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DIMENSIONS OF VARIATION IN MULTI-PATTERN REDUPLICATION

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Philip Spaelti

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The Thesis of Philip Spaelti is approved:

Professor Junko Itô, Chair

Professor Armin Mester

Professor Jaye Padgett

Dean of Graduate Studies

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Abstract: Dimensions of Variation in Multi-Pattern Reduplication

Philip Spaelti

The phenomenon of reduplication has been quite influential in phonological theory in recent years, and has therefore occupied a lot of attention. Still some aspects seem to have largely escaped noticed. One of these, which is the central topic of this dissertation, is that in many languages where reduplication is attested, more than one pattern of reduplication is found. I argue that in such cases it is crucial to look at these patterns as a single system.

Two types of systems are distinguished. In one type the patterns, are contrastive, and a single word can show more than one kind of reduplication. I call the patterns in such a system DUPLEMES. In the other kind of system the patterns are in complementary distribution, and the conditioning of their distribution is often phonological. The patterns in this type of system act as a single dupleme, and I call the individual patterns ALLODUPLES.

I look in detail at three systems of the second type, which all show very different types of variation. I show that all of this variation can be understood as a result of the language trying to avoid marked structures.

Nakanai has a large number of reduplication patterns. These patterns fill up exactly the available pattern space, a result which is expected if the different patterns are the result of avoiding marked structures.

The Aru languages, West Tarangan and Kola, have an infixing pattern reduplication system that places the reduplicant immediately before the main stress. This can be shown to be the result of reduplication seeking the least marked base. In addition, variation in the ranking of the constraints necessary to explain this type of reduplication, can be shown to explain straighforwardly a type of reduplication, where a single consonant is copied as a coda to a preceding syllable.

Mangap-Mbula has a form of reduplication that switches between prefixing and suffixing reduplication. This variation can be shown to be the result of the interaction between reduplication and the stress system of the language.

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1. Introduction

1.1. On the importance of reduplication for phonological theory

Reduplication is a form of morphological word formation where some part, possibly all, of the phonological string is repeated, and where this repetition itself carries morphological information. It is present to some extent in virtually every human language, though its functional load can vary greatly. If repetition were all there was to reduplication, there would be little to say about it. Most often however, the repetition does not lead to two identical strings. Instead the two parts deviate from each other, sometimes in rather striking ways. An interesting idea, due originally to Steriade (1988), is that this deviation is not haphazard, but results as a way for the language to avoid marked structures. This idea has been given a solid theoretical grounding by McCarthy & Prince (1993, 1994ab, 1995). In their system, implemented in the framework of Optimality Theory (Prince & Smolensky 1993), the emergence of unmarked structures in reduplication follows from the design of the theory, hence the name *Emergence of the Unmarked*.

The central argument defended in this dissertation is that only the complete and systematic implementation of this proposal gives the correct result. In particular, it will be argued that no special reduplication-specific devices are required.

For example, one frequent form of variation in reduplication is *partial reduplication.* A typical approach to this problem suggests that this is the result of templates, a type of straightjacket or Procrustean bed, that imposes itself on the reduplication. Analyses of this type have been proposed by McCarthy (1979), Marantz (1982), McCarthy & Prince (1986), Archangeli (1988), McCarthy & Prince (1993), among many others, and with a somewhat different twist McCarthy & Prince (1994b), as well as Urbancyzk (1995). Such templates have no status outside their duty in imposing the proper size restriction on the appropriate morphological constituent. As such they constitute a formidable theoretical device. Here it will be argued that no such device exists, and that partial reduplication results only from the desire to avoid marked structures.

Evidence for this will come from a number of languages which have more than one pattern of partial reduplication. In a templatic analysis, such multi-pattern reduplication systems typically require more than one template. This in turn brings with it the requirement for an extra device, which predicts when to use which template. On the other hand, if partial reduplication is the result of markedness pressures, we expect shape variation, since which shape is considered unmarked will vary depending on the context.

1.1.1. Overview of the dissertation

In the rest of this chapter, I will begin by presenting a typology of multi-pattern reduplication to serve as a point of reference. The theory of reduplication of McCarthy & Prince (1993, 1994ab, 1995) depends on a basic framework in Optimality Theory (Prince & Smolensky 1993). Thus I present a brief overview of Optimality Theory in section 1.3., before laying out the theory of reduplication in 1.4.

Chapter 2 introduces McCarthy & Prince’s account of emergence of the unmarked, and shows how it can account for the variety of divergence phenomena encountered in reduplication; including partial reduplication, default segmentism, as well as others. A consequence of this implementation of emergence of the unmarked is that there is no corresponding ‘Emergence of the Marked.’

Chapter 3 discusses variation in the shape of the reduplication pattern. The account of partial reduplication introduced in chapter 2 is inherently ‘a-templatic’. This predicts that there should exist systems where the variety of reduplication patterns cover the entire range of possibilities. I show that Nakanai reduplication constitutes such an example.

Chapter 4 considers cases where the reduplication is found inside the reduplicated form rather than at the edge. A particular type of infixation that is very common with reduplication, but virtually never occurs with regular affixes, is affixation ‘to the stressed foot’. I argue that this type of infixation results from a desire to avoid markedness of the base. A variety of examples are discussed, but a special focus will be on two languages from South East Maluku, West Tarangan and Kola.

Finally, chapter 5 looks at the example of Mangap-Mbula, where the reduplication is found to ‘switch places’, being found sometimes at the beginning of the form and sometimes at the end. The analysis of this case will be shown to have consequences for the definition of alignment, and the theory of affixation.

1.2. Multi-pattern reduplication

Certain aspects of reduplication have been the focus of much work in phonological theory; the mechanics by which identity between the two strings is achieved (Wilbur 1973, Carrier 1979, McCarthy 1979, Marantz 1982, Mester 1986, Steriade 1988, McCarthy & Prince 1993, 1994ab, among many others), the range of possible shapes of the part that is identical (McCarthy & Prince 1986, 1994b), and the forces constraining possible deviations from identity (Wilbur 1973, Steriade 1988, McCarthy & Prince 1995). Almost all of this work deals with single patterns. However, in many languages where reduplication is available, more than one pattern is attested. An important claim of this dissertation is that in such languages the various patterns must be treated as *a single system*.

1.2.1. The anatomy of reduplication

A reduplicated form always has two parts. Sometimes the two parts are completely identical. For example the West Tarangan word *tuntun* 'mosquito', has two parts, both consisting of the identical sequence [tun]. In such cases it is impossible to tell which part is original and which is copy, or even that one part is the designated original for that matter. Other times however the parts differ from each other in some respect:

(1) **Kalar-Kalar West Tarangan** (Nivens 1992, 1993)

baˈbakir	cf. bakir	'small.3s'
jaˈjaŋil	cf. janil	'rotten.3s'
ˈkɔlaˈkɔlat	cf. kɔlat	'spoon'
ˈboraˈborar-na	cf. borar-na	'small-3s'

In these examples the underlined part is shorter than the other, giving rise to the idea that it is copied form the longer original. This idea is appealing because the longer part is identical to a corresponding unreduplicated form. In addition, it is often observed that the shorter part has properties reminiscent of an affix. For example, in many languages it is unstressed. This leads to a treatment of reduplication as a form of affixation, where the designated original is called the BASE, and the copied part is called the REDUPLICANT (McCarthy & Prince 1993 attribute the latter term to Spring 1990). I will follow this general practice, and I will also follow the practice of underlining the reduplicant.

However, it must be remembered that the determination of which part to call the reduplicant, and which the base, is a tricky, and sometimes arbitrary matter, and should generally be considered a point of analysis. For instance Yip (1995b) discusses the following example from Javanese:

(2) **Javanese Habitual-Repetitive** Dudas (1968)

tuku	tuka-tuku	‘buy’
bul	bal-bul	‘puff’
melaku	meloka-melaku	‘walk’
kumat	kumat-kumet	‘have a relapse’
salah	salah-seleh	‘mistaken’

In the first group of examples in (2) the second part of the reduplicated form, indicated by the dotted underline, is identical to the unreduplicated form, while in the second group the first part looks like the original. A second example comes from Klamath (see McCarthy & Prince 1995):

(3) **Klamath Distributive** (Barker 1964, Clements & Keyser 1983)

/mbody’ + dk/	mbo-mpditk	‘wrinkled up’
/sm’oq’y + dk/	sm’o-smq’itk	‘having a mouthful’
/pniw + abc’ + a/	pni-pno:pc’a	‘blow out’

In this case the first part, which is only a syllable long is clearly not the original, thus we would want to call it the reduplicant. But the putative base distorts the unreduplicated form as well, and is in many respects less faithful to the unreduplicated form than the reduplicant.

