CHAPTER 2

BASE CONSTRUCTION AND LEFT EDGE REDUPLICATION

2.1 Introduction

As argued in Chapter 1, the observed asymmetry regarding left edge correspondence in reduplication and truncation falls from an asymmetry in the constraints themselves, stemming from the general theory of Positional Faithfulness. That is, as only privileged positions are targeted, only such positions will be preserved. Thus there is a left edge base-reduplicant correspondence constraint (LEFT-ANCHOR), and no parallel constraint calling for preservation of the right edge of the base. The question that this chapter explores is: given the priority of the left edge, how do we account for cases in which the segment targeted for copying is close to, but not coextensive with, the left edge of the root? Moreover, how do we limit the target to elements 'near the left edge'? Finally, if lexical access is central to the importance of left edge correspondence between base and reduplicant, then how can 'close to the left edge' be sufficient?

This chapter addresses each of these questions, while building an account of the typology of left edge copying. In looking closely at this typology, it becomes evident that the base of affixation must be redefined. One of the psycholinguistically prominent positions noted by Beckman is the root. There is a conspicuous cross-linguistic preference for copying root material; Urbanczyk (1996) and Spaelti (1997) observe a strong tendency, if not outright requirement, that at least some of the reduplicant's material come from the root, largely ignoring affixes. Certain patterns are observed that suggest McCarthy & Prince's (1993a) proposal, that the base is the 'string adjacent to the reduplicant in the output', although appealing in its simplicity, is not sufficiently restrictive. This chapter further develops the claim that partial reduplication is driven by positional faithfulness. The tendency for RED's content to be drawn from the root serves as the guiding intuition for this chapter. The proposal advocated here, which draws in part from earlier work by Downing (1998a,b) is: the base is by default the root, and can deviate from this only under limited conditions.

Empirically, it appears that if the left edge of the base is anything other than the left edge of the root, then it will be one of the following:

(1) Left edge of base[1]

a. The first syllable that *begins with* root material (e.g. *sam* in *n-osampi* 'ask'; Axininca Campa).

b. The first syllable that *contains* root material (e.g. *sik* in *s-ikuk; *kuk* 'chop, hack'; Chumash).[2]

c. The nearest syllable edge that constitutes the 'minimal base' edge (e.g. *no* in *no-na* 'chew', Axininca Campa).

d. The leftmost edge of an affix that must be targeted for independent syntactic or semantic reasons (e.g. *ma* in *<u>má</u>-ma-gimen*; Chamorro nominalizing reduplication, 'drinkable', from passive *ma-gimen* 'be drunk').

e. The leftmost onset of an optimized prosodic constituent (e.g. optimal prosodic word, which is a disyllabic foot in Samoan, e.g. *fa-na-náu*).

If this list is indeed exhaustive, then it is important to note what is left out. We cannot, for example, target the leftmost *coronal*, the leftmost *low vowel*, etc. I will leave aside for the moment the cases involving appeal to the minimal base (§2.3.1), reduplication of a specific affix (§2.3.2), or optimal prosodic word (Chapter 3), as these involve deviation

[1] See §2.4 for additional discussion, and references.
[2] In all probability, this should be further restricted to the first *vowel* of the root; this issue discussed in §2.6.3.

from the default case where the root is still driving the determination of the base. We are then limited to (1a-b). I will refer to these cases as 'minimal displacement' cases. These involve elements that are still the leftmost *something*, namely leftmost: root segment (default), root onset (1a), or onset of a syllable bearing a root segment (1b).

Only structural considerations can force the base to deviate from left root edge material. This restriction is achieved through a fixed ranking in which root-base faithfulness dominates all featural markedness. The details are explained in section 2.4; a comparison with Downing's system occurs in section 2.6. Finally, an example from Bella Coola illustrates the proposal at work (§2.7).

How does this pliable left edge affect the claim that lexical access drives the underlying bias toward left-edge anchoring? The results of allowing for base expansion and shrinkage relative to the root edge are non-trivial with respect to the proposed left-edge preference for anchoring. These assumptions imply that now in addition to the leftmost root segment, other leftmost positions within the base (namely those described in (1a-b)) are salient. The importance of the first onset of a word could indeed be proven with 'tip of the tongue' (TOT) experiments, which would require in this case inducing a TOT state with V-initial words, and investigating whether the first onset was helpful in terms of bringing the subject out of this state, e.g. *n* in *a<u>n</u>imal*. The proposal then would be that this output base has psychological reality, to the extent that it can play a role in lexical access. The privileged position argument then goes through, even in cases of imperfect left edge correspondence. This proposal adds a layer of complexity to the computation, and thus must be adequately supported. I assume that the base is assigned by GEN, and ultimately decided by the constraints. The remainder of this chapter aims to provide the needed support for a dynamically assigned base.

2.2 The importance of the left edge

Hawkins and Cutler (1988) give evidence for the importance of the beginnings of mono-morphemic words, which are essentially stems:

(2) Word left edge salience

a. The beginning portions are the most effective cues for successful recall or recognition of a word.

b. The effects of distorting the beginning of a word are much more severe than the effects of distorting later portions, for the purpose of word recognition.

c. In a 'tip-of-the-tongue' (TOT) state, the most effective cue for bringing a person *out* of a TOT state is to provide or confirm the word onset.[3]

In addition to these findings, they also note that just over 0% of O(bject)-V(erb) languages in four different surveys (two out of just under 345 languages)[4] have exclusive prefixing of fixed segment prefixes, which is striking. Their main claim is that heads are identically ordered with respect to their modifiers, with the addition of psycholinguistic effects. The main force at play then is the importance of early access of the root. So languages with VO and/or Preposition + Noun Phrase word order in their syntax regularly have either prefixes and/or suffixes in their morphology. But in a large number of cases, languages with OV and/or Noun + Postposition have *suffixes only*.

[3] It is unfortunate that no data with V-initial roots is discussed.
[4] The four surveys include a total of 345 languages, however Hawkins and Cutler note that a small number of languages belong to more than one of these samples.

A reduplicative morpheme on the other hand will not impede root access, or only minimally will, no matter where it is placed.[5] By targeting initial position in partial reduplication, then the presence of the affix is indicated as early as possible in word retrieval.

These and other properties of the left edge are shown to be more relevant than either the word middle or end. [6],[7] More generally, Beckman (1998:1) notes that “positions which are psycholinguistically prominent are those which bear the heaviest burden of lexical storage, lexical access and retrieval, and processing”.

2.3 Base of reduplication as root with possible structural optimization of output

The observation that root material is generally preferred for the purpose of reduplication has been parlayed into constraints that require the reduplicant to contain such material, as with RED ≤ Root (McCarthy & Prince 1993a, 1994, 1995, Urbanczyk 2000), RED = Root (Futagi 1998). This is the tradeoff required by allowing the *base* to

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[5] This argument is presumed to include cases involving neutralization of some type of markedness, for example simplification of onset clusters, as in Tagalog reduplication to mark the recent perfective (McCarthy & Prince 1996 and references therein): (*ka*)-*ta-trabaho* ‘just finished working’, (*ka*)-*bo-bloat* ‘just gave a special treat’, etc. Aspectual reduplication in Tübatulabal (Alderete et al. 1999, and references therein) shows consonant neutralization to glottal stop: *tumuːga* → *ʔun-dumuːga* ‘to dream’; *ʃiʔɨwɨ* → *ʔi-ʃiʔɨwɨ* ‘it looks different’, etc. Vowel neutralization in Igboo reduplication (Alderete et al. and references therein is slightly more complicated in that neutralization is not always to a single unmarked vowel. However, the reduplicant’s vowel is always high, depending on what the corresponding base vowel is (high vowels are copied exactly, e.g. *ti-ti* ‘cracking’, *mu-mu* ‘learning’); otherwise, the initial consonant conditions the RED vowel, with labial/palatal attraction (e.g. *cɪ-cɔ* ‘seeking’, *bu-be* ‘cutting’), or else rounding harmony with the base vowel occurs (e.g. *ki-ke* ‘sharing’, *nu-no* ‘swallowing’). The claim is that once the reduplicant and the corresponding portion of the base are uttered, then a simplified base can be correctly reconstructed. For example, upon hearing *ta-tra*…, the cluster neutralization in the reduplicant is undone, for the purposes of lexical access.

[6] The left/right asymmetry studied by Casali (1997:496) (see Chapter 1 §1.4.4) also lends support to the prominence of initial material: at the boundary between two lexical words, elision is always of the *first* vowel in a …V+V… context.

