift as the effect of a constraint that requires underlyingly long vowels to have output correspondents, Max-Long-V. Max-Long-V is defined as follows: "An input long vowel has a correspondent in the output" (Gouskova 2003, McCarthy 2007).

2.2 Underapplication of syncope in Tonkawa reduplication

2.2.1 The underapplication pattern

Verbal reduplication is pervasive in Tonkawa. Reduplicants are prefixes and always have the shape CV-. Unlike other CV- prefixes, however, reduplicant prefixes typically fail to condition syncope. As shown in (13), in reduplication syncope *underapplies*.[12] Even though the second vowel of the word is in the right position for syncope, it doesn't delete—with some exceptions, to which I return in the following section. The roots listed here are not exceptions to syncope in general, according to Hoijer's (1949) dictionary, where vowels that can syncopate are underlined.[13]

(13) Tonkawa reduplication: underapplication of syncope in 2nd syllable (Hoijer 1933:7)

topoˀs	to-topoˀs	'I cut it/rep.'	*to-t.poˀs	
komoˀs	ko-komoˀs	'I have it in my mouth/rep.'	*ko-k.moˀs	cf. wo-kmoˀs
k^wetoˀs	k^we-k^wetawoˀs	'I carry him in my arms/rep.'		'I have them. . . '
cexoˀs	ce-cexoˀs	'I turn him loose/rep.'		
/we-na-RED-wel-oˀs/	we-n-we-weloˀs	'I spread them (rep.)'	*wen.wew.loˀs	cf. na-w.loʔ 'he . . . '

Tonkawa reduplication raises two questions: why does syncope underapply (i.e., why not **kok.moˀs*), and why does reduplication copy just a light syllable when heavy syllables are clearly favored in initial position (i.e., why not **kom.ko.moˀs*). The answer to the first question is that underapplication of syncope is a base-reduplicant identity effect: deleting the vowel of the base eliminates a correspondent for the reduplicant vowel (see Gouskova (2007)). If syncope were to apply, as in *(ko$_1$-k)(moˀs), the reduplicant vowel would not have a correspondent in the base—from the point of view of the base, the vowel would be inserted, violating Dep-BR (McCarthy and Prince 1995). Dep-BR dominates SWP, however, blocking deletion in the base, so (ko$_1$-ko$_1$)(moˀs) wins.

(14) Underapplication of syncope in reduplication I: Dep-BR≫SWP≫Max-IO

input		Dep-BR	SWP	Max-IO
/RED-komo-oˀs/	(kó.ko)(móˀs)∼(kók)(móˀs)	W$_{0\text{-}1}$	L $_{1\text{-}0}$	W$_{1-2}$
/wo-komo-oˀs/	(wók)(móˀs)∼(wó.ko)(móˀs)		W$_{0\text{-}1}$	L$_{2\text{-}1}$

[12] The terms "underapplication" and "overapplication" are due to Wilbur (1973).

[13] If the reduplicant is preceded by another prefix, as in the following examples (Hoijer 1933:8, 61-3), then syncope is impossible for independent reasons. Second vowel syncope is impossible here because of a general prohibition against adjacent identical consonants (McCarthy 1986).

/he-RED-pak-o's/	he.pa.pa.ko's	'I tell him several times'	*hep.pa.ko's
/na-RED-wel-o's/	na.we.we.lo's	'I spread it out (rep)'	cf. naw.loʔ 'he spreads it out'
/ke-RED-topo-o's/	ke.to.to.po's	'he cuts me (rep)'	

The answer to the second question—why copy just CV—is that copying more than just a light syllable violates the template, which is informally defined as RED=σ_μ (I will return to the formal content of this requirement in §2.2.2):

(15) RED=σ_μ (cover constraint): "The reduplicative morpheme is a light syllable." (cf. McCarthy and Prince 1993b)

This constraint must dominate not just SWP but also MAX-BR, since MAX-BR favors not only the heavy-syllable-RED candidate but also the total reduplication candidate, **ko.moˀs-ko.moˀs*. SWP does not distinguish the winner from this candidate, since both violate SWP equally if the footing is as assumed here.[14]

(16) Underapplication of syncope in reduplication II: RED=σ_μ≫{SWP, MAX-BR}

/RED-komoˀs/	RED=σ_μ	SWP	MAX-BR
(kó.ko)(móˀs)∼(kóm.ko)(móˀs)	$W_{0\text{-}1}$	$L_{1\text{-}0}$	$L_{3\text{-}2}$
(kó.ko)(móˀs)∼(kó.moˀs)-(kó.moˀs)	$W_{0\text{-}1}$		$L_{3\text{-}0}$

Base-reduplicant identity does not have full reign in Tonkawa, since the base does not truncate to match the size of the reduplicant (i.e., not /RED-naatoˀs/ → *na-na). (I will return to this point in §4.) This is due to the high ranking of MAX-IO, which, together with the templatic constraint dominates MAX-BR in Tonkawa. RED=σ_μ dominates MAX-IO transitively via SWP.

(17) No truncation in backcopying

/RED-komoˀs/	RED=σ_μ	MAX-IO	MAX-BR
a. ko-komoˀs∼ko-ko		$W_{0\text{-}3}$	$L_{3\text{-}0}$
b. ko-komoˀs∼komoˀs-komoˀs	$W_{0\text{-}1}$		$L_{3\text{-}0}$

For simplicity, this analysis assumes that codas are always moraic in Tonkawa, i.e., that WEIGHT-BY-POISITION (Hayes 1989) is undominated. This is not the only conceivable analysis, of course, but the important thing here is that that codas must not be allowed into the reduplicant, whether they are moraic (and therefore ruled out by the light syllable template) or nonmoraic (and therefore ruled out by a prohibition on non-moraic syllable appendices—see Rosenthall and van der Hulst (1999), among others). As the following examples show, when the base begins in a closed syllable, the reduplicant is still CV-. Here, DEP-BR is not an issue, since syncope is not necessary to make the initial syllable heavy. Simply copying a closed syllable

[14] How *komoˀs* is footed is not known. Hoijer (1946) suggests that disyllables have somewhat stronger stress on the ultima, so the initial syllable may not be footed, or may form only a degenerate foot. Nothing in the present argument hinges on this, however.

(as in **sal-salkenoˀs*) would satisfy both SWP and MAX-BR, but the option fatally violates the template, and so light syllable reduplication is the only alternative. The prohibition on codas in RED is explored in the next section.

(18) Additional evidence for the light syllable template (Hoijer 1933:14)

CVC	sal.koˀs	sa-sal.ke.noˀs	'I pull/rep. cont.'	*sal-salke...
	xey.coˀs	xe-xey.coˀs	'I rub him/rep.'	*xey-xeyco...

2.2.2 Exceptional application of syncope and the nature of the light syllable template

Is the light syllable template a primitive of the theory, or can it be reduced to other independently motivated constraints? One of the central insights of GTT is that many aspects of templates echo general markedness constraints. For example, if RED is a syllable, it is often an open one, or one that obligatorily has an onset; if RED is a prosodic word, it will be perfectly parsed into a single binary foot, and so on. This insight is not itself new (see, for example, Steriade 1988), but it was not incorporated into the theory of Prosodic Morphology directly until the advent of OT (McCarthy and Prince 1994a). McCarthy and Prince demonstrate that the various aspects of syllabic markedness (such as the onset requirement and the prohibition on codas) have effects in reduplication independently of each other. They argue that the CV template we sometimes see in reduplication is not a primitive—rather, it arises from the interaction of several independently motivated constraints. To return to templatic constraints like RED=σ_μ (see (15)) would be a step backwards for the theory. In this subsection, I suggest that the templatic requirement can be decomposed into several more primitive, familiar markedness constraints. These constraints are lexically indexed to the reduplicative morpheme in Tonkawa, and they interact to create the effects of a reduplicative template. A consequence of this view is that it provides a straightforward way of answering the non-obvious question of how violations of the template are reckoned, since Tonkawa presents some cases where the reduplicant does not itself constitute a light syllable. Before considering these cases, we need some background on template satisfaction.