The desire to call the latter part the base in the Klamath example is motivated in large part by a desire to identify the unreduplicated form as a single contiguous part of the reduplicated form. However this is not always possible. Consider the following data, again from West Tarangan.

(4)

maˈnɛlay	maˈnɛlˈnɛlay	‘sour’
ɛ-taˈnira	ɛtaˈnirˈnira	‘3s-have diarrhea’
ɛ-taˈil	ɛtaiˈlil	‘3s-bounce’

If reduplication is a form of affixation, then the data in (1) was a form of prefixation, while the data seen here is a form of infixation. This type of data brings up another interesting point. It is important to note that the term *base* does not refer to a morphological constituent. There are a number of reasons for this.

A first point is that in infixing reduplication the base is always the part that the reduplicant affixes to, never the actual stem. Consider again the data from (4), this time contrasted with forms that copy the morphological stem.

(5)

maˈnɛlˈnɛlay	*maˈmanˈnɛlay	‘sour’
ɛtaˈnirˈnira	*ɛtaˈtanˈnira	‘3s-have diarrhea’
ɛtaiˈlil	*ɛtataˈil	‘3s-bounce’

In West Tarangan the reduplication always comes immediately before the main stress, and copies the segments immediately following, even if this falls in the middle of a word. For example in *maˈnɛlay* ‘sour’ the stress is on the second syllable *nɛ*. Reduplication immediately precedes this, and also copies, beginning with the *n*. If the base were defined morphologically as the stem, we would expect it to copy starting with the *m*. Systems of this kind are very common throughout the Austronesian world, as well as elsewhere.

A second point is that reduplication typically copies epenthetic segments in the base, which are generally believed not to have any morphological affiliation (Axininca Campa, see McCarthy & Prince 1993 for discussion).

A third point is that reduplication does not always stop at the morphological boundary. Neighboring affixes can be integrated into the base and be (partly) copied as well. The following examples are again from West Tarangan.

(6)	las-ay	lasalasay	‘three-3p’
	ka-y	kaykay	‘four-3p’

In both of these cases it can be seen that the reduplication copies part of the third plural suffixes, along with the stem.

A special case of this ‘blurring’ of stem and affix boundary can occur when the reduplication and the affix are on the same side of the stem, e.g. when both are prefixal. In such cases it is possible for the reduplicant to sometimes go inside the affix and sometimes outside. An example of this kind comes from Chumash (Mester 1986, McCarthy & Prince 1995, data originally from Applegate 1976).

(7) **Chumash** (Applegate 1976)

a.	s+ceq	sceqceq	‘it is very torn’
	s+kitwon	skitkitwon	‘it is coming out’
b.	s+ikuk	siksikuk	‘he is chopping’
	s+iʃ-expec	ʃiʃexʃexpec	‘they two are singing’

The data in (7a) shows that the reduplication generally comes after the prefix right before the stem. However, as seen in (7b), if the stem is vowel initial the base will include the final consonant of the affix. Examples of this kind are found in West Tarangan as well, as seen in (8) below.

(8)	a.	nɔ-m-DUP-ˈtɛn	nɔmtɛnˈtɛn	‘prog.-2s.-DUP-cry’
		mɔ-DUP-maˈnam	mɔmanamˈnam	‘2s.-DUP-eat’
	b.	m-DUP-ˈakay	maˈmakay	‘2s.-DUP-climb up’
		m-DUP-ˈabak	maˈmabak	‘2s.-DUP-pluck’
		m-DUP-ˈɔy	mɔyˈmɔy	‘2s.-DUP-go’

With consonant initial bases the second singular prefix *m(ɔ)-* appears before the base in the reduplicated forms as seen in examples (8a). With vowel initial bases the prefix is included in the base, and is copied as well. This is seen in (8b). Another effect of a similar kind is found in many Austronesian languages, which have a prefix that undergoes *nasal substitution*. West Tarangan shows data of this type as well.

(9)	a.	sin + talar	siˈnalar	‘sitting’
		sin + sir	siˈnir	‘speech’
	b.	sin + DUP + tor	sinorˈnor	‘constantly calling’

As the data in (9a) show, whenever the nominalizing prefix *sin-* is prefixed to a stem beginning with an alveolar, the initial consonant is lost, and in its place appears the final nasal of the prefix. However, when the stem is also reduplicated, this nasal ‘substitute’ is found in both parts of the reduplication, as (9b) demonstrates.

That this type of data is quite problematic for derivational theories was first pointed out by Bloomfield (1933). The problem is that the order of the affixes seems to indicate that the reduplication is applied ‘first’. If we do this the reduplicated form for ‘call’ will be *tortor*. But now addition of the nominalizing prefix and subsequent nasal substitution, will wrongly predict the form **sinortor*. This seems to indicate that the nasal substitution must already have applied when reduplication occurs.

All of this makes it clear that the base is not defined morphologically, though this is not to say that morphology plays no role in determining the base. Rather it seems that a morphological constituent, commonly a root/stem, serves as the rough target. (Affix reduplication is attested as well. For an example from Amele, see Roberts 1991.) Exactly how this mediation happens is a topic that I will address in chapter 4.

A point that should be equally obvious from this discussion is that the base is not the same as the unreduplicated form. I will refer to the latter as the BASEFORM. I will refer to the full form which includes the reduplication as the REDUPLICATED FORM (also REDFORM). With this terminology established, I will now turn to the discussion of multi-pattern reduplication.

1.2.2. The dupleme/alloduple distinction

Among languages that have multiple patterns of reduplication two basic types of systems can be distinguished. In one type of system, the patterns are distinct in their use. Each pattern corresponds to one or more functions, but the patterns do not overlap in their function(s). The patterns therefore constitute separate morphemes. In this type of system it is possible for a base to reduplicate according to several of the patterns. I will call the patterns in such a system DUPLEMES.

In a second type of system, the patterns are typically used for the same function, or functions, but for any given base only one pattern is possible. The patterns are in complementary distribution, and are thus akin to allomorphs. The set of patterns forms a unit, as far as the function is concerned, and this unit can be identified with a dupleme. Since the individual patterns are different instances of the same dupleme, following a familiar naming convention I will call them ALLODUPLES. In this type of system the choice of alloduple is frequently prosodically determined.

To illustrate let us consider the following data from Sawai, a language spoken on Halmahera in Maluku, Indonesia.

(10) **Sawai** (Whisler 1992)

a. Cɛ	gɛlay	gɛgɛlay	‘to scream’ -> ‘wailing’
b. CɛC	lɛsɛn	lɛslɛsɛn	‘to sweep’ -> ‘broom’
c. …C	gali	falgali	‘to help’ -> ‘to help one another’

functions: (a) duration — (b) nominalization — (c) reciprocal

The language has three patterns of reduplication: (a) copy the first C, (b) copy the first and the second C, (c) copy only the second C of the base. Patterns (a) and (b) always appear with a fixed vowel [ɛ], while (c) always appears with the prefix *fa*. All three patterns apply to verbs and adjectives, and it should even be possible for a single lexical item to exhibit all three of the patterns, though Whisler reports that pattern (a) is rather rare. The choice of pattern is determined by the desired function: (a) adds a meaning of duration, (b) nominalizes a predicate, and (c), in conjunction with the *fa* prefix, turns a verb into its reciprocal form. Thus while such forms are not available in Whisler's data in constrast to *lɛslɛsɛn* ‘broom’ we would expect forms such as **lɛlɛsɛn* ‘to sweep for hours’, and **faslɛsɛn* ‘to sweep each other’. The three patterns in (10) are contrastive and represent three different *duplemes.*

It is interesting to contrast the system of Sawai with that of Doka Timur West Tarangan, a second dialect related to Kalar-Kalar West Tarangan discussed above. [I will henceforth abbreviate West Tarangan, WT]. Superficially, the patterns exhibited by Doka Timur WT are strikingly similar to those of Sawai, except for the different default vowel[1]. Note that the three patterns apply to verbs and adjectives, but also to other word classes as well.