[7] For the sake of word retrieval at least, Hawkins and Cutler do cite a study that found that the word end is more salient than word middles.

be defined, as mentioned above, as merely the 'string adjacent to the reduplicant in the output' (McCarthy & Prince 1993a).

Of concern here are the minimal displacement cases where the edge of the base for copying is not consistent with the left edge of the root. Two questions must be answered for each example. First, what compels departure from the left edge of the root? Also, in what way does the base in the optimal candidate violate left edge correspondence to the root? There is a limit to the types of constraints that may cause displacement of the base edge. There is overwhelming evidence that it must be a structural constraint, such as ONSET (which requires that syllables have onsets), or *COMPLEX (which bans complex onsets); featural markedness is not sufficient. In order to satisfy the appropriate markedness constraints, the copying will begin at the onset immediately to the left or the right of the stem edge, as determined by the constraint ranking.

The system is illustrated here using examples where ONSET plays the compelling role, forcing base displacement. Examples of each kind of mis-alignment that we find are given below; (the root is italicized; the base according to the proposed analysis is in parentheses):

(3) Base manipulation to satisfy ONSET

a. Mokilese

wad-(*wadek*)	base = root, by default	/RED, wadek/

b. Ineseño Chumash

sik-(s-*ikuk*)	base *expansion*	/RED, s+ikuk/

c. Axininca Campa

n-*o*(*sampi*)-sampi	base *shrinkage*	/RED, n+osampi/

In (3b-c), ONSET dominates the constraints that otherwise lead to exact root/base correspondence. As first proposed by Downing (1998a,b), these are faithfulness constraints between the root and the base:[8]

(4) Faithfulness constraints determine base content

a. MAX$_{\text{Root-Base}}$ (MAX-RtB): Each segment in the root must have a correspondent in the base. (No deletion)

b. DEP$_{\text{Root-Base}}$ (DEP-RtB): Each segment in the base must have a correspondent in the root. (No insertion)

The constraint in (4a) has the effect of preferring *expansion* of the base under compelled violation. (4b), alternatively, prefers base *shrinkage* from the left edge of the root. Examples are given below:

(5) Base expansion: MAX(RtB), ONSET >> DEP(RtB)

/RED, s-ikuk/	MAX$_{\text{RT–BASE}}$	ONSET	DEP$_{\text{RT-BASE}}$
a. ☞sik-(s-*ikuk*)$_B$			*
b. s-ik-(.*ikuk*)$_B$		*	
c. s-*i*-kuk-(*kuk*)$_B$	*		

(6) Base shrinkage: DEP(RtB), ONSET >> MAX(RtB)

/RED, n-osampi/	DEP$_{\text{RT-BASE}}$	ONSET	MAX$_{\text{RT-BASE}}$
a. ☞n-*o*(*sampi*)$_B$ -sampi			*
b. (n-*osampi*)$_B$ -nosampi	*		
c. n-(*osampi*)$_B$ -osampi		*	

In the default situation, the Root-Base faithfulness constraints are ranked high, forcing perfect mapping from root to base. In the cases studied in this chapter however, we see minimal, compelled violation.

[8] These are identical in function but not in name to the constraints proposed by Downing. Her proposal is outlined in §2.6. Numerous other assumptions made here differ from those made in her proposal.

2.4 Reduplication of affixes

2.4.1 Satisfying prosodic minimality

In some cases of affix copying, the affix is only included in the base when a minimality requirement is imposed. For patterns like this, the default case still involves copying of the left edge of the root. It is only when the base is sub-minimal that shifting of the base edge will occur. The minimality requirement is imposed in fact on the *reduplicant*, by means of the Emergence of the Unmarked (TETU), McCarthy & Prince 1994. We see from the total reduplication of the Axininca Campa example *kawosi* that it is only minimality, and not concomitant maximality, that is imposed. Examples where the base is expanded in order to supply the minimal material for RED are given below (once again, the root is in italics; the base is in parentheses).

(7) MINIMALITY compels expansion of base

a. Axininca Campa (Spring 1990, McCarthy & Prince 1993, Downing 1998a)[9]

'long root' ≥ σσ

word	reduplicated form	stem	base
koma	no-(*koma*)-<u>koma</u> (*nokoma-nokoma)	/koma/	koma
kawosi	no-(*kawosi*)-<u>kawosi</u>	/kawosi/	kawosi

'Short roots' ≤ σ

word	reduplicated form	stem	base
no-na	(no*na*)-<u>nona</u>	/na/	nona
no-wa	(no*wa*)-<u>nowa</u>	/p/	nowa

[9] Reduplication indicates 'VERB more and more'. The glosses for these verbs are: *paddle, bathe, chew*, and *give*.

b. Kinande[10] (Mutaka & Hyman 1990)[11]

stem = *σσ*

o-mú-twe	o-mútwé-(mú*twe*)	/twe/	mútwe
a-ká-tì	a-kátí-(ká*tì*)	/tì/	kátì

stem = *σ*

e-∅-swa[12]	e-swa-(swa-*swa*)[13]	/swa/	swaswa

In the Axininca Campa example, reduplication appears to be total, with copying of the root (7a). However, when the root is sub-minimal (i.e. smaller than two syllables), then the prefix will be included in the base for copying. My analysis for this augmentation follows.

The observation that the prosodic word plays a crucial role in this pattern is due to Spring (1990), whose analysis required the base to be a (maximal) prosodic word. This too is the effect of McCarthy & Prince's (1993b) SUFFIX-TO-PROSODIC-WORD, which required the left edge of the suffix to align to the right edge of a prosodic word. This constraint is discussed more below.

Here, I claim the *reduplicant* must be a prosodic word; in the context of the general prosodic requirements of Axininca Campa, this means that it must be disyllabic.[14] The constraint that I propose then is 'RED = PROSODIC WORD'. This constraint is flawed, as it predicts back-copying of the type discussed in McCarthy & Prince (1999); the

[10] Expansion can be compelled for additional reasons in Kinande; onset maximization is also witnessed, as é-m-buli → é-mbulí-(m*buli*), 'sheep' shows.
[11] Glosses are: *head, stick,* and *cabbage*.
[12] The symbol '∅' indicates a null prefix; the *e* here is an augment. Augments never reduplicate; Mutaka and Hyman (1990) take this to be evidence that reduplication takes place at a stage when the augment is not present. A further complication however is that although the augment may never be copied in noun reduplication in Kinande, it must be present on (or preceding) the noun in order for reduplication to take place at all. It is unknown whether this is for structural or semantic reasons.
[13] I assume in this case that the second *swa* corresponds to both RED and the base, in violation of BR-INTEGRITY (cf. de Lacy 1999 for discussion of this sort of haplology).
[14] McCarthy & Prince (1995) entertain and reject such a possibility.

problem has been dubbed the 'Hamilton Kager Conundrum'. By naming the template in the constraint, a typological prediction is that the template can be *back-copied* onto the base. That is, in a language where the base is smaller than a prosodic word, prosodic word requirement can be imposed on the base by virtue of RED = PrWd and highly ranked base-reduplicant faithfulness, MAX-BR. However, if we admit the constraint for the sake of argument, then the rest of the analysis is fairly straightforward: RED = PrWd dominates the constraint that otherwise requires faithful mapping between the root and the base (DEP-RTB).

(8)

	RED = PRWD	DEP-RtB
a. ☞(no*na*) B - [nona] PrWd		**
b. no(*na*) B - na	*!	

The base is compelled to encompass the prefix only when it would otherwise not contain enough for RED to copy an entire prosodic word. Once the root is disyllabic, the prefix once again ceases to copy.[15]

(9)

	RED = PrWd	DEP-RtB
a. ☞no-(*kawosi*) B -kawosi		
b. (no-*kawosi*) B -nokawosi		*!*

The preference for root copying, all other things being equal, is achieved in McCarthy & Prince's (1993a) analysis with their constraint RED ≤ Root.

[15] An example of reduplication that may optionally include prefixes may be found in a dialect of Axininca Campa, 'Axininca 2' (Spring 1990:118). Apparently, roots two syllables or longer may optionally include the prefix in the base of reduplication, e.g. /koma/ *no-(*koma*)-koma-waitsi* ~ *(no-*koma*)-no-koma-waitsi* 'paddle/paddle more and more'. However, Spring notes some hesitancy on the part of the informant regarding reduplicated forms.