Templatic constraints are inherently complex, incorporating several distinct component requirements. Intuitively, something like RED=σ_μ might be understood to require that the reduplicative morpheme consist of a single light syllable, no more, no less, with no extraneous material. If the syllable that contains RED also includes material other than RED, then RED is not exactly a light syllable. McCarthy and Prince (1993b) discuss a case like this and conclude that when RED shares the syllable with another morpheme, the template is violated: "Because of the dominant constraints, the templatic target σ is met only weakly, though violation is still minimal, as usual in Optimality Theory. (Complex questions, yet to be addressed, underlie the characterization of *minimal* violation of a templatic target.)" (McCarthy and Prince 1993b:122, emphasis in the original). It is not obvious, though, what the difference is between RED sharing the syllable with another morpheme and RED itself being larger than a light syllable. Indeed, it is possible to violate different aspects of the intuitive definition separately. The candidates given in (19) for the hypothetical base */pataka/* demonstrate this (the reduplicative morpheme is underlined):

(19) Hypothetical cases of template violation for the input */pataka/*

a.	pat-.pa.ta.ka	RED is coextensive with a syllable, though the syllable is not light
b.	pa-p.ta.ka	RED is not coextensive with the syllable, and the syllable is heavy, though the weight is contributed by another morpheme
c.	pa.ta-.pa.ta.ka	RED is coextensive with two syllables, not one, and both are light
d.	pa-p-.ta.ka	RED (infixed) is not a syllable, and it is contained in a syllable that is heavy

In order to cover all of the eventualities raised by (19), the formal definition of RED=σ_μ would have to be rather crafty, and it would still fail to capture the Emergence of the Unmarked insight. Rather than pursuing this tack, I suggest that RED=σ_μ is not a primitive but a cover term for several distinct constraints, which happen to be lexically indexed to the reduplicative affix in Tonkawa. Lexical indexation is the way to encode lexical exceptions and lexical stratification, among other things (Ito and Mester 1999, Pater 2000, Flack to appear, Benua 1997, Prince and Smolensky 2004, inter alia): a constraint may be "split" into two versions in a given language, one of which will be labeled to apply to one subset of lexical items. Lexically indexed constraints in Tonkawa include the familiar constraints NoCoda (see (20)) and No-Long-V (see (21)), which together enforce the "lightness" requirement, as well as the requirement for an affix to be monosyllabic.

(20) NoCoda$_{RED}$: Syllables do not have codas. (Prince and Smolensky 2004:30)

(21) No-Long-V$_{RED}$: "A vowel must not be associated with two moras." (McCarthy and Prince 1994b, Rosenthall 1994)

The nature of the monosyllabicity requirement is a subject of some recent debate, and it has several possible sources, which include gradient alignment, output-output correspondence, and considerations of morpho-phonological complexity (see Gouskova 2004a, Walker 2002, 2000, Downing 2006, McCarthy and Prince 1994b, inter alia). For simplicity, I will use the familiar pseudotemplatic constraint in (22), though Tonkawa does not present any evidence that would rule out other accounts. This constraint is a variation on Downing's Morpheme=Syllable (2006:120), and it belongs to the same class as the interface constraint Lx≈Pr of Prince and Smolensky (2004), which requires that a lexical word be associated with a prosodic word.

(22) AFFIX≤ σ: "The phonological exponent of an affix is no larger than a syllable." (McCarthy and Prince 1994b)

The hypothetical cases in (19) raise the issue of locality: how does the template differentiate between reduplicants that are too small for their syllables and ones that are too large? If the template is viewed as a cover term for more primitive requirements, then a ready answer is presented by existing work on lexically indexed constraints. Following Pater (2006), I assume that lexically indexed constraints such as (21) and (20) are violated "if and only if the locus of violation contains some portion of the indexed morpheme" (Pater 2006:16, see also (23)). Thus, NOCODA$_{RED}$ would assign a violation mark to (19a) and (19d) but not to ((19b), since the locus of violation (the coda consonant itself—see McCarthy 2003a) is not part of the reduplicative morpheme.

(23) *X$_L$: Assign a violation mark to any instance of X that contains a phonological exponent of a morpheme specified as L. (Pater 2006:15)

With this background in hand, we are ready to consider how these assumptions allow us to understand the nature of the templatic requirement. There is a subpattern of reduplication of Tonkawa that differs from the underapplication pattern analyzed earlier. In this subpattern, RED is still a CV sequence, but it is embedded in a CVC syllable (see (24)). As shown below, some Tonkawa roots have syncope either in the expected position, as in *ya-y-pecoˀs*, or in the following syllable. Hoijer observes that the prefix *ya-* is often implicated in such patterns, but there are a few examples that do not involve *ya-*; he also remarks that the CV-CV pattern is unexpected, given the general trend for second vowel syncope:

(24) Exceptional application of syncope in reduplication (Hoijer 1933:7)

yapcoˀs	ya-y_pecoˀs	'I sew it/rep.'
yapxoˀs	ya-pa-p_xoˀs	'I slap him/rep.'
coxnoˀs	co-c_xaayewo?	'I sleep/several sleep together'

Reduplicated forms without syncope form the majority of Tonkawa verbs in Hoijer's corpus. The relative frequency of syncopating and non-syncopating forms is actually not all that central to the argument, since the very existence of two patterns demands an analysis, but it is instructive to consider how robust the patterns are. Hoijer (1933) classifies verbs according to whether they copy the first or the second syllable of the stem (the non-copied first syllable is most likely an older prefix) and whether the result is CV-CV or CV-C_ (with syncope). This roughly aligns with the analytical categories of whether syncope is conditioned (given the general phonology of Tonkawa) and whether it occurs. The results of my search of Hoijer's (1933) grammar are summarized in the following table, along with some examples of each type.

(25) Reduplication subpatterns (Hoijer 1933)

	Syncope conditioned			Syncope not conditioned			Total
Syncope attested	/RED-ya-kapa-/	ya-y_kap-	17	/ya-RED-xoya-/ /ya-RED-tasalka-/	ya-xo-x_ya ya-ta-t_salka-	15	32
Syncope not attested	/RED-topo-/	to-topo-	33	/RED-yˀoco-/ /RED-pancale-/ /na-RED-poxa-/	yˀo-yˀoco- pa-pancale- na-po-poxa-	57	90
Total	50			72			122

Under the analysis presented in the preceding section, syncope is conditioned to apply to the second but not the third underlying vowel of the word. In words that reduplicate the initial syllable, the second vowel is eligible for syncope, but syncope is often blocked for phonological reasons (e.g., syncope cannot put a glottalized consonant in coda position, create a trisyllabic cluster, or delete an underlyingly long vowel). Syncope is also blocked between identical consonants (McCarthy 1986), so the forms that reduplicate a non-initial syllable (as in /ya-RED-tasalka-/→ya-ta-t_salka-) are not expected to delete the second underlying vowel (*ya-t_-tasalka-) and never do. Some of the verbs with second syllable reduplication unexpectedly show syncope of the *third* underlying vowel, and I assume that in such forms, the first CV is lexically marked to be an extraprosodic prefix.[15] It is clear that the majority of the forms cited by Hoijer do not have syncope (though see Phelps (1973), who treats the majority pattern as exceptional due to assumptions about the applicability of syncope to stems vs. prefixes). Even though in many of these cases, syncope is ruled out for independent reasons, 33 of the 50 forms expected to have syncope do not have it. The incidence of syncope is lower in reduplicated forms than would be expected by chance.[16] I conclude from this that the pattern of syncope underapplication is robust in Tonkawa, despite there being some exceptional forms that do have syncope.

Phonologically, the forms with syncope differ from the forms without syncope as follows. In both cases, the reduplicant itself contains no marked structure—it is not bigger than a syllable, and it contains no material that would contribute weight (i.e., a coda or a long vowel). The status of these forms with respect to the template is therefore the same—both satisfy it. This is illustrated in (26): we find forms that reduplicate like (26a) and (26c), but none that have full reduplication, two-syllable reduplication, or CVC reduplication.