(11) **Doka Timur West Tarangan** (Nivens 1992, 1993)

a. Ci	ˈlɔir	li̲ˈlɔir	‘clean-3s’
b. CiC	ˈlet-na	l̲i̲t̲ˈletna	‘male-3s’
c. …C	ɛ-laˈjir	ɛlar̲ˈjir	‘3s-white’

functions: (a,b,c) nominalization, negative agreement, plurality, and others

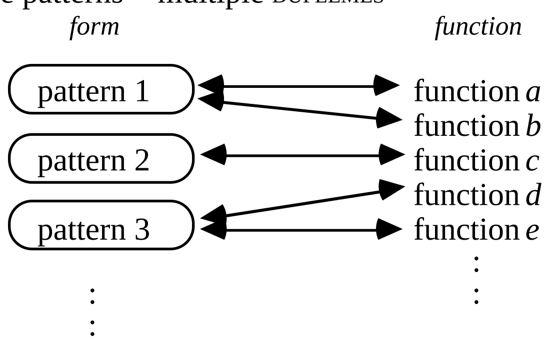
Despite the similarity of the patterns, the Doka Timur WT system is quite different from that of Sawai. In Doka Timur WT all three patterns are used for all of the possible functions of reduplication. These functions include nominalization, subordination, and formation of ordinal numbers, among others. However for any given base only one of the three patterns is available. Even if the base requires reduplication for more than one function the same pattern is used for all functions. Which pattern is appropriate for a given base is determined *prosodically*: (a) is chosen, if there is only one consonant, or when the second consonant does not immediately follow the first vowel. If there is a second consonant immediately following the vowel, then (b) is chosen. Pattern (c) is appropriate, if there is an open syllable immediately preceding the main stress. These patterns are in complementary distribution, and since they all cover the same functions, they are all *alloduples* of a single dupleme.

The following diagrams will help to illustrate this distinction. Example (12) gives a diagrammatic representation of a language with multiple duplemes. Sawai was seen to

[1]The default vowel in Doka Timur WT actually varies between *i* and *a*, with *a* appearing with forms that show plural agreement, and *i* elsewhere. See section 4.2.2.4 for a detailed discussion and analysis.

be of this type.

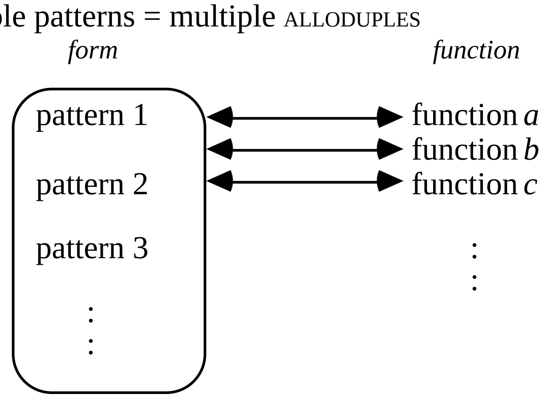
(12) **Type I**: multiple patterns = multiple DUPLEMES



In this type of system each reduplication pattern corresponds to a different usage. In such a system, the choice of pattern is made on morphological (or morpho-syntactic) grounds.

Diagram (13) shows a system with multiple patterns where the patterns correspond to different alloduples. Doka Timur WT is a representative example.

(13) **Type II**: multiple patterns = multiple ALLODUPLES



In a system with multiple alloduples, the choice of pattern is often made on phonological grounds. However, the choice can also be in part, or completely, lexicalized.

These two types of systems are not mutually exclusive. Both can be combined in a single language. For example, Doka Timur WT has a further reduplication pattern in addition to the dupleme shown in (11). This form of reduplication is apparently restricted in use to plural agreement for stative predicates:

(14) **Doka Timur WT plural agreement for stative predicates**

kuran-ay	kakuranay	'few-3p'	(cf. karkuranay)
balin	babalin	'wet'	(cf. balbalin)

In contrast to the dupleme in (11), this one has only a single alloduple, consisting of a C*a* pattern for all stems, regardless of their prosodic shape. Thus for example *kuranay* 'few-3p' reduplicates as *<u>ka</u>kuranay*. Note that if stative predicate agreement used the dupleme seen in (11) we would expect **<u>kar</u>kuranay*.

This concludes the typology of multi-pattern reduplication. I now turn to the theoretical background which will permit us to give an account of such systems.

1.3. Overview of Optimality Theory

The theoretical framework used by McCarthy & Prince (1993 et seq.) for their description of reduplication is that of Optimality Theory (Prince & Smolensky 1993).

1.3.0.1. Constraints as tendencies

Work on universals and typology recognizes the prevalence of certain phonological patterns. Generally such statements do not carry across languages, except as tendencies. For example, a constraint stating that syllables should not have codas (NoCoda, Prince & Smolensky 1993) is surface true in some languages, for example Fijian, or Swahili. This constraint is clearly false, however, in most languages. For example, it does not hold of English, among others. Nevertheless effects of such a putative constraint are observable, even in English. For example in a VCV configuration the syllabification is always V.CV, and not VC.V, in deference to the principle NoCoda.[2]

A second example showing the same point is provided by the distribution of geminates, i.e. clusters of identical consonants. Geminates are not permitted in many languages, and we can formulate a constraint barring their existence (NoGeminate). This constraint holds absolute in a language such as West Tarangan. In West Tarangan, geminates that would be created through concatenation, reduplication, etc., are eliminated in favor of single consonants. The constraint NoGeminate describes a fact of West Tarangan, in addition to giving expression to the known markedness of such structures.

In English too geminates are reduced. But only in level one morphology (i[m]oral), not in level two morphology (u[nn]erving) or compounding (roo[mm]ate). Clearly then NoGeminate is false in English. But to say that NoGeminate is wholly absent from English grammar misses the generalization that it is observed for the most part.

While geminates might be considered marginal in English, this is clearly not the

[2]Other principles, such as that requiring onsets, have the same effect.

case in Japanese, where geminates carry a significant functional load, distinguishing such minimal pairs as *saka* ‘slope’ from *sakka* ‘author’. Nevertheless, even in Japanese geminates reveal their markedness in a number of ways. For example, certain segments are never geminated (*r*, *y*, *w*). Others, such as the voiced stops, are only geminated in certain strata of the vocabulary. But even the geminates that occur in the language can be shown to be marked.

In Japanese loanwords borrowed from English, geminates occur following vowels that correspond to lax vowels in the source language: (Iwai 1989, Wade 1996, Itô & Mester 1996)

(15)	ji**pp**aa	‘zipper’
	ra**kk**ii	‘lucky’
	pura**tt**ohoomu	‘(train) platform’

The data in (15) shows how Japanese adapts English words which contain a lax vowel. Whenever a syllable in an English word contains a lax vowel, the corresponding syllable in the Japanese loan is closed with a geminate. However in cases where this would lead to two geminates in the same word, this situation is avoided.

(16)	pi**k**unikku	‘picnic’	*pikkunikku
	po**k**etto	‘pocket’	*pokketto

Even though the English donor words contain two lax vowels each, only one of the corresponding vowels in the Japanese loans is followed by a geminate. Apparently structures with two geminates are marked even though otherwise geminates are freely available. This seems to indicate that in Japanese NoGeminate is not simply ‘turned-off’.

Both of these examples point to the existence of constraints that, while clearly not surface-true in many languages, nevertheless seem to have effects as tendencies in such languages. Thus we can say that NoCoda is a constraint in Fijian, but merely a tendency in English. Similarly NoGeminate is a constraint of West Tarangan, but only a tendency in Japanese.

1.3.0.2. Tendencies as constraints

The researcher committed to the existence of constraints such as NoCoda or NoGeminate is faced with a dilemma. If the language-particular nature of such constraints is accounted for by means of a parameter that is on/off, then the predictive force of the constraints is lost in languages where the parameter is off. Alternately the constraint might be declared universal, but only in its ‘core’ form, the universal common denominator. This waters down the predictive power of constraints to nothing, making them useless. This would seem to relegate the constraints to the status of extra-linguistic truths.

Prince & Smolensky (1993) [henceforth P&S] develop a model that permits a formalization of tendencies as constraints. In their Optimality Theory framework [henceforth OT] they begin by defining the notions of constraint VIOLABILITY and RANKING:

> Violability
> Constraints are violable; violation is minimal.
>
> Ranking
> Constraints are ranked; minimal violation is defined in terms of the ranking.