McCarthy & Prince account for the augmentation of the base in part by positing a constraint that requires the base of suffixation to be a prosodic word, 'SUFFIX-TO-PROSODIC WORD'. Both fixed segment suffixes (e.g. *piro* in *naTA-piro*) and reduplicative suffixes require that the base augment, which is captured by this constraint. The above analysis, using a reduplication-specific constraint, fails to capture this generalization. However, SUFFIX-TO-PROSODIC WORD, which is represented in the Generalized Alignment scheme as ALIGN (Suffix, L, PrWd, R) has suffered some criticism. First, Spaelti (1997), while not addressing the Axininca Campa case in particular, claims that opposite-edge alignment constraints like this one, which aligns the left edge of the suffix to the right edge of the prosodic word, are excluded in principle. He cites the problem of comparing violations of under- vs. over-shooting the desired alignment configuration, as he illustrates in the diagram below.

(10) Mis-alignment of opposite-edge aligned constituents

This problem of comparing violations may not be insurmountable,[16] but there is a second problem. Once violation of this constraint is compelled, one possible solution is to *delete* the second, argument of the constraint, thus the internal prosodic word, altogether. This

[16] For example, we could conceivably construct two separate constraints: one for the case of overlap, another for when alignment falls short of the target.

option is illustrated in the tableau below (the tableau is taken directly from McCarthy & Prince, and is in Containment Theory, (Prince & Smolensky 1993)).

(11) Constraints:

ONSET: Syllables must have onsets.
FOOT BINARITY (FTBIN): Feet must be binary under syllabic or moraic analysis.
FILL: Do not insert structure.

(12) V-initial Suffixation /na+aanc^h^i/

	ONSET	FTBIN	SFX-TO-PRWD	FILL
a. na].| aanc^h^i	*!	*!		
b. naTA].| aanc^h^i	*!			**
c. na.| aanc^h^i]	*!		*	
d. naTA].T| aanc^h^i			*	***!
e. ☞na.T| aanc^h^i]			<u>*</u>	*

The underlined violation of SFX-TO-PRWD should be compared to the violation of candidate (12d) on the same constraint. These violations must be identical for the sake of the analysis (so that the decision can be passed on to FILL; we know that FILL is ranked lower because augmentation occurs with C-initial suffixes, e.g. *naTA-piro*). Thus, I argue that RED = PrWd avoids this problem of distance vs. existence.

2.4.2 Additional cases of compelled affix copying

If the reduplicant were able to be positioned by a constraint like LEFTMOSTNESS (McCarthy & Prince 1993), then typologically, we would expect to find cases where the reduplicant would seek out the left edge of the word, regardless of the morphological identity of the material directly to its right. Given the overwhelming tendency for RED to copy root material, this prediction does not appear to be correct.

The constraints thus far predict that any copying of affixes must be compelled. This section presents some examples where reduplication of affixes occurs.[17]

2.4.2.1 Tagalog

In some cases, it appears that the stem is at least optionally the base for reduplication, as variation can be found in the output. No meaning difference appears to result from the affix movement. Thus, the placement of the reduplicant is clearly dependent on the structure of the base. The examples of this type of variation can be found in Tagalog (Carrier-Duncan 1984, Martin 2002), and in Choctaw (Lombardi & McCarthy 1991).

The Tagalog case involves the addition of a topic-marking (TM) affix. A TM affix on a verb indicates the role played by the NP marked by the particle *ang*; all Tagalog sentences contain an *ang*-marked NP. The TM itself can be reduplicated only if it is not word-initial. Alternatively, the left edge of the root may also reduplicate. All options have exactly the same meaning, i.e. 'contemplated' (unrealized) and imperfective aspects.

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[17] Wolio (Uhrbach 1987, Anceaux 1987) may provide a case to challenge the claim made here, as the source of the compelling force is not clear. Uhrbach cites Wolio as a case where the base for reduplication is the full word, including any affixes: e.g. */RED, ma+puti/* → *mapu-maputi* 'whitish'; */RED, po+pa+lala/* → *popa-popalala* 'give each other opportunities'. Uhrbach explains that unfortunately further details concerning the glosses were not available in the text she consulted. Anceaux (1987) is a Wolio-English dictionary. However, the additional illumination provided here remains dim; *ma-* is an 'intransitive verbal prefix', *po-* is a 'verbal prefix', and *pa-* is a 'verbal prefix for causatives'. The data are duly noted as potential counter-examples, however, until more can be uncovered regarding their glosses and productivity, I set them aside for the time being.

(13) ma + ʔi + pag + bigay
potentative (ability) Topic marker Transitivity marker give

'happen to be given'

a. ma+**ʔi**+pag+bigay → ma+ ʔiː -ʔi+pag+bigay

b. ma+ʔi+**pag**+bigay → ma+ʔi+ paː -pag+bigay

c. ma+ʔi+pag+**bi**gay → ma+ʔi+pag+ biː -bigay

'will happen to be given'

In spite of the fact that the reduplicant has alternative locations, Carrier notes that it may occur only once in a word. What is of interest in the context of the discussion is that the left edge of the root constitutes one of the possible base edges for anchoring.

2.4.2.2 Balangao

The case of Balangao is similar. Continuous aspect reduplication can apply to a root or to a stem (Lombardi & McCarthy 1991:60). In Lombardi & McCarthy's analysis, a gemination rule makes the first mora of the stem extraprosodic. The output varies depending on whether gemination occurs before or after prefixation.

(14) Two possible derivations for *dakál* 'make bigger'

	a.		b.	
	Root:	dakál	Root:	dakál
	Base:	(da)kál	Prefixation:	padakál
	Prefix μ:	μ + kal	Base:	(pa)dakál
	Spread:	kkal	Prefix μ:	μ + dakal
	Concatenate:	dakkál	Spread:	ddakal
	Reduplication:[18]	dadadakkál	Concatenate:	paddakal
	Prefixation:	padadadakkál	Reduplication:	papapaddakal
	Prefixation:	ʔepadadadakkál	Prefixation:	ʔepapapaddakal
	'continuously make bigger'		'continuously make bigger'	

Here again, no meaning change results in the placement of the affix in the two possible positions within the stem.

Although these cases seem to provide a counter-example to the claim that prefixes do not copy, note that in each case the root-initial syllable is still one of the possibilities. This is a thorn in the side of the claim that affixes cannot be included in the base for copying unless compelled for structural or semantic reasons (see below); they must be considered as research in base left edges continues.

2.4.2.3 Chamorro

One case that poses less of a problem however is when a particular affix is targeted for copying. One example comes from Chamorro (Topping 1973:258). In the relevant pattern, when verbs containing the passive prefix *ma* are nominalized through reduplication, then it is the passive marker, and not the left edge of the root, which serves as the left edge of the base:

[18] The light syllable reduplicant is optionally repeated.

(15) Nominalizing reduplication

Root		*Root + Passive*		*Reduplicated form*	
kannoʔ	'eat'	ma+kannoʔ	'be eaten'	má+makannoʔ	'edible'
gimen	'drink'	ma+gimen	'be drunk'	má+magimen	'drinkable'
chupa	'smoke'	ma+chupa	'be smoked'	má+machupa	'smokeable'
tugeʔ	'write'	ma+tugeʔ	'be written'	má+matugeʔ	'writeable'
taitai	'read'	ma+taitai	'be read'	má+mataitai	'readable'

For reasons that are admittedly not altogether clear, reduplication targets the passive prefix specifically. I assume that this requirement overrides the otherwise default situation in which the root and base are in correspondence, and it is thus the prefix itself that is ‘privileged’ for the purpose of this process.

2.5 Constraining base movement

Although the proposal entails that perfect alignment of the base and root is violable, this violation must be constrained to keep it from extending or shrinking in unattested and implausible ways. As mentioned in the beginning of this chapter, the limit for expansion appears to be the syllable to which the root-initial segment belongs; the limit for shrinkage seems to be the first onset of the root. A common problem for systems of RED placement (McCarthy & Prince 1993b *et seq*., as well as Downing 1998a,b, Kim to appear) is avoiding the prediction that RED copy material too far inward, thus shrinking the base excessively, in order to avoid additional violation of a given constraint. For example, when ALIGN-L (RED, Stem) pulls RED leftward, this has the desired base-maximizing effect.

(16) Left-aligned RED

/RED, badupi/	*VELAR	ALIGN-L(RED, Stem)
a. ☞ba-badupi		
b. ba-du-dupi		*!*
c. badupi-pi		*!*****

In the above tableau, things are as we would expect; RED appears at the left edge of the word and the base is maximized. However, markedness of the place feature *velar* leads to an unattested type of infixation in the following example:

(17) Emergent velar markedness: *VELAR >> ALIGN-L(RED, Stem)

/RED, kanumi/	IDENT-BR	*VELAR	ALIGN-L(RED, Stem)
a. ka-kanumi		**!	
b. ❽ ka-nu-numi		*	**
c. kanumi-mi		*	***!***
d. t_1a-$k_1$anumi	*!	*	

Although the over-eager RED infixation is illustrated here using a RED-alignment constraint, the problem is one that exists for root expansion (Kim to appear) and base optimization (Downing 1998a,b) as well. Below, I illustrate the possibility that *VELAR could force base contraction.