[15] A reviewer asks whether there are any forms that syncopate the second vowel of the base rather than the first, as in the hypothetical /RED-patik-oˀs/→*papat_ koˀs*. I have not found any forms like that.

[16] The null hypothesis is that syncope applies to reduplicated forms at random, in which case we would expect the distribution of syncope to be 50/50%, i.e., 25 forms would have it and 25 would not. This hypothesis can be rejected on the basis of a χ^2 test ($\chi^2(1)=5.12$, $p < 0.25$). Underapplication is not accidental.

Each of these options is separately ruled out by the constraints that produce the effects of the template. The two attested patterns, (a) and (c), clear all three of the lexically indexed constraints:

(26) RED=σ_μ as lexically indexed constraints

	/RED, yapecoˀs/	AFFIX≤ σ_{RED}	NOCODA$_{RED}$	NO-LONG-V$_{RED}$
a.	ya.ya.pe.coˀs			
b.	ya.pe.coˀs-ya.pe.coˀs	*	*	
c.	yay.pe.coˀs			
d.	ya.pe.ya.pe.coˀs	*		
e.	yap.ya.pe.coˀs		*	

Thus, the CV template comes about because RED is not allowed to be more than a syllable, to contain codas, or to have long vowels (NO-LONG-V$_{RED}$ has not played a role in these cases, but it will in the next section). These limitations hold even when RED shares a syllable with a non-reduplicated consonant, as with syncope. The answer to McCarthy and Prince's (1993b) concern about the minimal violation of templatic targets, then, is that the templatic target is not a monolithic unit but an artifact of the interaction of separate constraints, each of which is separately violable. By virtue of its ability to distinguish different types of template violation, the llexical indexation approach allows fine-grained control over exceptions. For example, there is one form in Hoijer's data that has does violate the CV template: /he-RED-yaxa-oʔ/ he-yax-yaxoʔ 'several eat it' (Hoijer 1933:76). Its CVC shape can be accounted for if NOCODA$_{RED}$ is dominated by a morpheme-specific version of MAX-BR, which is lexically indexed just to the stem "eat." This kind of control would be difficult to achieve with gross templatic constraints such as RED=σ_μ.

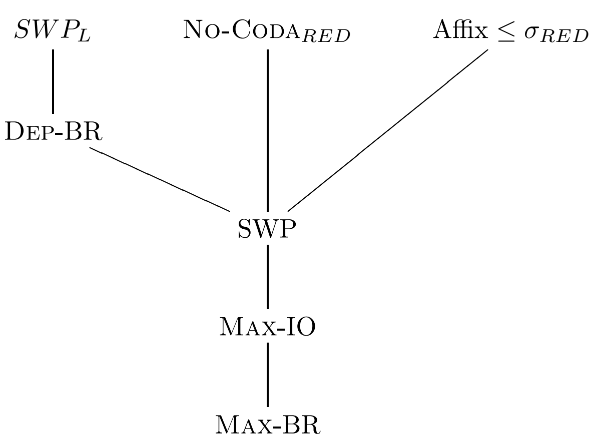
Whether syncope applies to reduplicated forms or not is also up to lexical indexation. While all reduplicated forms are subject to the lexically indexed RED constraints, only some are exceptional with respect to syncope. The underapplication pattern and the normal application pattern differ in how they do on DEP-BR and SWP: syncopating forms violate faithfulness (DEP-BR), and non-syncopating ones violate markedness (SWP). This is exceptional triggering of syncope, which I attribute to the high ranking of a lexically indexed version of SWP$_L$. SWP$_L$ is indexed to certain stems/bases, so it applies to every stressed syllable that contains any segments of the stem to which RED is prefixed—even if a syllable contains only one consonant that belongs to the stem. This analysis is shown in (27). The first input follows the underapplication pattern: DEP-BR outranks the general SWP and therefore disfavors syncope. In the second input, the stem is indexed as subject to the higher-ranked SWP$_L$, which returns a violation for every light stressed syllable that contains some portion of the stem *yapece-*. In the winner, all stressed syllables are heavy, and all happen to contain some segments from the lexically exceptional stem. In the most viable loser, the first stressed syllable consists entirely of RED and is not subject to SWP$_L$. Since footing is exhaustive in Tonkawa, one of the other syllables would have to be stressed, and *pe* is the best option under trochaic footing. This light stressed syllable incurs a fatal violation of SWP$_L$.

(27) Underapplication and normal application of syncope

/RED-topo-oˀs/ 'I cut rep.'	SWP$_L$	Dep-BR	SWP
(tó.to)(póˀs)∼(tót)(póˀs)		W	L
/RED-yapece$_L$-oˀs/ 'I sew rep.'			
(yáy.pe)(cóˀs)∼(yá.ya)(pé.coˀs)	W	L	W
/RED-yakawa-oˀs/ 'I kick rep.'			
(yáy.ka)(wóˀs)∼(yá.ya)(ká.woˀs)	W	L	W

The rankings motivated so far are summarized in (28). In this subgrammar, SWP and Max-IO interact to favor syncope in general contexts, but syncope is blocked in reduplication when required by reduplicant-specific markedness or base-reduplicant identity. Base-reduplicant identity cannot require the deletion of base segments, however, so there is no template-backcopying truncation.

(28) Ranking summary



To summarize the discussion so far, the default state of affairs in Tonkawa is for the first syllable to be heavy, but when this syllable is a reduplicative prefix, it must be light. This alone is not a devastating argument for reduplicant-specific templatic constraints; indeed, one could argue that this is nothing more than emergence of the unmarked open syllable. Under such an analysis, the general (not lexically indexed) constraint NoCoda would show its activity in reduplication by dominating Max-BR but not Max-IO. I show that this analysis does not work in §3.2.

2.3 Overapplication and backcopying of shortening

The crucial argument for reduplicant-specific templates comes from the pattern of vowel shortening in Tonkawa reduplication. Recall that shortening normally applies to the second vowel of a word, provided that it is preceded by a light syllable (see (2)). Outside of that context, long vowels contrast in length with short ones in initial syllables or in following syllables. When a word with a long vowel in the first syllable is reduplicated, however, both the reduplicant and the base that it copies have short vowels—shortening unexpectedly applies to the first syllable of the word:

(29) Overapplication of shortening in Tonkawa reduplication (Hoijer 1933:12-14)

CVV	naa.toˀs	na-na.toˀs	'I step on it/rep.'	*naa-naa...
	yaa.coˀs	he-ya-ya.ce.woʔ	'I see him/several look at it'	*he-ya-yaa...
	maa.koˀs	ma-ma.ka.noˀs	'I cry, weep/rep.'	*maa-maa...
CVVC	soop.koʔ	so-sop.koˀs	'he swells up/I swell up (rep.)'	*sop-sopko...
	coo.lˀoˀs	co-co.lˀoʔ	'I defecate/several defecate'	*coo-colˀ...
	mˀeey.coʔ	he-mˀe-mˀey.coˀs	'he urinates/I urinate, rep.'	*he-mˀee-mˀeeyca-

This is surprising because sequences of adjacent long vowels in the first two syllables are not prohibited in Tonkawa, as was shown in (2). Nor are long vowels prohibited in the third syllable, yet shortening applies in *he-ya-ya.ce.woʔ*.[17]

Long vowels are banned from the reduplicative prefix, and this shortness is copied onto the base, as well. The template together with base-reduplicant identity compel shortening, which is otherwise not motivated in Tonkawa phonology. Faithful copying of the long vowel is ruled out by the high-ranking lexically indexed constraint No-Long-V$_{RED}$ (see (30a)). As shown in (30b), copying a short vowel without shortening the base vowel creates a configuration that is generally prohibited in Tonkawa, i.e., a long vowel following a initial #CV syllable, and it also fails on base-reduplicant identity (see (30b)). This is ruled out by high-ranking Ident-BR(length) and by the constraints whose interaction produces second syllable shortening. Reduplication of non-initial syllables follows the same shortening pattern, as shown in (30c): both the reduplicant and the first syllable of the base must shorten, even though long vowels are allowed in the third syllable in Tonkawa. Here is the argument for the role of Ident-BR(length): neither the templatic constraint