These principles permit the incorporation of NoCoda into the grammar as a constraint. As a result, we can give a formal explanation for the preference of the syllabification V.CV over VC.V: the latter violates NoCoda, but not the former. At the same time, we also have an account of why a language such as English still permits a word like *cat*. English contains the constraint NoCoda, but it is violable. A higher ranking constraint demands the presence in the output of the offending *t*.

A useful distinction, is that between a *tendency* and a *surface true* constraint. We are now in a position to give formal content to this distinction. A constraint *c* is surface true if it outranks all other constraints. In this case we say that *c* is UNDOMINATED. A constraint *c* is a tendency if it is ranked below some other constraint.

1.3.1. Constraint violability

Most work in phonology was done in terms of rules. As a simple example consider again the case of geminate reduction in West Tarangan. Whenever two identical consonants come together in WT as a consequence of affixation or reduplication, they are systematically simplified to a single consonant. For example:

(17)	a.	tɔp	tɔptɔp	‘short’	
	b.	raray	rararay	‘hot’	*rarraray
		i-bɛbar	i-bɛbɛbar	‘3s-afraid’	*i-bɛbbɛbar

Normally in WT, reduplication copies the first CVC of the base. An example of this kind is seen in (17a). For a baseform like *raray* ‘hot’(17b), this type of reduplication would lead to a geminate cluster since the final C of the projected reduplicant would be identical to the first consonant of the base. In order to account for the failure of this consonant to materialize we could have written the rule:

(18) $C_i \rightarrow \varnothing$ / ___ C_i

This rule would have to apply after reduplication has occurred. In OT this same situation is handled with a constraint. For example in order to bar geminates we would posit a constraint NoGeminate:

(19) NoGeminate
*C_iC_i

So much is straightforward. What about reduplication? Let's assume there is a constraint, or set of constraints that force copying of the first CVC of the base. Much attention will be devoted to the proper formulation of this requirement in following chapters. A purely informal characterization will suffice for present purposes.

(20) Reduplicate-CVC (West Tarangan)
'copy the first CVC of the base'

Now for examples such as those seen in (17b), both constraints can't hold at the same time. This situation is what P&S call a CONSTRAINT CONFLICT. Whenever there is a constraint conflict it must be resolved. It will be resolved in favor of one, or the other constraint. Of the constraint that gives, we say that it is violated. In this case, NoGeminate is the winner, while Reduplicate-CVC is violated.

1.3.2. Constraint ranking

The previous example contains an insight which represents a fact about West Tarangan. The ban on geminates is more important than the imperative to copy the first CVC of the base. OT permits us to capture this insight by means of CONSTRAINT RANKING. Using the symbol '>>' to express the ranking relationship, we can write:

(21) NoGeminate >> Reduplicate-CVC

This reads 'NoGeminate is ranked above Reduplicate-CVC'. And as justification for this fact we can cite the lack of existence of a form **<u>rar</u>raray*. OT provides a handy way of representing this situation, through the device of the CONSTRAINT TABLEAU.

(22)

input: /RED + raray/	NoGeminate	Reduplicate-CVC
a. ☞ rararay		*
b. rarraray	*!	

In (22a) we have the actual reduplicated form for WT 'hot', while in (22b) we have the non-existent form with a geminate. These are the CANDIDATES; in this case, potential reduplicated forms. Each column represents a constraint, and the order left to right represents the ranking of these constraints. Now the asterisk in the first column in the row of candidate (b) indicates that this candidate violates the constraint NoGeminate. Since there is another candidate that does not violate this constraint, this violation is fatal, and this is marked by the exclamation point '!'. Since there are no more competing candidates, candidate (a) is declared the winner, and marked by the '☞' symbol. The fact that there is another constraint which (a) violates is irrelevant, since it is ranked below NoGeminate, and this irrelevance is indicated by the shading.

One should not be misled into thinking that the irrelevance of Reduplicate-CVC in tableau (22) means that this constraint can be dispensed with entirely. In contexts where it does not conflict with NoGeminate, its effects are quite palpable.

(23)

input: /RED + tɔp/	NoGeminate	Reduplicate-CVC
a tɔtɔp		*!
b.. ☞ tɔptɔp		

In a form such as *tɔp* 'short' a CVC reduplicant does not lead to a geminate. This means that the constraint NoGeminate will not rule out either candidate (a) or candidate (b). Therefore the decision between these possiblities falls to the lower ranked constraint.

If we simply posited ad hoc constraints and described situations in terms of constraint conflict and violation, we would have gained little. This brings up two important points: First, the set of constraints is *universal.* All constraints are present in every language. The second is that the language particular component of the grammar consists of a ranking of these universal constraints. Note that by the standards of the first requirement constraint (20) will have little hope. We must seek some alternate means to account for the shape of the reduplicated form in WT.

A further point is that of how we obtain the candidates. The answer is: anything goes! Anything that is a possible phonological change can happen. Since we do not see change happen willy-nilly, a particularly useful type of constraint are the FAITHFULNESS CONSTRAINTS (Prince & Smolensky 1993) [often simply referred to as FAITH]. These are the equivalent of the requirement 'procrastinate' of the Minimalist program (Chomsky 1995).

Whenever we see an alternation we know that a faithfulness constraint has been violated. Since there must be some phonotactic reason for the alternation we have the following very general ranking schema:

(24) phonotactic >> Faith

Since the phonotactic is ranked above Faith, it can force violation of the imperative to do nothing. The result is phonological change, and since we can see effects of the phonotactic in the language, we say that the phonotactic is active.

1.3.3. Factorial typology

If all constraints are present in every language, and only the ranking is language particular, assuming that there are *n* constraints, we predict *n*! possible grammars. And this is exactly the prediction that the theory makes, at least in the general case. A point that follows from this is that for every language with an implementation of the schema in (24), there is a potential language with the opposite ranking (25).

(25) Faith >> phonotactic

This ranking says that the imperative to do nothing is more important than that to obey the phonotactic. The effects of the phonotactic are not observed in the language. It is *inactive*.

1.3.4. Stampean Occultation

In a previous example we successfully accounted for the fact that West Tarangan reduces geminates that occur through reduplication. Geminates that arise through affixation are also reduced:

(26)	/tin + na/	tina	'itch-3s.'	*tinna
	/guyak + ka/	guyaka	'deaf-2s'	*guyakka

This fact can be accounted for by ranking NoGeminate above Faith since clearly the imperative to remove the marked configuration that geminates represent, is more important than the faithful realization of underlying material. This gives us the following ranking which is an instantiation of the general schema in (24).

(27) NoGeminate >> Faith

But now we also note that it is a fact of WT that there are no geminates at all. Of course the fact that there are no geminates will surely mean that there are no underlying forms containing geminates. If this is all we have to say in the matter, then this will not be much of an explanation. What then might happen if we slip in a form, accidentally, which contains a geminate, a hypothetical example: *sakka.* Well surely, if this form is ever to be realized, it must run the gauntlet of constraints which constitute our grammar, including those in (27). The tableau which records this encounter is shown next.

(28)

input: /sakka/	NoGeminate	Faith
a. sakka	*!	
b. ☞ saka		*

When our hypothetical example comes across the constraints in (27) it will come up against a candidate just like (28b). Candidate (b) has a problem. It does not faithfully realize the underlying form. But candidate (28a), which faithfully realizes the geminate, has an even bigger problem. Since it realizes the geminate, it violates NoGeminate and loses to its competitor (b) which does not. Thus we see that an underlying form with a geminate, will undergo geminate reduction, just as any other geminate would. No geminates will surface. But if no underlying geminate ever surfaces, no harm will come from having such geminates in an underlying form. At the same time we might ask: why bother?

The net result of this discussion is that the very same ranking, (27), which accounts for geminate reduction in derived forms can also account for the lack of geminates in the language as a whole. It even accounts for the lack of underlying forms containing geminates, though that part of the argument is an abstract one. But this is as it should be. There is no point in debating the content of underlying forms, they are beyond reach. Only the surface patterns are real.

In employing the very same ranking to account both for alternations, as well as for patterns in the inventory, OT follows a path similar to certain rule based frameworks, most notably the Natural Phonology of Stampe (1973), hence the name for the effect: *Stampean Occultation*.[3]

1.3.5. Lexicon Optimization

This approach has consequences for the notion of underspecification. Since a

[3]Another examaple of a rule-based framework that does this, is the 'Persistent Rules' framework of Myers (1991).

derivational framework relies on rules to capture generalizations, it has often been argued that redundant, and hence predictable, information must crucially be underspecified.