(18) Emergent velar markedness: *VELAR >> MAX(Rt,B)

/RED, kanumi/	*VELAR	LEFT-ANCHOR	MAX(Rt,B)
a. ka-(*kanumi*)$_B$	**!		
b. ❽ ka-*nu*-(numi)$_B$	*		**
c. (*kanumi*)$_B$ -mi	*	*!	

LEFT-ANCHOR can be satisfied regardless of the content of the base (18a,b). Given that *VELAR is ranked highly enough to abbreviate base content here, the infixing candidate (18b) is the unlikely winner.

This problem is related to the longstanding puzzle in the IO realm: why is featural markedness typically resolved by simplification, but not outright deletion? This lack of root-base deletion for featural markedness gain is striking, given that it holds even in languages where certain types of markedness-generated shrinkage are tolerated.

A tentative solution to this recalcitrant problem is to impose a fixed ranking of constraints: MAX-RtB >> Featural Markedness. (This ranking however simply encodes the observation.)

(19) Universal fixed ranking I: inhibits unwarranted base expansion or shrinkage
MAX-RtB >> Featural Markedness

With such a ranking in place, a candidate such as (18b) could never be optimal.[19] Only structural constraints, such as ONSET, could appear high enough in the hierarchy to force this behavior.

Base-reduplicant faithfulness constraints need to be subdued as well. There are two ways to satisfy base-reduplicant maximization (i.e. MAX-BASE REDUPLICANT, (MAX-BR)). One is by total reduplication. The other is by infixing to a smaller base (cf. Spaelti 1997). ALL-σ-LEFT functions here as a minimizer, penalizing each syllable not aligned to the left edge of a prosodic word (Ito & Mester 1997). Both strategies are illustrated below.

(20) Total reduplication

/RED, badupi/	MAX-BR	ALIGN-L (RED, Stem)	ALL-σ- LEFT
a. ☞badupi-(*badupi*)$_B$			*****
b. ba-(*badupi*)$_B$	d!upi		***
c. *badu*-pi-(*pi*)$_B$		*!***	

[19] Given the architecture of constraint hierarchies, there is the possibility that a constraint 'C', highly ranked, could force violation of MAX-RtB, and then an infixing candidate could emerge. However, I do not foresee any such constraint arising.

(21) Infixing to a smaller base

/RED, badupi/	MAX-BR	ALL-σ- LEFT	ALIGN-LEFT (RED, Stem)
a. badupi-(*badupi*) B		*****!	
b. ba-(*badupi*) B	d!upi	***	
c. ☞*badu*-pi-(*pi*) B		***	****

I assume that MAX-BR cannot compel infixation of the sort seen in candidate (20c, 21c). There are no clear cases in the literature that require this type of exploitation of MAX-BR. Furthermore, for theory-internal reasons, it would be problematic to allow apparent right-edge copying in a case such as this, which is independent of all other qualities of the language (most notably for the discussion here, stress). The winning candidate in (21) would effectively target right edge material. Rather than allow for this type of analysis for apparent right-anchored cases, I eliminate the possibility of this kind of winner generally, by positing another fixed ranking: MAX-RtB >> MAX-BR.

(22) Universal fixed ranking II: inhibits unwarranted base shrinkage
MAX-RtB >> MAX BASE-REDUPLICANT

By ruling out the typological possibility that right-edge material can form the base for the sole purpose of MAX-BR satisfaction, another result is that reduplicative copying will necessarily be achieved only by active targeting of a privileged position, by means of a Positional Anchoring constraint.[20]

In addition to ruling out *badu-pi-(pi)*, where the base has shrunk in order to satisfy MAX-BR, the system also rules out the gratuitous shrinking of the base in the other direction, e.g. *ba-(ba)dupi*. This base-shrinking candidate will always lose out to the base-maximized *ba-(badupi)*.

[20] This assertion is slightly overly optimistic. See appendix B of Chapter 1 for a case in which HEAD-MATCH BR alone seems to condition the position of RED.

2.6 What is in a base?

The study of what exactly constitutes the base for reduplication is still an unresolved issue in the literature.[21] Earlier work has isolated morphological and prosodic constituents as possible bases (Broselow & McCarthy 1983, McCarthy & Prince 1996). Later work in terms of Optimality Theory characterized the base as the string adjacent to the reduplicant in the output, with no direct conditions on what the base may be (McCarthy & Prince 1993b, Urbanczyk 2000). Giving the notion such a general character allows for maximum results to come from constraint interaction as opposed to having special requirements made by the constraints themselves. Markedness conditions and BR-Faithfulness then determine what ultimately will copy. A third proposal (Downing 1998a,b) claims that the base is optimized on the surface, in terms of satisfaction of a structural constraint at the periphery of the base. My proposal incorporates all of the above proposals.

In the account proposed here, as we have seen, the base is a malleable string drawn from the root or stem. Optimization does not target the base; it may only evaluate the form as a whole with respect to a given markedness constraint. Moreover, as discussed in §2.3, only structural markedness constraints can have the effect of shifting

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[21] In addition to the systems outlined here, I have found two isolated examples in the literature of direct appeal to the base shape/content. These examples occur without any discussion of the reference to the base shape within the constraint. Spaelti (1997:141, 155) proposes for Oykangand the constraint: ALIGN-EDGE (Base, PrWd), which crucially requires the left edge of the base to coincide with the left edge of a prosodic word. One problem with this constraint: when it is threatened to be violated, e.g. in *i.yal$_{PrWd}$[mal.mey]*, the best solution is to delete the prosodic word, in order to get rid of the alignment violation, (thus*, i.yal.m- e.y-ey*, by his constraint ranking). Ola (1995:80) also appeals to the base within an alignment constraint in her account of the optimality of V-initial reduplicant/base in Owon Afa distributive reduplication, e.g. *bàtà* (which is in variation with *ıbàtà*) → *ıbı-ıbàtà* ‘every shoe’: ALIGN-L (Base, L; Nucμ, L), ‘the base must begin with a V’. This constraint however overlooks the fact that the canonical Benue Congo noun shape is *VCV*; clearly, such a constraint could do much damage to the typology, contravening TETU of onsetless syllables in a language without such an independent requirement for vowel-initial morphemes. If a general markedness constraint $*\#V_{Noun}$ is active in the language, then one possible solution would be to locally self conjoin (Smolensky 1995) $*\#V_{Noun}$ & $*\#V_{Noun}$ in the domain of the word.

the edges of the base. Thus, 'global structural markedness', i.e. structural markedness that evaluates the output form as a whole, is the only force that can cause displacement of the base left edge from the left edge of the root.

The theories to be compared are briefly outlined here. First, there is the Morphological Constituent Hypothesis (MCH). (Broselow & McCarthy 1983, McCarthy & Prince 1996). Under this hypothesis, the base is the root. This hypothesis also allows for prosodic constituents as well to serve as the base, but in this section we will set these examples aside (see Chapter 3).

Second, we have the Adjacent String Hypothesis (ASH). This hypothesis is included here for comparison, however the failure of this approach to delimit the correct bases typologically was already outlined in the previous section, 2.5. Moreover, RED-alignment is not a possible means of base-maximization in the current theory (Chapter 1), thus root-base correspondence is the proposed alternative.

Third, we have Downing's Optimized Base Hypothesis (OBH). We will see here that under Downing's assumptions, her theory of bases allows for ambiguity in analysis when the base is altered to satisfy ONSET. Also, more damagingly, the system fails to limit the typological possibilities and does not generalize to the relevant fixed segment cases.

Comparing the three previous accounts of base formation with the Minimal Base Adjustment proposal made here (MBA), we have the following discrepancies. For a root that is C-initial, e.g. /RED, wadek/ → wad-(*wadek*): All theories agree that in the default case, the morphological left edge aligns with the left edge of the base.

2.6.1 Base expansion

Differences begin to arise when we consider a case of base expansion, e.g. /RED, s-ikuk/ → sik-(s-*ikuk*). The theories are compared below.