[17] Hoijer cites only a handful of counterexamples to reduplicative shortening: /RED-xˀeepa-/ → xˀe-xˀeepa- 'to take ... off/rep.' and /RED-sˀeeta-/ →sˀe-sˀeeta- 'to cut... /rep' (1933:61). In his (1949) dictionary, however, Hoijer cites these forms differently (1949:62, 66): *sˀesta-* and *sˀesˀeta-* are given as reduplicated forms for 'to cut' and *xˀe-xˀepa-* is given as the reduplicated form for 'to take off.' These forms will remain a mystery. The more robust counterexamples are /he-RED-maake-w-oʔ/ he-ma-maakewoʔ 'several cry, weep' and /he-na-naate-w-oʔ/ he-na-naatewoʔ 'several step on it' (1933:75). No straightforward analysis is available for these exceptions, since the the stems themselves undergo shortening in the unprefixed forms in (29), and the rest of the reduplicated forms with *he-* and other prefixes do have shortening.

nor the general phonological rules of Tonkawa require shortening here, so it must be due to base-reduplicant identity. The inputs in the tableau are /RED-naatoˀs/ for (a, b) and /he-RED-yaace-w-oˀs/ for (c, d).

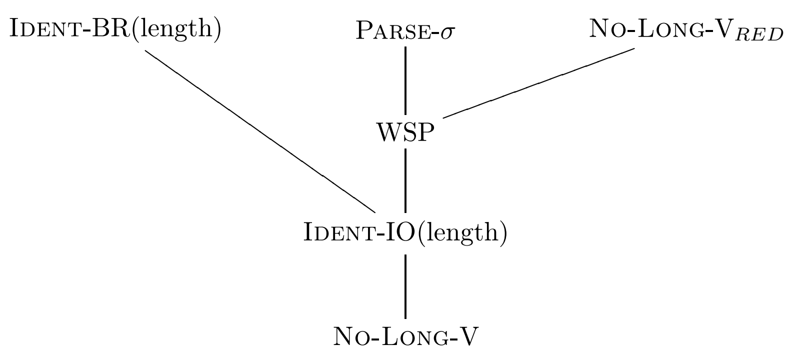
(30) Analysis of shortening

	No-Long-V$_{RED}$	Id-BR	WSP	Id-IO	No-Long-V
a. (ná.na)(tóˀs)∼(náa)(náa)(tóˀs)	$W_{0\text{-}1}$			$L_{1\text{-}0}$	W_{0-2}
b. (ná.na)(tóˀs)∼(ná.naa)(tóˀs)		$W_{0\text{-}1}$	$W_{0\text{-}1}$	$L_{1\text{-}0}$	$W_{0\text{-}1}$
c. (hé.ya)(yá.ce)(wóʔ)∼(hé.ya)(yáa.ce)(wóʔ)		$W_{0\text{-}1}$		$L_{1\text{-}0}$	$W_{0\text{-}1}$
d. (hé.ya)(yá.ce)(woʔ)∼(hé.yaa)(yáa.ce)(wóʔ)	$W_{0\text{-}1}$		$W_{0\text{-}1}$	$L_{1\text{-}0}$	W_{0-2}

An additional ranking can be justified based on forms such as */RED-soopk-oˀs/* → *so-sop.koˀs*: even though Tonkawa does not normally tolerate #(LH) feet (recall that long vowels undergo shortening in second syllables), a CV syllable can be followed by a CVC syllable in the context of reduplication. The marked configuration could be avoided by copying more, as in **sop-soop.koˀs*, **soo-soop.koˀs*, etc. The failure of these alternative parses suggests that Parse-σ, No-Long-V$_{RED}$, and NoCoda$_{RED}$ dominate WSP.

Thus, this analysis produces shortening of the first and second syllables only in reduplicative contexts, and it explains why shortening occurs simultaneously in the reduplicant and the base—the template is backcopied. The crucial rankings are summarized below. In many ways, the rankings for shortening are parallel to the subgrammar in (28): here, too, high-ranking reduplicant-specific constraints and BR-faithfulness interact with general prosodic constraints to produce a reduplication pattern that deviates from the default norms of the language. As I will show in the next section, a GTT analysis cannot produce this outcome.

(31) Ranking summary



3 GTT alternatives

Generalized Template Theory can be viewed as a sort of Null Hypothesis for Prosodic Morphology: nothing special has to be said about reduplicative morphemes that doesn't also have to be said about other morphemes, except that reduplicative morphemes copy their segmental content from the reduplicative base. GTT successfully explains foot-size reduplication, as in Diyari (McCarthy and Prince 1994a), and GTT analyses have been proposed for smaller size reduplicants, as well, so the burden of proof is on the present theory: it is imperative to show that no analysis of Tonkawa can be constructed without some specific reference to the prosodic properties of reduplicative morphemes. My argument consists of two parts. First, no properties of Tonkawa outside of reduplication motivate the claim that what goes on in reduplication is in any sense normal or unmarked: reduplicative affixes are restricted in a way that other affixes are not. Second, I will show that Tonkawa cannot be analyzed using the types of constraints that have been proposed for small reduplicants, including *Struc and OO-Dep. Each of these analyses encounters a different set of problems, and neither can explain the entire paradigm.

3.1 Affix shapes in Tonkawa

One of the reductionist assumptions of GTT that makes it so appealing is that under this theory, the reduplicant needs to only be specified *morphologically* as either a stem or an affix, and its phonological properties will then be determined by the same interactions that generally define the phonological properties of its stem or affix class in the language. If anything, the affixal reduplicant is expected to be less marked, not more, than the corresponding stems or affixes in the language. This line of attack on reduplication has been very productive, as the long line of research in this area will attest, but it doesn't work for Tonkawa. The key reason is that no size restrictions hold of affixes in the language.

Productive reduplication is prefixing, so it is instructive to consider what other prefixes of Tonkawa look like. A search of Hoijer's (1949) morpheme dictionary shows that non-reduplicative prefixes of Tonkawa often take the shape CV-, but there are quite a few longer prefixes, as well. There is no apparent size limit on suffixes, either—examples of disyllabic and CVC/CVV suffixes are numerous (-*ʔaa* 'definite (noun suffix),' -*nik* 'third person plural subject,' -*ʔita* 'number of them,' -*wesʔe* 'plural subject'). From the following examples, it should be clear that *no light monosyllable size limit holds of Tonkawa prefixes.* The size limit is specific to reduplicants.

(32) Prefix shapes in Tonkawa (Hoijer 1949:70-74)

$\leq\sigma_\mu$	
ke-	'1st person sg. object'
we-, -w-	'plural object'
xa-	'with force, to a distance'
CV-	RED
he-	'prefix added to demonstrative pronouns to form interrogatives'
ya-, -y-	'causative'
$>\sigma_\mu$	
ʔee-	'theme for most introductory, conjunctive, and subordinating particles'
taa-, tas-, tasa-	'with'
ʔaa-, ʔa-	'third person pronoun'
ʔaa-	'definite (noun prefix)'
nes-	'causative'
hes-	'mediopassive causative'
yan-	'theme prefix'

In some work on prosodic morphology, it has been observed that sometimes phonological restrictions hold of a well-defined subset of a language's affixes. For example, English derivational morphemes must minimally contain a mora, but inflectional ones do not have to. Moreover, Class II monosyllabic prefixes must be heavy in English, but Class I prefixes may be light (Golston 1991, McCarthy and Prince 1994b, Downing 2006; see also Urbanczyk 2006). It would be hard to make an argument for those kinds of distinctions in Tonkawa. There is no apparent derivational-inflectional divide between affixes of different sizes (note the two causative morphemes differ in size: *ya-*/*-y-* and *nes-*). There is also no phonological evidence for a class or level distinction—the only significant phonological distinction is between the reduplicative morpheme and all the other CV- prefixes, which I attribute to reduplicant-specific constraints. All CV- prefixes induce shortening of following vowels, for example, and so does the reduplicative prefix, assuming that it is a priori limited in size to a light syllable.