In OT however, we have just seen that generalizations are captured in the grammar, and enforced *in the output*. Thus an underlyingly underspecified form has no advantage over an underlyingly specified one. And since our constraints say nothing about the input, it is not possible to guarantee anything about the input either, including whether it is underspecified or not. The idea that the input could potentially contain any one of a multiplicity of forms that all converge on the same output is referred to as RICHNESS OF THE BASE (P&S).

While richness of the base says that any one of a multitude of possibilities could be the underlying form for a given surface form, this does not mean that they all are underlying forms, or even that the underlying form is indeterminate. As P&S discuss, and Itô, Mester & Padgett (1995) show in detail, the same grammar that predicts the correct surface form, can also predict the optimal underlying form. This can be demonstrated with the help of a simple example.

In an earlier example we saw that in WT an underlying form /sakka/ would need to surface with the geminate reduced as [saka]. On the other hand an underlying form /saka/ needs no particular adjustment, and can surface as [saka]. Since both of these forms have identical surface forms, they can be compared with the help of a very tableau-like device that Itô, Mester & Padgett call the 'tableau des tableaux'.

(29)

	input	output	NoGeminate	Faith
a. ☞	/saka/	☞ [saka]		
b.	/sakka/	☞ [saka]		*!

Unlike the tableaus seen so far, here the candidates consist not merely of output forms for a given input, but rather of input/output pairs. Despite this difference the evaluation is exactly the same. Candidate (29b), the winning form from tableau (28), violates Faith, since the output deviates from the input. Candidate (29a), where the input and the output are identical, does not, and it is therefore judged superior. This tells us that, all else being equal, /saka/ will be the preferred input form, for the output [saka].

This concludes the outline of OT. Before turning to the question of how OT can account for reduplication in particular, I conclude this section with a discussion on how to evaluate constraint violations.

1.3.6. An excursus: determining the winning candidate

In OT as it is currently practiced, violation (figured as marks) are always calculated negatively and always in an absolute fashion. This is not the only way things could be done, and depending on how things are done we get very different results.

I will now discuss two different variant ways of mark calculation. First I will discuss positive counting, in contrast with the negative counting that is standard. Then I will contrast the commonly used absolute counting method with relative counting.

1.3.6.1. Negative vs. Positive calculation of marks

A typical constraint that can serve to illustrate negative mark calculation is the constraint Max-BR (McCarthy & Prince 1993, 1994ab, 1995), which is used to force reduplication.

(30) Max-BR (informal)

All segments in the base of reduplication must be copied in the reduplicant

A point about Max-BR that to my knowledge has not been noticed in the literature, is that it can be satisfied in two ways. The 'obvious' way to satisfy Max-BR is to copy everything in the base, thereby leading to an increased reduplicant R. We might call this the MAX-R effect. A second way to satisfy Max-BR is to eliminate segments that need to be copied, decreasing the base B. This can be called the MIN-B effect. However, the name clearly implies that the desired effect is Max-R, and not Min-B, or else the constraint would be called 'Min-BR'!

In general the constraint in (30) does lead to a Max-R effect. The reason for this is that other constraints present in the grammar will work against the Min-B effect. However in chapter 4, I will show that under certain circumstances the Min-B effect is active as well, and that this is an equally important function of this constraint.

The dual nature of the constraint Max-BR follows from the way marks are counted. Under the standard interpretation a constraint requires a certain configuration, and if this configuration is not met, a mark is incurred. The candidates' lists of marks are compared against each other, and the one with the fewest marks wins. Thus marks are penalties. In the case of Max-BR, in order to calculate the marks we must delimit some target, the base, and then for each target segment that the reduplicant fails to copy a mark is added.

It is the defining of the base constituent that gives us the Max-R effect.

(31)

input: /RED + badupi/	Max-BR
a. ☞ <u>badupi</u>badupi	
b. <u>badu</u>badupi	**!
c. <u>ba</u>badupi	****!

This tableau shows how the standard conception of violation counting drives towards maximization of the reduplicant, and hence total copying. In this hypothetical example a form *badupi* is defined as the base. Marks are calculated for any segment of this base that is not mirrored in the reduplicant (indicated by underlining). In candidate (a) every segment is copied, and so there are no marks. In candidate (b) the final *pi* of the base is not present in the reduplicant, and so it incurs two marks. Correspondingly (c) incurs four. Candidate (a) has the fewest marks and is recognized as best.

The next tableau shows the Min-B effect.

(32)

input: /RED + badupi/	Max-BR
a. <u>ba</u>badupi	****
b. <u>ba</u>badu	**
c. ☞ <u>ba</u>ba	

The standard counting method favors reduplicated forms where the base is minimized in an effort to make the reduplication 'total'. Note also that the winner in this tableau is judged on a par with the winner in tableau (31) above. The decision will need to be made by some other constraint

Another way of calculating marks would be to count positive marks. Instead of marks as penalties, we have marks as rewards. Under this conception the evaluation of Max-BR will be slightly different, and I will indicate this by superscripting Max with a '+' (Max^{+}-BR). Max^{+}-BR assigns marks to candidates depending on how many segments are in R. The winner will now be the candidate with the *most* marks. One advantage to this way of doing things is it obviates the need for defining the base. This is good because the definition of base can be rather problematic. Especially the 'far end' of the base can be very difficult to determine. And it is exactly because there is no definition of base in this counting method, that it gives different results. In particular it does not lead to a

Min-B effect. This can be verified with the help of the following tableaux.

(33)

input: /RED + badupi/	Max^{+}-BR
a. ☞ badupibadupi	☺☺☺☺☺☺
b. badubadupi	☺☺☺☺
c. babadupi	☺☺

This tableau shows the same candidate set as that in tableau (31). However in this case Max is evaluated by the positive count method. The same candidate emerges victorious, namely the candidate which maximizes the reduplicant.

Finally we have the tableau corresponding to tableau (32) under the negative count method.

(34)

input: /RED + badupi/	Max^{+}-BR
a. babadupi	☺☺
b. babadu	☺☺
c. baba	☺☺

Since the marks are a record of absolute achievement rather than of failure to meet a target, and the reduplicants are the same size for all candidates, all candidates receive the same number of marks. Among this candidate set there is no winner, or all are winners. However the winner of tableau (33) bests all candidates in this tableau, and is thus the preferred form out of the lot.

1.3.6.2. Absolute vs. Relative calculation of marks

Both the negative and the positive mark evaluation methods discussed above are absolute. The constraint defines the marked configuration once and for all, the candidates are scanned for this configuration, and violations are chalked up whenever the configuration is found. In contrast to this there is also the possibility of assigning marks by the relative method. Under this interpretation it is not the quantity, but rather the quality of the marks that determines which candidate is best. This type of evaluation is not unknown in OT work. The best known example is the interpretation of HNUC used in the analysis of Imdlawn Tashlhiyt Berber in P&S (Chapter 2). Another example that will serve to show this is the constraint Parse-σ.

(35) Parse-σ

syllables must be footed

As it is formulated the constraint in (35) will penalize all unfooted syllables equally. Now consider the following two schematic forms:

(36) a. [σ ($\bar{\sigma}$) σ]

b. [σ (σ σ) σ]

Both of the ‘words’ in (36) have two unfooted syllables. They will thus be evaluated identically by Parse-σ. However the status of these unfooted syllables is very different. Example (a) shows a form with three syllables. The middle is heavy and can thus form its own foot, leaving the two syllables at the edges ‘stranded’. But nothing can be done about this, short of doing harm to higher principles of prosodic organization.

Example (b) is quite similar. It also has two unfooted syllables at the edges. But here the similarity ends. The middle in this form is taken up by two light syllables, and these syllables form there own foot. Note that in contrast to form (a) there is a simple way to satisfy Parse-σ in this case: we simply need to replace the foot bracketing the middle with two feet, one encompassing the first two syllables, and another for the last two, giving [(σσ)(σσ)]. However, the availability of this structure does not affect the evaluation of Parse-σ. The relative ‘footability’ of the syllables under its purview, has no effect on its evaluation

1.4. The Correspondence based theory of reduplication

As was pointed out in section 1.2., reduplication is often regarded as a form of affixation. The theory of McCarthy & Prince (1993, 1994ab, 1995) [henceforth M&P] takes this position. If reduplication is an affix however it must obviously differ from other affixes in some respect, since, unlike other affixes, its realization is different in every context.