2.6.1.1 Morphological Constituent Hypothesis

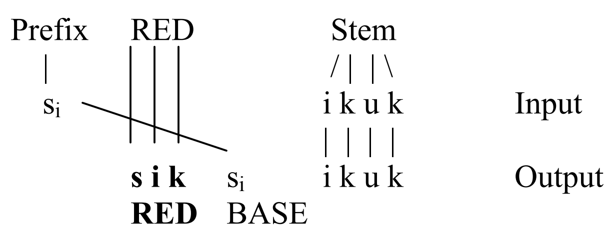
In the MCH, the base is (*ikuk*). The data are not analyzable in these terms.

2.6.1.2 Adjacent String Hypothesis

In the ASH, the base is (s-*ikuk*). McCarthy & Prince (1995) discuss two possible means of achieving this output; 'exfixation', as is assumed here, where the *s* of the base is associated with the prefix (23a) and prefix/reduplicant 'fusion', whereby the *s* of the base has no morphological affiliation in the output (23b).

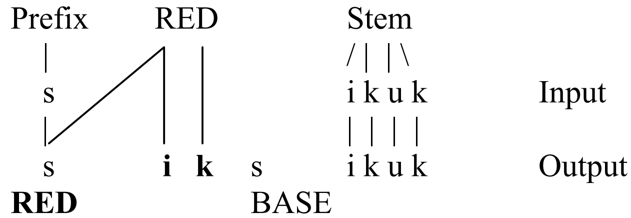
(23) Possible analyses for reduplication of s-*ikuk*[22]

a. Exfixation:



[22] We know that RED is prefixed to the root due to examples like */s-iš-RED-expeč/* → *s-i šex-šexpeč*, where the reduplicant is once again adjacent to the root, with an interloping C, which appears to correspond to the C from the closest prefix.

b. Fusion:



McCarthy & Prince argue against the 'immediately plausible' exfixation analysis because it requires metathesis of *s* and RED (assuming the input /s+RED+ikuk/), when these morphemes are not sisters. This violates a universal Scope Concordance Condition that they posit (see McCarthy & Prince 1995, as well as Downing 1998b:100-108 for discussion). The advantage of the exfixation plus base adjustment analysis is that it straightforwardly defines a typology of root-base misalignment, as pointed out by Downing 1998b. It is not clear whether a fusion analysis makes similar typological predictions.

2.6.1.3 Optimized Base Hypothesis

Downing (1998a,b) refers to the base as a 'P-Stem', or morpho-prosodic stem, citing Inkelas (1989). Inkelas argued in favor of a morpho-prosodic constituent that is smaller than the prosodic word, but is distinct from constituents of the metrical hierarchy, (foot, syllable). The grounds for this proposal is Selkirk's (1986) proposal that all phonological rules apply not within domains defined on morpho-syntactic structure, but rather within morpho-prosodic domains. Evidence that Inkelas presents in favor of morpho-prosodic constituents comes from extraprosodicity, which she analyses as a mismatch between morphological and morpho-prosodic constituents. An immediate example comes from English final syllable extraprosodicity (Inkelas 1993, Downing 1998b). The domain of stress assignment is argued to be the morpho-prosodic (P-)noun, which excludes the final syllable (except in cases of monosyllabic words, which are forced to include the final and only syllable in order to be parsed).

(24) Extraprosodicity as evidence of a P-Stem

a. <Pamela>$_m$	[Páme]$_p$ la	
b. <dog>$_m$	[dóg]$_p$	(*[ ]$_p$ dog)

Downing exploits this sub-lexical morpho-prosodic constituent, P-Stem, claiming that this constituent can serve as the base for reduplication. Misalignment of the morpho-prosodic constituent and the morphological constituent from which it is formed can be motivated to improve the prosodic well-formedness of the base.

The system proposed here, in which the base is a maximized version of the root, draws from Downing's (1998a,b) proposal. In her system of base formation, markedness at edges can compel circumscription of the marked element at the edge of a base. Reduplicants could then subcategorize for these 'Prosodic Stem' bases, per an alignment constraint requiring the right edge of RED to align to the left edge of a Prosodic Stem. Thus, in Timugon Murut, vowels are skipped over when forming the reduplicant because ONSET does not allow them to be included in the Prosodic-Stem:

(25) Timugon Murut reduplication

a. C-initial roots

bu-bulud	'hill/ridges in which tuberous crops are planted'
li-limo	'five/about five'

b. V-initial roots

om-po-podon ‘flatter/always flatter’
in-di-dimo ‘five times/about five times’

She argues that the analysis in terms of circumscription is superior to one in which emergent structural markedness determines the shape of the reduplicant. Her evidence for this claim comes from parallel cases of circumscription of marked structure at the edges of bases for stress and tone assignment. As the Emergence of the Unmarked in reduplication depends crucially on the addition of at least one violation for the repeated marked structure in reduplication, (which does not happen in cases involving no reduplication), then the TETU ranking cannot generalize to cases involving only tone and stress. An example is given from high tone assignment in KiKerewe to illustrate this point.

(26) No TETU, yet onset-initial domain preferred

akaluunduma, H	MAX-IO	ONSET	M-Stem ≈P-Stem
a. ☛ desired winner {a[kálúunduma			*!
b. ☞ actual winner {[ákáluunduma			

(26b), which has a perfectly left-aligned pair of high tones, is selected as optimal; there is no increase in ONSET violation by aligning perfectly. However, (26a) is the actual winner. This candidate avoids placing a high tone on a peripheral onsetless syllable. Downing claims that this is achieved through maximizing the base while circumscribing the onsetless vowel at the left edge.

One problem arises because this argument crucially depends on the non-existence of independent constraints that would rule out high tone or stress on onsetless syllables. In fact, evidence abounds that constraints against stress or high tone on onsetless syllables are needed. Kawu (2000) (and references therein) shows that onsetless high-toned *i* is marked in Yoruba; he argues that prefixation of an affix of this nature leads to copying in order to provide an onset.

(27) Gerundive formation: C_1í+C_1V_1

jó	jíjó	'dance'
kú	kíkú	'die'
mɔ̀	mímɔ̀	'know'
là	lílà	'split'

There is also various evidence that foot onsets can be independently required. This is further proof that 'onsetless initial syllables' do not deserve the special category status that they receive in Downing's system.

German glottal stop insertion, for example, calls for Onset to be satisfied foot-initially, regardless of morpheme structure.

(28) German glottal stop insertion (Alber 1999, Féry 1991, Hall 1992)

a. onsetless syllable is unstressed (no insertion of ʔ)

[Théo]	'Theo'	
Mu[séum]	'museum'	
[géhe]	'go 1 sing'.	= [geːə]

b. onsetless syllable is stressed (insertion of ʔ)

The[ʔáter]	'theater'
Be[ʔámte]	'civil servant'
Ru[ʔín]	'ruin'

The German data do not lend themselves to an analysis in terms of extraprosodicity, or mis-alignment of morphological and morpho-prosodic constituents.

Moreover, an analysis of Aranda data, in which an initial onsetless syllable does seem to be circumscribed for stress assignment, does qualify as a case for P-Stem formation. Giving it a P-Stem analysis however precludes a unifying analysis of the data in (28) and (29).

(29) Aranda stress (Strehlow 1943-44, Takahashi 1994, Goedemans 1996, Downing 1998b)[23]

a. C-initial words: stress is initial

bálkala	'in vain'	rínbinba	'beak, lips'
kála	'already'	ká:puta	'head'

b. V-initial words: stress peninitial; initial in disyllabic words

arátja	'straight'	ergúma	'to seize'
ilúlama	'to descend'	indá:go:bma	'mountain devil'
but: ílba	'ear'	ápma	'snake'

I suggest rather that the two cases are related, both due to a markedness constraint, something to the effect of ONSET(foot), as already proposed by Takahashi (1994) and Goedemans (1996) for the Aranda data.

To go one step further in exploring the circumscription of marked elements at edges, cases like the two following ones also show failure of the mis-alignment of a morphological and a morpho-prosodic constituent to generalize to additional cases that are clearly related. For example, Nanni (1977) shows that suffixation of *–ative* in American English is sensitive to the quality of onset of the foot built on it would have. That is, whether a foot is constructed or not depends on whether or not the onset is an obstruent.

[23] Additional data show that minimality effects can lead to a V-initial foot.