3.2 Alternative Analyses

This observation about Tonkawa affix shapes is important to the argument against a GTT analysis. As I will show, no ranking can produce shortening only in reduplicative affixation but not in other morphological contexts. It is impossible to capture this kind of interaction because it contradicts the very premise of GTT, which is that the grammar of reduplication does not specifically reference the phonological properties of reduplicative affixes. So what would it take to construct a GTT analysis? The analysis must explain the following:

(iii) Why is syncope blocked in reduplicated forms but not in other affixation?

(i) Why is the reduplicant limited in size to a single syllable but other affixes can be larger?

(ii) Why are long vowels and codas not found in reduplicants?

(iv) Why does shortening/backcopying apply in reduplicated forms?

The first question, why syncope is blocked, could be answered in the same way as in the analysis I propose: BR-faith prevents syncope because everything in the reduplicant must have a correspondent in the base. The traditional answer to the second question (why just one syllable) is that the monosyllable emerges through the interaction of a markedness constraint that penalizes syllables, such as *Struc(σ) (Zoll 1993) or syllable alignment (Spaelti 1997), with constraints that require something to be copied for the realization of RED, i.e., Morph-Real (see McCarthy and Wolf 2005 for the most recent overview). Thus, something must be copied, but reduplication copies just enough material to express the morpheme and no more. The answer to the third question (why not CVV/CVC) is the Emergence of the Unmarked (McCarthy and Prince 1994a): even though long vowels and codas are tolerated in Tonkawa generally (Faith-IO≫Markedness), the reduplicant is allowed to copy only what it likes because it is subject to a different set of faithfulness constraints (Markedness≫Faith-BR). The otherwise dominated markedness constraints against codas and long vowels will then determine the shape of the monosyllable (Walker 2000, Kennedy 2005, Yu 2005, and others).

The problem with the Emergence of the Unmarked part of this account is that codas and long vowels are not only tolerated—they are actually required in the relevant context in Tonkawa. It was independently demonstrated for non-reduplicative contexts that SWP dominates Max-IO, which gives us syncope. Since the output of syncope is a CVC syllable, SWP must also dominate NoCoda. The preferences of NoCoda will not be obeyed as long as SWP is ranked above it—in fact, since the two constraints are in a Paninian special-general relationship in Tonkawa (Prince and Smolensky 2004), NoCoda cannot be active in determining the shape of RED, even in an Emergence of the Unmarked configuration. This argument is valid even if syncope were attributed to something other than SWP; any constraint that favors the deletion of a vowel in that context will be in a special-general relationship with NoCoda.[18] As demonstrated in the following tableau, then, NoCoda does not work as a size limiting constraint in Tonkawa—no ranking of just these constraints will produce the observed outcome.

[18] Indeed, *Struc has been suggested to be the motivating force behind Tonkawa syncope (Hartkemeyer 2000), but this kind of analysis has many difficulties accounting for the details of how syncope applies and where it doesn't apply; see Gouskova 2003 for discussion.

(33) The Emergence of the Unmarked cannot explain CV shape

/RED-topoˀs/	SWP	MAX-IO	NOCODA	MAX-BR
to-topoˀs∼top-topoˀs	**L**		**W**	L
to-topoˀs∼to-t.poˀs	**L**	**W**	**W**	
/notoso-oʔ/				
not.soʔ∼no.to.soʔ	W	L	L	

The question about backcopying turns out to be the hardest one to answer. The vowel in RED cannot be short because of the Emergence of the Unmarked (cf. Sanskrit, McCarthy and Prince 1994b, Steriade 1988). As we know from non-reduplicative phonology, shortening in Tonkawa is not an effect of NO-LONG-V; it is really motivated by a host of much more subtle prosodic constraints, some of which actually favor long vowels in certain positions (see (8)). Indeed, (8) showed that NO-LONG-V must be ranked at the bottom of the relevant subhierarchy. In some contexts, reduplicant-base shortening could be attributed to base-reduplicant identity, as in (34a)—this is identical to the analysis I proposed in (30). The problem is that in the absence of a templatic constraint limiting RED to a light syllable, nothing can explain why *naatoˀs* reduplicates with shortening (see (34d)). The only constraint that favors shortening there is NO-LONG-V, and it is ranked too low to matter.

(34) Reduplicative shortening doesn't work in a GTT analysis

		ID-BR	WSP	ID-IO	SWP	NO-LONG-V
/he-RED-yaace-w-oʔ/	a. (hé.ya)(yá.ce)(wóʔ)∼ (hé.ya)(yáa.ce)(wóʔ)	$W_{0\text{-}1}$		L_{1-0}	$L_{2\text{-}1}$	$W_{0\text{-}1}$
/taa-notoso-oˀs/	b. (táa)(nót)(sóˀs)∼ (tá.not)(sóˀs)		$W_{0\text{-}1}$	$W_{0\text{-}1}$	$W_{0\text{-}1}$	L_{1-0}
/ke-taa-notoso-oˀs/	c. (ké.ta)(nót)(sóˀs)∼ (ké.taa)(nót)(sóˀs)		$W_{0\text{-}1}$	L_{1-0}		
/RED-naatoˀs/	d. (ná.na)(tóˀs)∼ (náa)(náa)(tóˀs)			$\mathbf{L}_{1-0}$	$\mathbf{L}_{1-0}$	$W_{0\text{-}2}$

This analysis needs IDENT-IO(Length) to be dominated by a constraint that favors shortening in (34e) but not in (34b) (or in, say, /yaaloona-oʔ/, which surfaces as *yaa.loo.noʔ*). *STRUC constraints cannot do the job, because they would favor shortening across the board—this is in fact the reason why *STRUC constraints have been so popular in GTT; they cannot produce templatic backcopying, which is what we have in Tonkawa.[19]

OO-Dep. Yet another alternative from the work on GTT fails for a different reason. In Transderivational Correspondence Theory, there is a family of constraints that favors shortening only in affixation—including reduplicative affixation: OO-Dep (Gouskova 2004a, Benua 1997). OO-Dep requires every element of a derived form to have a correspondent in the derivational base. By this definition, every segment and mora of a prefix, including a reduplicative prefix, violates OO-Dep, so the shorter the reduplicant, the less the candidate violates OO-Dep. The problem is that OO-Dep, too, is overly general: without additional provisions, it applies to all prefixes and would favor shortening in (34b) *and* in (34d). Benua's theory allows to lexically index OO constraints to certain affixes, but if this is done for RED, the analysis ceases to be a Generalized Template analysis, since it invokes a reduplication-specific mechanism to derive the templatic restriction. There are some additional confounds for an OO-Dep analysis in Tonkawa, since vowels alternate with zero in morphologically related forms so regularly that it would be difficult to argue that any sort of paradigm uniformity pressure even exists in the language.

*Repeat. Another alternative analysis, suggested by an anonymous reviewer,[20] would attribute the overapplication of shortening to a ban against adjacent identical syllables with long vowels (*naa.naa). Constraints against adjacent identical syllables have been proposed by Yip (1998) and Hicks-Kennard (2004), though their *Repeat constraints are silent on the issue of vowel length; see Inkelas and Zoll (2005) for a recent critical discussion.[21] The *Repeat analysis hinges on whether there are sequences of identical syllables with long vowels outside of the reduplicative context. Fortunately, Tonkawa fusion provides derived syllables with long vowels, which are etymologically non-reduplicative. I have found some examples of this that are non-reduplicative in origin. The long-vowelled syllables in these examples come about because /h/ deletes between vowels, which fuse as a result. If this is a general pattern, the existence of such form suggests that the hypothetical constraint against identical syllables with long vowels is ranked below Ident-IO-(length), which would make overapplication of shortening impossible.