The relevant difference follows as a consequence from this very observation. Because reduplication is realized differently in every context, it cannot have any underlying specification. Thus, M&P argue, it must consist of nothing, but the *empty morpheme* RED. From this fact alone, implemented in an OT framework, all other properties follow. To understand how this is so, we must return again to the question of how the realization of underlying forms is handled in OT.

1.4.1. Faithfulness as a correspondence relation

In my previous discussion of the constraints that regulate the faithful realization of underlying forms (Faith), I treated them as a single, unanalyzed constraint. That conception is too simplistic. All work in phonology recognizes a number of different ways to alter a form, usually at least: deletion of segments, insertion of segments, and featural change. OT recognizes these three types as well. The constraints proposed to handle these three cases are (cf. M&P 1994b, 1995):

(37) **Faithfulness Constraints in OT** (informal)

MAX [P&S 'Parse']
'deletion of segments is prohibited'

DEP [P&S 'Fill']
'insertion of segments is prohibited'

IDENT(Feature)
'change of [Feature] is prohibited'

Of course we also need a way to determine whether these constraints have been violated. To handle this aspect M&P posit the existence of a *correspondence relation* [$\mathfrak{R}$] between an underlying, or lexical, form [L], and a surface candidate [S]. This can be understood with the help of the following diagram:

(38) **Faithfulness as a correspondence relation** (M&P 1994b, 1995)

lexical form: k_1 $ɔ_2$ l_3 a_4 t_5

$\updownarrow$ $\updownarrow$ $\updownarrow$ $\updownarrow$ $\updownarrow$

surface form: k_1 $ɔ_2$ l_3 a_4 t_5

This relation pairs segments from the lexical form, with the segments of the surface form, as indicated by the subscripts. Since correspondence is a relation, it can of course be incomplete, in the sense that not all segments in the lexical form need be paired with segments in the surface form, and vice versa. Alternately lexical segments can be paired with more than one surface segment, and vice versa. Thus faithfulness can be understood as a set of wellformedness constraints on the relation $\mathfrak{R}$, requiring it to be as close to a bijective, biunique function as possible. This allows a formal definition of the constraints in (37).

(39) **Faithfulness Constraints in OT** (cf. M&P 1994b, 1995)

MAX-LS

$\forall x\ [(x \in \mathrm{L}) \Rightarrow \exists y\ ([y \in \mathrm{S}]\ \&\ [\langle x, y\rangle \in \mathfrak{R}])]$

'every lexical segment corresponds to some surface segment'

DEP-LS

$\forall y\ [(y \in \mathrm{S}) \Rightarrow \exists x\ ([x \in \mathrm{L}]\ \&\ [\langle x, y\rangle \in \mathfrak{R}])]$

'every surface segment corresponds to some lexical segment'

These two constraints together will ensure bijectivity. Max-LS will require that all the lexical material be mapped onto surface material, i.e. that underlying material be realized. Dep-LS makes sure that no surface segment is without an underlying counterpart. In other words, it prohibits epenthesis.

Biuniqueness is another matter. Two cases need to be distinguished. The first is when a single segment realizes two underlying segments. This is coalescence, and a number of people have independently suggested the need for a constraint prohibiting this (see Lamontagne & Rice 1995, McCarthy 1995, Pater 1995). However in the cases discussed the coalescence of segments always violates a number of other constraints as well, generally the imperative to preserve the features of one, or both of the segments. A case of 'pure coalescence' would need to involve degemination, and would of course be undetectable when compared with deletion.

The second half of biuniqueness is the case when an underlying segment is realized twice. M&P (1995) formulate a constraint against this, which they call INTEGRITY. They suggest that a case where this might be violated is diphthongization. A related idea, though proposed in a derivational framework, is that of 'Fission' (Calabrese 1988). Generally, however, multiple realization of a single underlying segment might simply be ruled out by the imperative to avoid unnecessary structure (*Struc).

Thus both of these putative constraints are considerably less useful than the constraints in (39), as well being more likely to be redundant. I will return to this question.

In order to formalize Ident(Feature), we need a model of features. One simple possibility is to assume that features are properties of segments. The feature bundle that makes up a segment can then be defined as a set of functions FEAT from the set $\{\mathrm{L} \cup \mathrm{S}\}$ to an approprate set of values. Then Ident can be defined as follows:[4]

[4]One way in which this model might be inadequate is that it does not allow Ident(+Feat) and Ident(–Feat) to be ranked independently.

(40) **Featural Identity** (cf. M&P 1994b, 1995)

IDENT(f: $f \in$ FEAT)

$\forall x\ \forall y\ [(x \in \mathrm{L})\ \&\ (y \in \mathrm{S})\ \&\ (\langle x, y\rangle \in \Re)] \Rightarrow [f(x) = f(y)]$

As formulated there will be an Ident constraint for every feature. Thus Ident is not a single constraint but rather constitutes a *constraint family.*

So far so good. But there is another piece of information contained in a phonological form. After all, a form is not just a set of segments. At a minimum, it is a string. This means that in addition to the information about its content, we must also know something about its organization. To account for this M&P propose another group of constraints. I will postpone discussion of these constraints until we consider how this system accounts for reduplication.

1.4.2. Correspondence and reduplication

Since RED, the empty morph, is born without any segmental material it cannot be subject to the constraints in (39) and (40), so M&P argue. How then do they ensure that it is realized as reduplication? To account for this they posit that there is a correspondence relation between base and reduplicant, *analogous*, but not identical, to the one between underlying and surface form

(41) Reduplication as a correspondence relation $\Re_{BR}$: $B \leftrightarrow R$

$\underline{k_1\ ɔ_2\ l_3\ a_4}\ \ k_1\ ɔ_2\ l_3\ a_4\ t_5$

We say for any element $b \in B$, $r \in R$, b corresponds to r iff $\langle b,r\rangle \in \Re_{BR}$

Since it is a separate but analogous relation, it has a separate but analogous set of wellformedness constraints. Thus parallel to the constraints in (39) and (40), there is a set of constraints that ensure that the segmental content is copied. I will call these the *substance* constraints:

(42) **Reduplication Wellformedness Constraints.** (M&P 1994ab, 1995)

Substance constraints

MAX-BR

Every element of *B* has a correspondent in *R*

‘copy every segment in the base’

DEP-BR

Every element of *R* has a correspondent in *B*

‘only copied segments in the reduplicant’

IDENT(F)-BR
Corresponding elements in *B* and *R* have identical values for feature F

Analogous to the lexical/surface dimension there is also a set of constraints which ensure that the organization of the segmental material is maintained. While I skipped discussion of the equivalent constraints in the L-S dimension, it will be important to consider these now. M&P propose that three constraints are responsible for maintaining the organization of the segments.

(43) *Organization constraints*

ANCHOR(LEFT/RIGHT)-BR
The left/rightmost element in *R* corresponds to the left/rightmost element in *B*

CONTIGUITY-BR
Adjacent elements in *R* correspond to adjacent elements in *B.*

LINEARITY-BR
The linear order of elements in *R* is identical to the linear order of their corresponding elements in *B.*

The purpose of the individual constraints is as follows. Anchor, which comes in two varieties, one for each edge, ensures that copying begins immediately at the edge of the base. Contiguity makes sure that copying does not skip segments. Linearity guarantees that linear order is preserved in copying. The easiest way to understand the effects of these constraints is to consider cases where they are violated. Some relevant examples from a variety of Austronesian languages are provided below.[5]

(44)	*examples*	*constraint violated*	*explanation*
	kɔla kɔlat	*MAX-BR	[t] not present in reduplicant
	pa pui	*DEP-BR	[a] not present in base
	mak maaga	*IDENT(voice)-BR	no voicing on [k] in reduplicant
	tar puran	*ANCHOR(L)-BR	reduplicant does not start with [p]
	bo biso	*CONTIGUITY-BR	skipping of [is]
	puer pure	*LINEARITY-BR	linear order of [re] reversed

In some of the examples above more than one constraint is violated. For instance all of the examples save the last violate Max-BR, since they all constitute partial reduplication. In the example *kɔlakɔlat* total reduplication would mean a form **kɔlatkɔlat* . The missing *t* constitutes a Max-BR violation. In *papui* the *p* is copied but the *a* is

[5] *Language references and glosses*: Kalar-Kalar WT 'spoon'; Kola 'fruits'; Mangap-Mbula: 'you (sg) be drying up'; Rebi WT 'middle'; Nakanai 'members of the Biso sub-group'; Rotuman 'to rule'

obviously not present in the base. Thus it must constitute a Dep-BR violation. In *<u>mak</u>maaga* the *k* is a copy of the *g*, but it is not perfect, since the voicing has been altered. Such change violates Ident(voice)-BR. In *<u>tar</u>puran* the base is *puran*. Anchor(L)-BR expects copying to start promptly with the leftmost segment *p*, but the reduplicant copies from the 3rd segment *r*. In the example *<u>bo</u>biso* the first segment *b* of the reduplicant is a copy of the first of the base. But the next segment in the reduplicant *o* corresponds to the 4th (and last) in the base, skipping the intervening *i* and *s*. This type of omission is penalized by Contiguity. Finally, in *<u>puer</u>pure* the last two segments have been switched. This type of breach of order is not tolerated by Linearity.