(30) *-Ative/-ətive* suffixing (Nanni 1977)

Conditioned by the *quality of the would-be foot onset*:

ínno(**v**àtive)	but	íte**r**ətive
quáli(**t**àtive)		nómi**n**ətive
légi(**sl**àtive)		manípu**l**ətive

A secondary stress foot is built if the onset will be an *obstruent*; foot-building is foregone if the foot onset will be a *sonorant.* Reference to a P-Stem is of no help. Below, I offer a tentative solution, using the following constraints:

(31) a. HEAD-MATCH-OO$_{\text{ATIVE}}$ (HD-MCH(main)): The main stressed vowel in the output string S1 corresponds to the main stressed vowel in S2. Alderete 1996, Pater 1995.

b. Parse-σ: All syllables must belong to feet. McCarthy & Prince 1993a,b.

c. ALIGN-RIGHT (HEAD FOOT, PROSODIC WORD) (ALIGN-R): The right edge of the head foot must align with the right edge of a prosodic word. McCarthy & Prince 1993a.

d. *ONSET/foot(sonorant) (*ONSET/foot(son)): The foot onset must not be a sonorant consonant.

e. HEAD-MATCH-OO$_{\text{ATIVE}}$(HD-MCH(*Ătive*)): Any stressed vowel in the output that corresponds to a vowel in the suffix *-Ătive* must not be stressed. (Penalizes any vowel in *–ative* that is stressed in the output.)

*ONSET/foot(son) is assumed to be part of a markedness hierarchy in which this constraint will dominate the less marked *ONSET/foot(obstruent). In addition, the analysis makes reference to a conjoined constraint, HD-MCH(-*Ătive*) & *ONS/ft(son). This constraint, following Smolensky (1995), rules out the “worst of the worst”, in other words, the candidate that violates both of these constraints.

(32) Secondary stress depends on quality of foot onset

[ínnovàte], +*Ative*	HD-MCH (main)	HD-MCH(-*Ative*) & *ONS/ft(son)	PARSE -σ	ALN-R(HDFT , PRWD)	*ONSET/ ft(son)
a. ☞(ínno)(vàtive)				σσ	
b. (ínno)vative			σ!σ	σσ	
c. inno(vátive)	*!		σσ		
[íteràte], +Ative					
a′. (íte)(ràtive)		*!		σσ	*!
b′. ☞(íte)rative			σσ	σσ	
c′. ite(rátive)	*!	*	σσ		

When the would-be secondary stress foot has a sonorant onset, it is no longer able to be a foot that would include the lexically unstressed -*Ative*. The special main stress HEAD-MATCH constraint for this suffix leads to the preservation of the original main stressed foot.

A final case sensitive to onset quality is stress assignment in Pirahã. Stress is assigned based on the following condition: ‘Stress the rightmost token of the heaviest syllable type in the last three syllables of the word’.

(33) Pirahã ‘onset-sensitive stress’ (Everett 1988)

Scale of heaviness: $C_{[-voice]}$ VV > $C_{[+voice]}$ VV > VV > $C_{[-voice]}$ V > $C_{[+voice]}$ V

That is, all other things being equal, voiceless foot onsets are preferred over voiced ones.

These examples show that circumscription of marked elements at the edge of the base as a methodical approach will not generalize in a satisfactory way. Moreover, in order to apply the notion of P-Stem as base to reduplication and non-reduplicative cases of stress and tone assignment, Downing resorted to constraint conjunction, using Hewitt & Crowhurst’s (1996) logical conjunction. Logical conjunction, rather than ruling out the 'worst of the worst', the effect of Smolensky's proposed conjunction, rules *in* only the best of the best. In other words, in order to satisfy a constraint, a candidate must satisfy both conjuncts. The crucial type of conjoined constraint for her analysis is: ONSET ∩ ALIGN-L(Tonal Domain, σ). That is, all tonal domains must be left-aligned with a syllable, and that syllable must contain an onset.

To return to the Kikerewe example, we see that using the conjoined constraint allows us to construct a P-Stem that is analogous to the bases in reduplication that also avoided initial onsetless syllables. The following are taken from Downing (1998a), with minimal adjustment. The P-Stem is in braces; the tonal domain is in brackets. The new constraints are defined below

(34) a. DEP M-P: Every element of the morpho-prosodic-Stem (P-Stem) has a correspondent in the morphological-Stem (M-Stem).

b. MAX-M-P: Every element of the M-Stem has a correspondent in the P-Stem.

(35)

akaluunduma, H	DEP M-P	DEP-IO	ONSET ∩ ALIGN-L (TD, σ)	ONSET	MAX M-P
a. ☞{a[kálúunduma				*	*
b. {[ákáluunduma			*!	*	
c. {Y[ákáluunduma	*!	*			

The analysis does unite the data in terms of the behavior of onsetless initial syllables in these cases. However, the cost of doing so is too great, and the benefits are unclear, given the apparent difference underlying non-reduplicative cases, as illustrated in particular by the stress cases discussed above. I reject the constraint conjunction adopted by Downing to unify these cases, and suggest rather that the Emergence of the Unmarked is sufficient to account for markedness reduction in reduplication. In both cases, markedness reduction is "global" in the sense that the overall markedness of the resulting form is always reduced. The persistent role of global markedness reduction is relevant in fixed segment affixation as well (see §2.8 for a comparison of the two approaches). Independent markedness constraints will rule out cases of edge markedness in the types of non-reduplicative examples that Downing examines.

2.6.2 Base shrinkage

Using the Axininca Campa example, /RED, n+osampi/ → n-*o(sampi)*-sampi, we have one more source for comparing the different ways of assigning a base.

2.6.2.1 Morphological Constituent Hypothesis

In the MCH, the base is (*osampi*). For infixing reduplication like this, McCarthy & Prince 1996 posit vowel-initial syllable extra-metricality, word-initially. The apparent arbitrariness of such an environment is better explained in a constraint-based analysis, in which the effects of the constraint ONSET, even though violated in the language generally, plays an active role (McCarthy & Prince 1993a).

2.6.2.2 Adjacent String Hypothesis

In the case of base shrinkage, an analysis in terms of the ASH is straightforward: MAX-IO >> ONSET >> MAX-BR.

2.6.2.3 Optimized Base Hypothesis

Under the OBH, the base is also taken to be (*sampi*). Once again however, there is an ambiguity of analysis. Either ONSET simply dominates the base-maximizing constraint MAX-MP, or else there is (logical) constraint conjunction.

2.6.3 Consonant clusters as base budgers

We see that ONSET can cause base expansion or shrinkage. Before listing several cases where ONSET can play this role, I will also note that *CC, the constraint against onset clusters, may also lead to base alteration. However, only shrinkage appears to be compelled by *CC. That is, when the base begins with an onset cluster, the reduplicant can effectively infix just enough to shrink the adjacent base so that the base begins with a simple onset, and thus RED does as well (36a). What we do not see are cases that will expand to include prefixes in the base when the root begins with a consonant cluster. The pattern would be as in (36b):

(36) Hypothetical data, pattern presumed to be unattested

	no reduplication	*reduplication*
a. No fixed segment prefix:	bladupi	*b*-la-(*ladupi*)
b. With CV prefix *pe*-:	pebladupi	pe-(pe*bladupi*)

It is not clear whether this type of expansion should be ruled out. Presently, it is predicted to exist, and is thus taken to be an accidental gap.

Furthermore, what this approach predicts is that infixation cannot go further than the rightmost onset consonant of the leftmost onset cluster to resolve the additional *CC violation. That is, barring additional constraints, a candidate like **tra-ba-baho* would always be harmonically bounded by the candidates *t-ra-rabaho* (parallel with cluster simplification in Latin *s-<u>po</u>-pondi*), and *<u>ta</u>-trabaho* (Tagalog), which will have the same number of *CC violations, but will fare better on MAX-RtB.[24]

The chart below summarizes the examples of languages that exhibit each type of displacement. As we see, it is possible for one language to exhibit more than one type of behavior.

(37) Typology of L-ANCHOR cases: Structural constraints compel shifting of base

	ONSET	*CC
Expand base	Ineseño Chumash, Kinande (noun), Kihehe	(?)
Shrink base	Axininca Campa, Isi Xhosa (Bella Coola)	Latin, Ineseño Chumash

In order to better satisfy ONSET, the base can be either contracted or expanded. This appears to be an option limited to a window of an onset that precedes the root-initial vowel and the onset that follows this vowel. For *CC, only cases of shrinkage have been found thus far.

2.6.4 Examples of base adjustment

In this section, I offer examples of both ONSET and *CC-compelled cases of base alteration from the default left edge of the root. In the cases of ONSET-compelled expansion (38), the reduplicant will copy affixal material only when this will lessen syllabic markedness.

[24] The same is true of an alignment account, *CC >> ALIGN L(RED, Stem).