[19] Another alternative has behind it the intuition that reduplicants are limited in their ability to add feet to the word. This can be the effect of a gradient alignment constraint such as All-Feet-Left (McCarthy and Prince 1993a) or *Struc(Ft). While the intuition is attractive, this analysis cannot produce shortening only in reduplicative contexts. Since shortening applies only in reduplicative contexts, Ident-IO(length) must dominate All-Ft-Left/*Struc(Ft); even if Ident-BR(length) were ranked above markedness, the ranking would favor a candidate that does not shorten the reduplicative base's long vowel. Moreover, gradient alignment constraints face additional conceptual and typological challenges that are quite independent of reduplication (McCarthy 2003b, Kager 2001, Gouskova 2003).

[20] I would like to thank the anonymous reviewer for suggesting this and the next alternative analyses of Tonkawa and for an extremely constructive discussion of their predictions.

[21] One could argue that a constraint against identical syllables with long vowels is what one gets when *Repeat is locally conjoined with No-Long-V or *Clash. I am assuming that local conjunction is not a valid operation in Con, since it comes with many problematic predictions (McCarthy 2003a, 1999, Fukazawa and Lombardi 2003, Gouskova 2004b, Lubowicz 2002, and others). It is also worth noting that a precise formal definition of the **naa.naa* constraint is not a straightforward matter, since one would have to establish identity between segmental and prosodic features (Campos-Astorkiza 2004, McCarthy 2000, Ito et al. 1996).

(35) Sequences of identical syllables with long vowels outside of reduplicative contexts[22]

/tasa-taha-/	taa.taa-	'to come with (him), to bring (him) here'	(1949:17)
/ʔoo-ʔa-heepane-wa-an/	ʔooʔoopanoon	'night story'	(1949:57)

Morphological structure. Yet another alternative GTT analysis would reinterpret the morphological structure of reduplicated words. If the reduplicant is actually outside the morphological stem, then it would not have to be prosodified with the base, and its shortness could follow from other general principles (cf. McCarthy and Prince 1994b, Downing 2003, Inkelas and Zoll 2005). This analysis predicts that prefixes external to the reduplicant should never be long, either. This is falsified by the following forms, in which the reduplicant is not initial in the word:

(36) Non-initial reduplicants

/we-na-RED-wel-oˀs/	we-n-we-welo ˀs	'I spread them rep.'	(1933:8)
/hee-RED-sa-na-/	hee-sa-sa-na-	'several point, indicate tr.'	(1933:30)
/ʔey-RED-samˀaxe-/	ʔey-sa-samˀaxe-	'to break (his) head'	(1949:63)
/he-ya-RED-kawa-wa-/	he-y-ka-kawa-wa-	'several dance'	(1946:304)

Since syncope applies to *#we-na-* and shortening fails to apply to *#hee*, it appears that those are actually prosodified in the normal way—and therefore the reduplicant is, as well. Thus, the reduplicant is not external to the prosodic or the morphological word—it is in the middle of it.[23]

Cophonologies. Tonkawa reduplication is relevant to another theory of reduplication, Inkelas and Zoll's (2005) Morphological Doubling Theory (MDT). I cannot do this framework justice within the available space, but I will point out a few of its predictions and cite some potentially crucial data. The first important feature of MDT is that it has no base-reduplicant faithfulness and therefore allows neither true overapplication nor underapplication. Any deviation from default patterns is attributed to morphological idiosyncracies or opacity, both of which are analyzed in terms of cophonologies (morpheme-specific rankings). Second, the theory does include templates as a primitive and sees templates in reduplication as just a special case of morphological truncation. Inkelas and Zoll use templates in their analyses but ultimately leave CV-reduplication as an issue for future research, speculating that it may have either morphological (=truncation-templatic) or phonological (=copying) nature. My assumptions match those of MDT when it comes to the

[22] The prefix tasa- 'with' (cited in §3.1) presumably has has *taa-* as an optional allomorph; /taha-/ becomes *taa* by *h*-deletion.

[23] A variant of this analysis is suggested by another reviewer: Suppose the reduplicant syllable must be unstressed; then RED would have to be light under WSP, and shortening of the following syllable is required by BR-identity. This analysis is difficult to test because we do not have a detailed record of stress in Tonkawa. In principle, one could draw some inferences from the behavior of long vowels and syncope of vowels following the reduplicant-base syllable sequence. From my examination of Hoijer's Tonkawa corpus, shortening does not seem to apply later in the word, independent of reduplication. As for syncope, the crucial vowels are exempt from syncope in most cases because they are root-final. This does not provide any support for the analysis or any crucial evidence against it. The reviewer points out that exceptional third-vowel syncope verbs could point to stress on the reduplicant; it is hard to make any conclusions on the basis of these, however.

need for reduplication-specific phonology, but we disagree on how this is implemented in the theory (see Pater (2006) for more on co-phonologies vs. lexical constraint indexation) and on the mechanisms underlying over/underapplication.

In MDT terms, overapplication of shortening and underapplication of syncope are examples of reduplication-specific alternations and non-alternations, respectively. The first can be accomplished in MDT by calling on a grammar that is specific to the concatenation of RED with the base: if No-Long-V dominates Ident-Length in that grammar, shortening has to apply to both RED and the base long vowel. The challenge here would be ensuring that shortening applies only to those two vowels but not to the rest of the word; as Pater (2006) points out, locality is a general challenge for morpheme-specific ranking theories. It appears that long vowels are not prohibited in words that contain reduplicative prefixes, so in the concatenative cophonology, Ident-Length dominates No-Long-V—surface long vowels derived by *h*-deletion and *w*-fusion are unfaithful to their underlying length (alternative approaches to moraic faithfulness are possible, however). Any analysis must explain why both derived and underlying long vowels are allowed in reduplicated words (see (37) and (36)) but banned from the reduplicative morphemes themselves and from the bases they copy. BR-Faith in conjunction with reduplication-specific markedness constraints handles locality straightforwardly (see §2.2.2); whether a reasonable cophonology analysis can be developed is a challenge for the MDT framework.

(37) Long vowels allowed in reduplicated words

/he-na-RED-taya-w-n-oʔ/	hen.ta.ta.yoo.noʔ	'several are choosing it'	1933:15
/RED-nota-w-noˀs/	no.no.too.noˀs	'I touch it rep. cont.'	1933:16
/ke-ha-RED-yox-oʔ/	kaa.yo.yo-xoʔ	'he mounts me repeatedly'	1946:295

To summarize, I've discussed a number of alternatives to my analysis and argued against them on empirical grounds. The constraint that favors shortening in (34a) must be reduplicant-specific; it cannot be a general constraint of the language or a constraint that applies to all affixes. This makes a true GTT analysis of Tonkawa impossible. The main argument here is that within the context of Tonkawa phonology, there is nothing special about RED except that it is limited in size to a light syllable; everything else follows from the interaction of this requirement with the language's prosodic system.

4 The Kager-Hamilton Conundrum

Any theory with templatic or pseudotemplatic constraints makes a prediction that is widely thought to be problematic: under a certain ranking of BR and IO faithfulness with reduplicant-specific constraints, the base will truncate to match the size of the reduplicant, but the size limit is not generally obeyed by non-reduplicative morphemes (McCarthy and Prince 1999). This prediction is illustrated in the following tableau. In this hypothetical language, /pataka/ maps to [pataka] when not reduplicated, but it reduplicates as [pa-pa], not as *[pa-pataka]. The only difference between this language and Tonkawa is the relative ranking of MAX-BR: in Tonkawa, MAX-IO dominates MAX-BR.