As these examples demonstrate, each of the putative constraints on the wellformedness of the BR relation corresponds to an observed type of deviation from identity in reduplication. This forms an argument for the necessity of distinguishing these aspects of BR-Identity.

1.4.3. Extensions to the basic model

We have seen that M&P's framework for reduplication is based on the following assumptions:

- reduplication is an affix RED
- RED has no underlying segmental content, and is thus not subject to Faith-LS
- RED is subject to its own set of 'separate, but equal' faithfulness constraints

This basic setup leads to two parallel correspondence relations as was seen in the earlier exposition. M&P call this the BASIC MODEL. This model is sufficient in most cases.

However in a number of cases, such as Klamath (3) and Javanese (2), the reduplicant, seems to take its cue directly from the underlying form. This leads them to amend the basic model by positing a third relation between the underlying form and the reduplicant directly. M&P call the result the FULL MODEL.

(45) **'Full Model' of reduplicative correspondence** (M&P 1995)

lexical form: k$_1$ ɔ$_2$ l$_3$ a$_4$ t$_5$

LR Faith *LS Faith*

surface form: <u>k$_1$ ɔ$_2$ l$_3$ a$_4$</u> k$_1$ ɔ$_2$ l$_3$ a$_4$ t$_5$

BR Identity

Unfortunately the extension to the Full Model entails a loss of predictions that must be regained by stipulation. The relevant predictions involve the concept of Emergence of the Unmarked, which will be discussed in detail in the next chapter. The problematic aspects of the Full Model point to certain weaknesses in the assumptions underlying the basic model

- The idea that reduplication involves an affix is problematic. Unlike regular affixes reduplication is not subject to ordering generalizations. Its position is frequently dictated by prosodic considerations in a way not seen with segmental affixes. This will be discussed in detail in chapter 4.
- While it is true that reduplication does not have underlying segmental content in the way lexical items do, it does not automatically follow that it is not subject to Faith-LS. In fact such a requirement would need to be stipulated. I will show that a simpler, and more consistent theory results, if we assume that reduplication is subject to normal faithfulness constraints.
- Although there is plentiful evidence for the independence, and parallelism of the constraints Max and Ident in both the LS and the BR dimension, the same is not true for the other constraints. In particular, it is not true for the constraint Dep. This undermines the idea that there are two separate, but equal correspondence dimensions.

Instead of assuming, as do M&P, that reduplicated segments are exempt form the rigors of regular faithfulness, I will assume they are fully subject to them just as are any other segments. This means in particular that Dep-LS will require that they be associated with an underlying form. Since they do not have their own underlying form they will need to be associated with the underlying form of the segments that they copy. Thus the underlying form is in correspondence with both the reduplicant, and the base, in other words the entire *redform*. BR correspondence is internal to the redform. This assumption leads to the following model of reduplicative correspondence:

(46) **The Reduplicate! model of correspondence**

lexical form: k$_1$ ɔ$_2$ l$_3$ a$_4$ t$_5$

↕ *LS Faith*

surface form: <u>k</u>$_1$ <u>ɔ</u>$_2$ <u>l</u>$_3$ <u>a</u>$_4$ k$_1$ ɔ$_2$ l$_3$ a$_4$ t$_5$

BR Identity

Under this view, reduplication is double realization of underlying segments. This has no effect on the evaluation of Max-LS. While Max-LS demands that underlying material must be realized, it is indifferent as to whether this happens twice, or only once. For the same reason, Max-LS is powerless to enforce total copying. This requirement continues to be the duty of Max-BR. However BR-identity now becomes a matter internal to the redform.

According to the description given here, reduplication might seem to happen for free. The question to ask is then: what constraint or condition does reduplication violate? The answer to this question brings us back to the interpretation of faithfulness as a set of wellformedness conditions, forcing the correspondence relation to be as close to a bijective, biunique function as possible. The role of Max and Dep in this scenario is to enforce bijectivity. If an underlying element is assigned two surface elements, this does not violate bijectivity. It does, however, violate biuniqueness, more precisely, the constraint M&P (1995) call *Integrity.* Alternately one might equate this with the constraint *Repeat (NoEcho) of Yip (1995b). More generally however unnecessary reduplication, i.e. reduplication not forced by some constraint, might simply be ruled out by *Struc.

This concludes the basic introduction to the theory of reduplication. In the next chapter I turn to the first important result of the theory: the demonstration that this architecture leads directly to *emergence of the unmarked* in reduplication.

2. Emergence of the Un/Marked

A direct consequence of the theory of reduplication presented in chapter 1 is the formal implementation of the concept of the 'Emergence of the Unmarked'(M&P 1994ab, 1995). Originally due to Steriade (1988), the idea is that reduplicated forms show a much greater tendency towards unmarked structures than the language as a whole.

The central claim that will be defended throughout this thesis, is that all cases where reduplication shows a deviation from identity are the result of Emergence of the Unmarked. In particular, all cases of partial reduplication are the consequence of Emergence of the Unmarked (cf. M&P 1994b). Such cases have heretofore been argued to involve templates. I will argue that no such devices are necessary. Itô & Mester (1992) show this already for loanword truncation in Japanese, while Itô, Kitagawa & Mester (1996) do the same for the Japanese jazz musician's language Zuuja-go.

2.1. Emergence of the Unmarked

In the general exposition of OT we encountered the following, very general ranking schema, which says that a particular phonotactic constraint is inactive.

(1) Faith-LS >> phonotactic

In chapter 1 we argued that the reduplicative morpheme RED cannot have an underlying form, since it is realized differently in every context. If it does not have an underlying form, it does not have anything to be faithful to, and can thus not be subject to Faith-LS. But this means that no matter what its realization it will not violate Faith-LS. But if Faith-LS is never violated, then Faith-LS cannot force violation of the phonotactic constraint in (1). And in turn this will mean that only structures which do not violate the phonotactic—which are *unmarked* with respect to the phonotactic—can be realized. Thus the phonotactic in (1), which is normally inactive in the language, suddenly makes its presence felt in reduplication contexts.

It should also be recalled that in order to ensure copying of the base, reduplication has its own set of faithfulness constraints Faith-BR. In order that they do not override the effects of the phonotactic they must be ranked below the phonotactic. This gives the following general ranking schema for Emergence of the Unmarked (M&P 1993, et seq.):

(2) Faith-LS >> phonotactic >> Faith-BR

This proves to be an invaluable ranking. In order to see its effects let us consider some examples.

2.1. 0.1. Example I: NoEcho in Boumaa Fijian reduplication

Boumaa Fijian (Dixon 1988) reduplicates a foot as a prefix. This foot can consist either of two light CV syllables (3) or a heavy CVV syllable (4).

(3)	ðula	ðulaðula	‘sew’ -> ‘sew for a period’
	butaʔo	butabutaʔo	‘steal’ -> ‘steal on a number of occasions
	talanoa	talatalanoa	‘tell stories’ -> ‘

In these examples the unreduplicated stem always begins with two light syllables. Since the reduplicant must be a foot in size, and two light syllables can form a foot in Fijian, the reduplicant copies these syllables faithfully.

In the next set of examples the stem begins with a heavy CVV syllable.