(38) ONSET compels expansion of base

a. Ineseño Chumash

C-initial stems: no expansion

tʃ^{h}um-*tʃ^{h}umaʃ*	‘islanders, Chumash people’	base = *tʃ^{h}umaʃ*
pon-*pon’*	‘trees’	base = *pon’*

V-initial stems: expanded

s-ikuk	sik-s*ikuk*	‘he is chopping’	base = s*ikuk*
s-iʃ-expetʃ	ʃi-ʃex-ʃ*expetʃ*	‘they two are singing’	base = ʃ*expetʃ*

b. Kinande nominal reduplication, ‘a real X’

C-initial stems: no expansion

o-ku-gulu-(*gulu*)	‘a real leg’	base = *gulu*
o-mu-longo-(*longò*)	‘a real village’	base = *longò*

V-initial stems: expanded

ó-mw-ana	ó-mw-aná.(mw-*ana*)	‘a real child’	base = mw-*ana*
e.ky-úmbà	e.ky-úmba-(ky*úmbà*)	‘a real room’	base = ky*úmba*

c. Kihehe

C-initial stems: no expansion

kú-ceenga-(*ceénga*)	‘build’	base = *ceénga*
kú-teleka-(*teléka*)	‘cook for’	base = *teléka*

V-stem: expanded

kw-íimbíla	kwíimbila-(kw*iimbíla*)	‘sing’	base = kw*iimbíla*
kw-áaka	kwáaka-(kw*aáka*)	‘burn’	base = kw*aáka*

In other cases where satisfaction of ONSET is at issue, a different typological possibility is witnessed. The base shrinks in order to satisfy the constraint; the root-initial vowel (as well as any coda consonants) are excluded from the base.

(39) ONSET compels shrinkage of base:

a. Axininca Campa

C-initial stem

word	reduplicated form	stem	base
non-t^haaŋki	non-*t^haaŋki*-t^haaŋki	/t^haaŋki/	t^haaŋki
noŋ-kawosi	noŋ-*kawosi*-kawosi	/kawosi/	kawosi

V-initial stem (RED is suffixed)

n-osampi	n-*o*(*sampi*)-sampi	/osmapi/	sampi
n-osaŋkina	n-*o*(*saŋkina*)-saŋkina	/osaŋkina/	saŋkina

b. IsiXhosa

C-initial

word	reduplicated form	stem	base
ndi-ya-táka 'I am jumping'	ndi-ya-taká-(*taka*)	/táka/	taká
ndi-ya-fumána 'I am getting'	ndi-ya-fuma-(*fumána*)	/fumána/	fumana

V-initial

ndi-y-oyísa 'I am defeating'	ndi-y-*o*-yisá-(*yisa*)	/oyísa/	yisa
ndi-y-onwábisa 'I am making happy'[25]	ndi-y-*o*-nwabi-(*nwábisa*)	/onwábisa/	nwabisa

It is also possible for a base to shrink in order to minimize violations of *CC. The only examples I have found involve shrinking the base in order to perform better on this constraint.

[25] I am setting aside variants that differ only with respect to the placement of tone.

(40) Chumash

C-initial

word	*reduplicated form*	*stem*	*base*
lew	lew-(*lew*)	/lew/	lew
‘mythological creature’			
mux	mux-(*mux*)	/mux/	mux
‘to crumble’			

CC-initial

skon	*s*-kon-(*kon*)	/skon/	kon
‘worms, reptiles’			
xšap	*x*-šap-(*šap’*) (~xšap-xšap’)	/xšap/	šap’ (~xšap’)
‘rattlesnakes’			

The Bella Coola case, which shows dramatic base contraction, is examined in more detail in the next section.

2.7 Bella Coola

2.7.1 Background: syllables in Bella Coola

The syllable structure of Bella Coola has been hotly debated in the literature. At the heart of the matter is the syllabification of obstruents, given the numerous vowelless words, e.g. *ɬχʷtɬcxʷ* ‘you spat on me’ (Bagemihl 1991, and references therein). Bagemihl claims that the maximal syllable is CRVVC;[26] all other segments are syllabically unaffiliated. Evidence from reduplication shows that CR is the only complex onset allowed in the language. He argues that unsyllabified obstruents however are not deleted, but rather are licensed moraically. Moraically licensed obstruents contrast with those that are copied but unlinked; the latter suffer deletion.

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[26] Here, R = resonant, i.e. sonorant consonant; V = vowel or sonorant consonant.

Cook (1994) challenges the notion of moraic licensing, claiming that this innovation unduly complicates the prosodic structure of Bella Coola, and adds no insight into the behavior of obstruents. Cook's contention is that unsyllabified obstruents persist in the language due to an absence of Stray Erasure, not to the innovation of moraic licensing.

Setting aside the question of moraic licensing, what is crucial to the present discussion is that the only possible complex onset is CR, and that sonorant consonants can function as a syllable nucleus. Thus, syllabification of a string like *skma*, 'moose' would in present terms involve the interaction of the constraints *COMPLEX$_{obs}$/$_{obs}$, MAX-SEG-IO, and ONSET.

(41) a. ONSET: Syllables must have onsets.

b. MAX-SEG: All segments in the input must have a correspondent in the output.

c. *COMPLEX$_{obs}$/$_{obs}$: Onset obstruent/obstruent clusters are not allowed.

d. LICENSE(C): All consonants must be dominated by a syllable node.

I assume that *COMPLEX is part of a hierarchy that reflects the universal implications of onset clusters, e.g. a language that allows obstruent/obstruent onset clusters will allow obstruent/sonorant clusters. Thus, *COMPLEX$_{obs}$/$_{obs}$ >> *COMPLEX$_{obs}$/$_{son}$.

The following tableau shows the constraints at work, syllabifying the string *skma*:

(42) Syllabification of *skma*

/skma/	MAX-SEG	ONSET	*COMPLEX$_{obs\ obs}$	LICENSE(C)	*COMPLEX$_{obs\ son}$
a. σ s k m a			*!		*
b. ☞ σ s k m a				*	*
c. σ s k m a				**!	
d. σ k m a	*!				*
e. σ σ s k m a		*!		*	

These constraints on syllable structure play an important part in reduplication. We see that maximization of the base will drive the reduplicant to be syllabified differently than the corresponding base segments in some cases.

2.7.2 Reduplication

Reduplication in Bella Coola shows evidence of gradient sensitivity to the left edge of the root morpheme. In selecting material for the reduplicant, the following considerations come into play: a) the onset must be a single consonant, and b) the minimum sonority requirement for the nucleus of the reduplicant is that it be a sonorant segment. We see this both in the infixation that results when the leftmost segment(s) in the root do not contain a sonorant segment, and also in the outright failure of all-obstruent words to reduplicate.[27] Also, adjacency relations between segments in the base must be respected by corresponding segments in the reduplicant (CONTIGUITY-BR).

2.7.2.1 With an adjustable base

Within the proposed system, the gradience is achieved through minimal violation of MAX-RtB. In this discussion, I will be concerned only with the CV pattern, although similar restrictions hold of all of the reduplication patterns in the language.[28]

(43) Bella Coola CV reduplication data

#C roots			
	qayt	qa-(*qayt*)	‘hat/toadstool, diminutive’
	tl̩k^w	tl̩-(*tl̩k^w*)	‘swallow/continuative’
#CC roots			
	p'ɬa	*p'*-ɬa-(*ɬa*)	‘wink, bat the eyes/continuative’
	tqn̩k	*t*-qn̩-(*qn̩k*)	‘be under/underwear’
	skma	*s*-km̩-(*kma*)	‘moose/diminutive’
#CCC roots			
	stχ^{w}m̩	*st*-χ^{w}m̩-(*χ^{w}m*)-i	‘floor mat/diminutive’
	st'q^{w}lus	*st'*-q^{w}l̩-(*q^{w}lus*)-i	‘black bear snare/diminutive’
	t'ksn̩	*t'k*-sn̩-(*sn̩*)	‘shoot with a bow/cont’.

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[27] Bagemihl reports that nearly 10% of the Bella Coola lexicon is made up of all-obstruent words. For the few exceptions he notes of all-obstruent words that do reduplicate, either *i* or *n* is inserted into the base, providing a nucleus that is then acceptable in the system: ɬq’- → ɬn̩q’ → ɬn̩-ɬn̩q’.