(38) Kager-Hamilton Conundrum (templatic backcopying)

		MAX-BR	RED=σ_μ	MAX-IO
/pataka/	a. pataka∼pa			W_{0-4}
/RED=pataka/	b. pa-pa∼pataka-pataka		$W_{0\text{-}1}$	$L_{8\text{-}0}$
	c. pa-pa∼pa-pataka	W_{0-2}		L_{4-0}

The Kager-Hamilton Conundrum is predicted even in theories without templatic constraints like RED=σ_μ, however. The prediction persists if RED=σ_μ is replaced in (38) by OO-DEP, since OO-DEP also prefers *pa-pa* to *pataka-pataka*: the latter introduces more material in the derived form that is not present in the derivational base *pataka*. OO-DEP can therefore have the same effect as templatic constraints, even though it does not expressly legislate the size of affixes (Gouskova 2004a). Similarly, templatic backcopying is predicted by morpheme-specific markedness constraints (Ota 2004, Pater 2006, Flack to appear), which have been with us since Prince and Smolensky's EDGEMOST(*um*: L) ((2004):42-3). Both morpheme-specific markedness and output-output constraints are arguably independently necessary, so eliminating templatic constraints from the theory does not eliminate the prediction.

Whether the Kager-Hamilton Conundrum is a problematic prediction remains to be seen. Tonkawa shortening is argued here to be templatic backcopying: the requirement that the reduplicant be short coupled with BR-identity compels shortening in the base. In fact, the ranking in (30) exactly parallels the Kager-Hamilton ranking, in that a BR-Faithfulness constraint and a reduplicant-specific constraint together dominate IO-Faithfulness.[24] Downing (2000) discusses another possible case of templatic backcopying of the truncating variety: in Hausa, reduplication copies two syllables of the base and truncates the base to two syllables, as in /RED-cakwale/ *cakwal-cakwal* 'slushy.' Downing also argues that Kikuyu has templatic backcopying that is in a way the opposite of Tonkawa, that is, RED is required to be long, and this length is copied to the base. It could be, therefore, that templatic backcopying is not impossible in human languages—it may simply be rare or underrepresented in the currently available sample.

[24]Though, as a reviewer correctly observes, this is not a case of *truncating* templatic backcopying that Kager and Hamilton present.

5 Conclusion

In this paper, I presented a study of reduplication in Tonkawa and argued that it provides evidence for reduplicant-specific constraints. I showed that the Tonkawa reduplicative affix is required to be a light open syllable. This requirement comes about through the interaction of lexically indexed constraints that ban codas, long vowels, and polysyllabicity in RED. The requirements of these constraints are obeyed, even though this introduces configurations otherwise avoided in the language. The resulting light syllable template is also copied by the base, reflecting a strong general preference for base-reduplicant identity.

This evidence does not invalidate the considerable body of work on atemplatic reduplication; it is clear that reduplicant size can sometimes vary under the demands of various non-templatic constraints. It does mean, however, that it is not possible to account for all types of reduplication without some reference to the properties of reduplicative affixes. Lexically indexed constraints have to be a part of phonological theory in order to account for exceptionality and lexical stratification. It is entirely reasonable to expect that in some languages, the reduplicant will be *the* exceptional morpheme, subject to restrictions that do not apply elsewhere. Even though this account makes specific reference to the reduplicative affix, however, it is fully within the spirit of Prosodic Morphology in that it derives the light syllable template from independently necessary principles.

References

Alber, Birgit. 2005. Clash, Lapse and Directionality. *Natural Language and Linguistic Theory* 23:485–542.

Benua, Laura. 1997. Transderivational Identity: Phonological Relations between Words. Doctoral Dissertation, University of Massachusetts, Amherst. Available on the Rutgers Optimality Archive, ROA 259, http://roa.rutgers.edu.

Bermudez-Otero, Ricardo. 2001. Underlyingly nonmoraic coda consonants, faithfulness, and sympathy. University of Manchester. Accessed on 02/02/07 at http://myweb.tiscali.co.uk/bermudez/DEP-mora.pdf.

Campos-Astorkiza, Rebeka. 2004. Faith in moras: A revised approach to prosodic faithfulness. In *Proceedings of NELS 34*, ed. Keir Moulton and Matthew Wolf, 164–174. UMass Amherst: GLSA.

Downing, Laura. 2000. Morphological and prosodic constraints on Kinande verbal reduplication. *Phonology* 17:1–38.

Downing, Laura. 2003. Compounding and tonal non-transfer in Bantu languages. *Phonology* 20.

Downing, Laura. 2006. *Canonical forms in Prosodic Morphology*. Oxford: Oxford University Press.

Fitzgerald, Colleen. 1999. Unfaithful bases and syncope in Tohono O'odham reduplication. Tucson, AZ. The 18th West Coast Conference on Formal Linguistics.

Flack, Kathryn. to appear. Templatic morphology and indexed markedness constraints. *Linguistic Inquiry* 38 (2007).

Fukazawa, Haruka, and Linda Lombardi. 2003. Complex constraints and linguistic typology in Optimality Theory. *The Linguistic Review* 20:195–215.

Gafos, Adamantios. 1998. A-templatic reduplication. *Linguistic Inquiry* 29:515–527.

Gleason, Henry A. 1955. *Workbook in Descriptive Linguistics*. New York: Holt.

Golston, Chris. 1991. Minimal word, minimal affix. In *Proceedings of NELS 21*, ed. T. Sherer, 95–110. Amherst: GLSA Publications.

Gouskova, Maria. 2003. Deriving Economy: Syncope in Optimality Theory. Doctoral Dissertation, University of Massachusetts, Amherst. Available on the Rutgers Optimality Archive, ROA 610, http://roa.rutgers.edu.

Gouskova, Maria. 2004a. Minimal Reduplication as a Paradigm Uniformity Effect. In *Proceedings of WCCFL 23*, ed. B. Schmeiser, V. Chand, A. Kelleher, and A. Rodriguez, 265–278. Somerville, MA: Cascadilla.

Gouskova, Maria. 2004b. Relational hierarchies in Optimality Theory: The Case of Syllable Contact. *Phonology* 21:201–250.

Gouskova, Maria. 2007. Dep: Beyond Epenthesis. *Linguistic Inquiry* 38:4. To appear.

Hartkemeyer, Dale C. 2000. *V: An optimality-theoretic examination of vowel loss phenomena, with special reference to Latin, early Western Romance, and Basque. Doctoral Dissertation, University of Illinois at Urbana-Champaign.

Hayes, Bruce. 1989. Compensatory Lengthening in moraic phonology. *Linguistic Inquiry* 20:253–306.

Hayes, Bruce. 1995. *Metrical Stress Theory: Principles and Case Studies*. Chicago: The University of Chicago Press.

Hicks-Kennard, Catherine. 2004. Copy but don't repeat: the conflict of dissimilation and reduplication in the Tawala durative. *Phonology* 21.

Hoijer, Harry. 1933. Tonkawa. An Indian language of Texas. In *Handbook of American Indian Languages*, ed. Franz Boas and Harry Hoijer, volume Part 3. Gluckstadt; New York: J.J. Augustin.

Hoijer, Harry. 1946. Tonkawa. In *Linguistic Structures of Native America*, ed. Harry Hoijer, L. Bloomfield, Mary Haas, A. Halpern, F.K. Li, Stanley Newman, Morris Swadesh, G.L. Trager, C. Voegelin, and Benjamin L. Whorf. New York: Viking Fund Publications in Anthropology 6.

Hoijer, Harry. 1949. *An analytical dictionary of the Tonkawa language*. Berkeley and Los Angeles: University of California Press.

Inkelas, Sharon, and Cheryl Zoll. 2005. *Reduplication: doubling in morphology*. Cambridge: Cambridge University Press.

Ito, Junko, Yoshihisa Kitagawa, and Armin Mester. 1996. Prosodic faithfulness and correspondence: Evidence from a Japanese Argot. *Journal of East Asian Linguistics* 5:217–294.

Ito, Junko, and Armin Mester. 1999. The phonological lexicon. In *The Handbook of Japanese Linguistics*, ed. Natsuko Tsujimura, 62–100. Oxford: Blackwell.

Kager, Rene. 2001. Rhythmic directionality by positional licensing. University of Potsdam. HILP 5. Available on the Rutgers Optimality Archive, ROA 514, http://roa.rutgers.edu.

Kennedy, Robert. 2005. The binarity effect in Kosraean reduplication. *Phonology* 22:2:145–168.

Kenstowicz, Michael, and Charles Kisseberth. 1979. *Generative Phonology: Description and Theory*. New York: Academic Press.

Kisseberth, Charles. 1970. Vowel elision in Tonkawa and derivational constraints. In *Studies presented to Robert B. Lees by his students*, ed. Jerrold M. Sadock and Anthony L. Vanek, 109–137. Edmonton, AB and Champaign, IL: Linguistic Research.

Levin, Juliette. 1985. A Metrical Theory of Syllabicity. Doctoral Dissertation, MIT, Cambridge, Mass.

Lubowicz, Anna. 2002. Derived Environment Effects in Optimality Theory. *Lingua* 112:243–280.

Marantz, Alec. 1982. Re Reduplication. *Linguistic Inquiry* 13:483–545.

McCarthy, John J. 1981. A prosodic theory of nonconcatenative morphology. *Linguistic Inquiry* 12:373–418.

McCarthy, John J. 1986. OCP Effects: Gemination and antigemination. *Linguistic Inquiry* 17:207–263.

McCarthy, John J. 1999. Sympathy and phonological opacity. *Phonology* 16:331–399.

McCarthy, John J. 2000. Faithfulness and prosodic circumscription. In *Optimality theory: Phonology, syntax, and acquisition*, ed. Joost Dekkers, Frank van der Leeuw, and Jeroen van de Weijer, 151–189. Oxford: Oxford University Press.

McCarthy, John J. 2003a. Comparative Markedness. *Theoretical Linguistics* 29:1–51.

McCarthy, John J. 2003b. OT constraints are categorical. *Phonology* 20:75–138.

McCarthy, John J. 2007. *Hidden Generalizations: Phonological Opacity in Optimality Theory*. London: Equinox.

McCarthy, John J., and Alan Prince. 1986. Prosodic Morphology 1986. Excerpts appear in John Goldsmith, ed., Essential Readings in Phonology. Oxford: Blackwell. Pp. 102-136, 1999.

McCarthy, John J., and Alan Prince. 1993a. Generalized Alignment. In *Yearbook of morphology*, ed. Geert Booij and Jaap van Marle, 79–153. Dordrecht: Kluwer. Excerpts appear in John Goldsmith, ed., Essential Readings in Phonology. Oxford: Blackwell. Pp. 102?136, 1999.

McCarthy, John J., and Alan Prince. 1993b. *Prosodic morphology I: Constraint interaction and satisfaction*. New Brunswick: Rutgers University Center for Cognitive Science. To appear, MIT Press, Cambridge, Mass. Available on the Rutgers Optimality Archive, ROA 482, http://roa.rutgers.edu.

McCarthy, John J., and Alan Prince. 1994a. The emergence of the unmarked: Optimality in prosodic morphology. In *Proceedings of the North East Linguistic Society 24*, ed. Merce Gonzalez, 333–379. Amherst, Mass.: GLSA Publications.

McCarthy, John J., and Alan Prince. 1994b. Two lectures on Prosodic Morphology (Utrecht, 1994). Part I: Template form in Prosodic Morphology. Part II: Faithfulness and reduplicative identity. Available on the Rutgers Optimality Archive, ROA 59.

McCarthy, John J., and Alan Prince. 1995. Faithfulness and Reduplicative Identity. In *University of Massachusetts Occasional Papers in Linguistics 18*, ed. Jill Beckman, Laura Walsh Dickey, and Suzanne Urbanczyk, 249–384. Amherst, Mass.: GLSA Publications.

McCarthy, John J., and Alan Prince. 1999. Faithfulness and identity in Prosodic Morphology. In *The prosody-morphology interface*, ed. Rene Kager, Harry van der Hulst, and Wim Zonneveld, 218–309. Cambridge: Cambridge University Press.

McCarthy, John J., and Matthew Wolf. 2005. Less than zero: Correspondence and the Null Output. Ms. Available on the Rutgers Optimality Archive, ROA 722, http://roa.rutgers.edu.

Mellander, Evan. 2003. (HL)-creating processes in a theory of foot structure. *The Linguistic Review* 20:243–280.

Morén, Bruce. 1999. Distinctiveness, Coercion and Sonority: A Unified Theory of Weight. Doctoral Dissertation, University of Maryland, College Park, MD.

Nivens, Richard. 1993. Reduplication in Four Dialects of West Tarangan. *Oceanic Linguistics* 32:358–388.

Ota, Mitsuhiko. 2004. The learnability of the stratified phonological lexicon. *Journal of Japanese Linguistics* 20:19–40.

Pater, Joe. 2000. Nonuniformity in English secondary stress: The role of ranked and lexically specific constraints. *Phonology* 17:237–274.

Pater, Joe. 2006. The locus of exceptionality: Morpheme-specific phonology as constraint indexation. In *Papers in Optimality Theory III*, ed. L. Bateman, M. O'Keefe, E. Reilly, and A. Werle, 259–296. Amherst, MA: GLSA.

Phelps, Elaine. 1973. Tonkawa, Sundanese, and Kasem—Some problems in Generative Phonology. Doctoral Dissertation, University of Washington.

Phelps, Elaine. 1975. Iteration and disjunctive domains in phonology. *Linguistic Analysis* 1:137–172.

Prince, Alan. 1990. Quantitative consequences of rhythmic organization. In *Parasession on the syllable in phonetics and phonology*, ed. M. Ziolkowski, M. Noske, and K. Deaton, 355–398. Chicago: Chicago Linguistic Society.

Prince, Alan. 2002. Arguing optimality. In *University of massachusetts occasional papers in linguistics: Papers in optimality theory ii*, ed. Andries Coetzee, Angela Carpenter, and Paul de Lacy. UMass Amherst: GLSA. Available on the Rugers Optimality Archive, ROA 562.

Prince, Alan, and Paul Smolensky. 2004. *Optimality Theory: Constraint interaction in generative grammar*. Malden, Mass., and Oxford, UK: Blackwell. Published version of Prince and Smolensky (1993), ROA-537.

Rice, Curtis. 1992. Binarity and Ternarity in Metrical Theory: Parametric Extensions. Doctoral Dissertation, University of Texas, Austin.

Rosenthall, Sam. 1994. Vowel/Glide Alternation in a Theory of Constraint Interaction. Doctoral Dissertation, University of Massachusetts, Amherst.

Rosenthall, Sam, and Harry van der Hulst. 1999. Weight-by-position by position. *Natural Language and Linguistic Theory* 17:499–540.

Spaelti, Philip. 1997. Dimensions of Variation in Multi-Pattern Reduplication. Doctoral Dissertation, University of California, Santa Cruz.

Steriade, Donca. 1988. Reduplication and syllable transfer in Sanskrit and elsewhere. *Phonology* 5:73–155.

Urbanczyk, Suzanne. 2006. Reduplicative Form and the Root-Affix Asymmetry. *Natural Language and Linguistic Theory* 24:179–240.

Walker, Rachel. 1998. Minimizing RED: Nasal Copy in Mbe. Ms. Available on the Rutgers Optimality Archive, ROA 264, http://roa.rutgers.edu.

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

Walker, Rachel. 2002. Yuhup prosodic morphology and a case of augmentation. In *The proceedings of NELS 23*, ed. Mako Hirotani, 551–562. Amherst, MA: GLSA.

Wilbur, Ronnie. 1973. The Phonology of Reduplication. Doctoral Dissertation, University of Illinois.

Yip, Moira. 1998. Identity avoidance in phonology and morphology. In *Morphology and its relation to phonology and syntax*, ed. Steven G. Lapointe, Diane K. Brentari, and Patrick M. Farrell, 216–246. Stanford, CA: CSLI Publications.

Yu, Alan. 2005. Quantity, stress and reduplication in Washo. *Phonology* 22:437–475.

Zoll, Cheryl. 1993. Directionless syllabification and ghosts in Yawelmani. Ms. Available on the Rutgers Optimality Archive, ROA 28, http://roa.rutgers.edu.