[28] There are two other basic patterns: CVC- and V-. Both these and the CV- pattern examined here can combine with a syncope process that deletes the first stem vowel, as well as undergo phonological modification that is seen in unreduplicated forms as well, such as vowel lengthening. Other additional patterns are variations of the three basic types of reduplication. The pattern that a given lexical item exhibits is not predictable from its form; it must be lexically marked. The semantic content contributed by reduplication is also not consistent, and must be designated for each stem. The meaning associated with reduplication is usually diminutive for nouns, continuative for verbs, or else it may combine with other affixes to produce a derived form, which sometimes carries an idiosyncratic meaning. For discussion of the additional patterns and auxiliary phonological processes, see Bagemihl (1991).

#CCCC roots

qpsta	*qps*-ta-(*ta*)	‘to taste/iterative (actual)’
pɨtkn̩	*pɨt*-kn̩-(*kn̩*)-ɬp	‘bark of bitter cherry tree/~tree’

The data exhibit several interesting qualities. First, the reduplicant can be infixed deeply inside the root. However, RED only goes as far as is necessary to copy a sonorant nucleus. Even when a more sonorous nucleus is available, for example, with *skma* in **sk-ma-ma*, the leftmost possible string is still the one to serve as the base: *s-km̩-kma*. The same example also shows us the possible variation in syllable role. In this case, *m* is syllabic in the reduplicant, whereas it is a member of the onset in the base.

Assuming the syllabification above, we know that obstruent/obstruent clusters are not allowed in the language. Thus I assume in the candidates below that each syllable contains maximal syllabification of segments, (C, CR), but no CC clusters. Violations of LICENSE(C) are only counted for the reduplicated material.

(44)

	LICENSE(C)	MAX-RtB
a. ☞*s*-km̩-(*kma*) B –y		*
b. *sk*-ma-(*ma*) B -y		**!
c. sk-(*skma*) B -y	*!*	
d. skm̩-(*skma*) B -y	*!	

Examples such as this show that proximity of the correspondent of the leftmost segment of the root to the leftmost segment in the base is crucial. Candidate (44b) is preferable to (44a) with respect to the increased sonority of the nucleus. It is this comparison that shows the need for a constraint sensitive to the left edge of the root, here MAX-RTB.

2.7.2.2 Criticism of Bagemihl's analysis

Bagemihl claims that reduplication in this case is to a base characterized as a *foot*. The intuition behind Bagemihl's analysis is clear. Given the obvious link between reduplication and syllable structure, he first posits prefixing of RED at the leftmost syllable boundary. He revises this to prefixation to the left of the *foot*, given cases in CVC reduplication where the second C is a member of a second syllable in the base, e.g. *milix*^{w} → *mil-milix*^{w}*-ɬp, * mii-milix*^{w}*-ɬp* 'bear berry/ plant of the bear berry'. Bagemihl admits that this hypothesis "depends on complete analysis of the stress system of the language… given that stress most often appears to fall on the final syllable (occasionally the penult or antepenult, under conditions that are unclear), with no consistent secondary stresses, it does not appear that the foot structures posited here will be incompatible with this analysis", p. 613.

However, under this claim it is reduced to a coincidence that a language in which reduplication would behave like this has an apparent prosodic limit on roots, (namely, no larger than one foot). His attempt to capitalize unduly off of this fact leads the analysis astray. Moreover, in the couple of cases where footing does not seem to give the proper designation of the base, his analysis makes the prediction that infixing would occur, whereas we can see that sensitivity to the left edge of the morpheme (with emergent unmarked syllable structure) is clearly at play: (CVx- example with 'Initial Consonant Deletion'): t'iiχɬalam → ʔix-t'iiχɬalam; $_{\sigma}$(t'iiχ)$_{ft}$[$_{\sigma}$**(ɬa)** $_{\sigma}$(lam)] also, $\sigma_{\mu\mu}$ with syncope (p.628): kuɬulmx → kuɬ-kʷɬulmx $_{\sigma}$(ku); $_{ft}$[$_{\sigma}$**(ɬu)** $_{\sigma}$(lm̩x)]. In both examples, the base seems to be an unfooted syllable, thus posing a problem for the generalization. Stress is not given for these forms, so they may in fact have the initial syllable exceptionally encompassed by a foot. However, then it would be a coincidence that in all cases where the base has more syllables than a single foot, the stressing was exceptional. More likely is that Bagemihl's original intuition was correct: affixation picks out the onset of the first syllable as a starting point. All cases, regardless of footing, would be covered under the proposed analysis. RED placement is contingent on syllable structure, as is implied by Bagemihl. In addition, the emergent requirement that the RED be syllabifiable entails that RED will copy from syllabified material. The further markedness reduction witnessed in this pattern is the exclusion of any unlicensed consonants. Thus, the leftmost C of the base will correspond to the leftmost C of RED; the second segment, whether vocalic or resonant, will serve as the RED nucleus.

2.7.2.3 Problems with a non-dynamically assigned base

McCarthy & Prince (1993/2001:137 fn.) note that Bella Coola provides an example where RED can be compelled to skip over one or more initial C's, in what is presumably prosodically compelled infixation. The constraint that they informally suggest forces the infixation is 'obstruents are not nuclei', or *NUC/obs. Although this seems reasonable, the problem comes when this constraint is considered in terms of its typological predictions. Without further stipulation, we should assume that any member of the '*NUC' family should be able to emerge. However, then we would make predictions along the lines of those discussed in §2.5. A concrete example can be constructed using the sub-hierarchy *NUC/i >> *NUC/a. If ALIGN-L RED >> *NUC/i (and a faithfulness constraint requiring the vowel quality of corresponding base and reduplicant segments to agree is undominated), then unattested infixation of RED can occur. For example:

(45) Unattested typology

dami → da-(*dami*)
dima → *di*-ma-(*ma*)

(46) Unattested infixing to syllable with unmarked nucleus

/RED, dima/	*NUC/i	ALIGN-L RED
a. ❽ *di*-ma-(*ma*)	*	**
b. di-(*dima*)	*!*	

In other words, by infixing, RED is then able to locally and faithfully copy the optimal nucleus, *a*. However, this type of affixation is unattested. In the proposed theory, it is ruled out by a combination of factors. First, alignment constraints do not position RED. Secondly, the fixed ranking proposed in 2.5 does not allow featural markedness, such as the constraint against the vowel *i* in the nucleus, to force shrinking of the base. Thus, we avoid this problematic prediction.

2.8 Minimal base adjustment and fixed segment affixation

Does an optimized base play a role in fixed segment affixation? The answer could very well be affirmative. In exploring the theory of RED placement, it was necessary to claim that RED could not be positioned by explicit alignment constraints, as is broadly assumed to be the mode of affixation of both reduplicative and fixed segment affixes. With respect to fixed segment affixes, it may be the case that in examples where a *VC* affix is infixed, e.g. *gr-um-adwet*, that the global structural optimization forces base shrinkage here as well. This could be forced with NO CODA, a constraint banning syllable codas, dominating MAX-RtB:

(47) Global structural markedness reduction

/um, gradwet/	NO CODA	MAX-RTB
a. ☞*gr*-u.m-(*ad.wet*)$_B$	**	**
b. um.-(*grad.wet*) $_B$	***!	
c. *gra.d*-um.-(*wet*) $_B$	**	***!*

This is a major point of departure from Downing's theory. Under her formulation, the OBH could only serve to optimize the *base*. Here, the base in the optimal form begins with a (marked) onsetless syllable. This is tolerated in the theory promoted here, as the global results are improved. However, under Downing's theory, this case would be unrelated and would not involve base correspondence.

2.9 Minimal base adjustment hypothesis and truncation

We would expect that the proposed system of base formation would extend to truncation. A pattern in which ONSET caused base shrinkage would have the following properties: C-initial words would truncate as expected; the left edge of the word would correspond with the left edge of the base. However, in a V-initial word, the base would shrink. For example, hypothetical *abadupi* would have the base *a*(*badupi*). If L-Anchor characterized the truncation pattern, then *badu* would be a possible truncated form for *abadupi*. Such a prediction does not on the surface seem terribly unreasonable; further research will have to uncover whether such a pattern is indeed attested.

2.10 Conclusion

The boundary of the base for reduplication may diverge minimally from the edge of the root. This is caused by an optimization that does not target the base (contra Downing), but rather will occur in order to improve the markedness profile of the output as a whole. Structural markedness constraints can dominate constraints that require the base to be coextensive with the root. Because these base-root faithfulness constraints are directly involved in determining the base, we derive the fact that reduplicative morphemes are 'internal' affixes (Carrier 1984), in that they can be drawn inward toward the root, (even when additional affixes are added before RED). In addition, we see how a Positional Faithfulness account of anchoring can be preserved, even when the left edge of the maximized base, and not the actual root, is what is targeted for copying.