(4)	maarau	maamaarau	‘be happy’ -> ‘be permanently happy’
	^{ŋ}goolou	^{ŋ}goo^{ŋ}goolou	‘shout’ -> ‘shout for an extended period’

A heavy syllable is also a possible foot in Fijian. Since copying such a heavy syllable fills the foot requirement, this is all that is copied. Let us assume for the moment that there is some constraint, or set of constraints, that can account for this requirement. We can call this requirement ‘Foot’. (I will return to the question of how to account for such requirements in the next section.) Since ‘Foot’ is strictly observed it must outrank the desire to copy the entire base, i.e. Max-BR. A representative tableau is shown in (5).

(5)

input:	/RED + ðula/	‘Foot’	Max-BR
a. ☞	ðulaðula		
b.	ðuðula	*!	la
c.	ðuuðula		la!

As seen here candidate (5b) which only copies the first light syllable violates the foot requirement. It is therefore not optimal. Candidate (5c) tries to make up for this failing by lengthening the vowel of the only syllable. It succeeds in fulfilling the foot requirement, but it fails in other respects. For example it does not copy as much of the base as it could. There is however another candidate (5a) which copies the first two light syllables, which means the entire base in this example, thus satisfying ‘Foot’, as well as Max-BR. Not surprisingly it is judged best.

Now consider the data in (6), where the stem consists of two identical light syllables. Since the stem begins with two light syllables we would expect reduplication to copy both. But this is not what happens. Instead only one syllable is reduplicated. In order to meet the foot size requirement the vowel is lengthened.

(6)	^{n}re^{n}re	<u>^{n}ree</u>^{n}re^{n}re	‘laugh’ -> ‘laugh for a period’
	rere	<u>ree</u>rere	‘be frightened’ -> ‘be frightened for a time’

Arguably, the failure to see a fully reduplicated form *<u>^{n}*re*^{n}*re*</u>^{n}*re*^{n}*re* in such cases, is a reflection of the general markedness of sequences of repeated syllables. Yip (1993) discusses such cases noting that this type of situation frequently leads to dissimilation. She proposes to account for this markedness with the following constraint:

(7) NoEcho (Yip 1993, cf. also Yip 1995ab)
‘Adjacent identical syllables are prohibited’

As Yip notes this constraint bears a striking similarity to the Obligatory Contour Principle (OCP, Leben 1973, McCarthy 1986, cf. also Mester 1986). A number of people have independently suggested that *local constraint conjunction* (Smolensky 1995) can serve as a possible way to formalize the OCP in OT (Itô & Mester 1996, cf. also Alderete 1996, Suzuki 1995). I will briefly discuss this in an attempt to formalize constraint (7).

The idea of local constraint conjunction is that the simultaneous violation of two constraints in some sufficiently small domain is marked above and beyond the mere markedness of either by itself (i.e. ‘the whole is greater than the sum of its parts’). Since this is a recurring pattern, Smolensky proposes a general schema for combining constraints.

(8) $A \,\&_{l}\, B =_{def}$ ‘the local conjunction of A and B (in domain *l*)’

The suggestion of Itô & Mester (1996) is that OCP effects can be explained as *self conjunction* of constraints. In other words, if one occurrence of a structure is marked, then multiple occurrences of the same structure in some domain are more marked. Thus if we have some phonotactic *Φ, then the self conjunction of this constraint in some local domain can be written as:

(9) $*\Phi^{2}_{dom} =_{def} *\Phi \,\&_{dom}\, *\Phi$

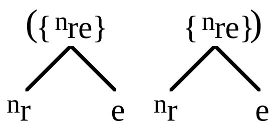
Adapting this to the problem of formalizing NoEcho, we can write:

(10) No-Echo

$*\sigma^{2}_{\text{Foot}}$

This constraint says that sequences of two syllables in the local domain foot are prohibited. Note that here ‘syllable’ will need to be understood as suggested by Itô, Kitagawa & Mester (1996) (cf. also Chomsky 1995), since obviously (10) is not meant to rule out all sequences of 2 syllables. Under this conception a syllable is represented by its specific contents. Thus the word $^{n}re^{n}re$ ‘laugh’ can be represented as:

(11)



The formalization of the constraint NoEcho as in (10) does point to a clear difference between two uses of the OCP: the use in the tonal domain on one hand, and the use in the featural domain on the other. In its original use by Leben the markedness of OCP violating configurations lies in the *identity* of the elements. Thus there is no question of the markedness of the elements themselves. In contrast the self conjunction of constraints is clearly premised on the markedness of the individual structures. At the same time it will not penalize all instances of identical structures, but only those specifically mentioned. Yip’s NoEcho is clearly closer to the original form of the OCP. This leaves it open to question, whether (a) the term OCP should be applied to both types of configuration, and (b) whether (10) is really an appropriate way to formalize NoEcho. Nevertheless I will keep this formulation, and in particular the restriction to the foot domain.

With this formalized version of NoEcho in hand we are ready to consider the analysis of Fijian. The tableau for the reduplicated form of $^{n}re^{n}re$ ‘laugh’ is given in (12).

(12)

input: /RED + $^{n}re^{n}re$/	‘Foot’	NoEcho	Max-BR
a. ($^{n}\underline{re^{n}re}$)($^{n}re^{n}re$)		**!	
b. ☞ ($^{n}\underline{ree}$)($^{n}re^{n}re$)		*	^{n}re
c. $^{n}\underline{re}$($^{n}re^{n}re$)	*!	*	^{n}re

The candidate (12a) which faithfully copies the first two syllables of the stem incurs a NoEcho violation for each of its two feet. In contrast the candidates in (12b) and (12c), which only copy the first syllable, only violate NoEcho once. However (b) which lengthens the vowel and thus manages to meet the foot requirement is clearly judged better than (c) which does not. Finally note that the victory of (b) over (a) clearly shows that NoEcho must be ranked over Max-BR.

With No-Echo present and active in the grammar of Fijian, the question becomes: why are there words like ^{n}*re*^{n}*re* ‘laugh’ in the first place? Shouldn’t they be ruled out as well? The answer is of course: no. Faithful realization of an underlying form is more important than obeying NoEcho. This situation can be illustrated as follows:

(13)

input: /^{n}re^{n}re/	Max-LS	NoEcho
a. ☞ ^{n}re^{n}re		*
b. ^{n}re	^{n}re!	
c. ^{n}ree	^{n}re!	

The tableau in (13) demonstrates that NoEcho is inactive in the ‘regular’ non-reduplicative phonology of Fijian. Any attempt to rid the word of the offending configuration is immediately knocked down by Max-LS. Max-LS must outrank NoEcho, giving the overall ranking for Fijian:

(14) Max-LS >> NoEcho >> Max-BR

This ranking, which constitutes a specific instantiation of the general schema in (2), says that NoEcho is only active in the reduplication phonology of Fijian, i.e. it *emerges* in reduplication. Since echoed structures are marked, we call the situation when the unmarked non-echoing structures emerge ‘Emergence of the Unmarked’.

While the formalization of Emergence of the Unmarked [henceforth EoU] is a nice result by itself, I will argue that the true import of this is that EoU constitutes the entire explanation of special reduplication phonology. In particular all deviations from complete identity between the two parts of the reduplication are due to EoU. In contrast to this any unexpected identity between the reduplicant and the base are the result of what I will call IDENTITY INDUCED FAILURE OF ALTERNATION (IIFA). These two concepts constitute the entirety of the theory of reduplication. It will thus be incumbent on us to show that EoU and IIFA can indeed account for the many aspects of reduplication which in the past have lead researchers to posit special devices. We turn to this next.

2.1.1. Templates as Emergence of the Unmarked

Probably the single most common deviation from identity between the reduplicant and the base comes in the form of size variation, a type of system generally referred to as *partial reduplication*. In fact most other forms of identity failure occur in systems which also include partial reduplication. In past work, explanations of partial reduplicative systems have generally appealed to an extraneous device: *the template*.

In a templatic theory the limited size of the reduplicant is the result of the stipulation that the size requirement specified by the template applies only to the reduplicant. Under the EoU conception of 'templates', the size restriction is the result of general markedness pressures. The reason these pressures only affect the reduplicant is due to constraint ranking. The general ranking schema for partial reduplication is shown in (15).

(15) Max-LS >> 'size restrictor' >> Max-BR

This ranking schema is of course just another variant of the general ranking schema in (2). To see how this ranking can lead to partial reduplication, we return to the example of Boumaa Fijian.

2.1.1.1. Example II: Foot size in Boumaa Fijian reduplication

As will be recalled from the previous section, it was seen that the size of the reduplicant in Boumaa Fijian is restricted to exactly a single bimoraic foot. Such a restriction is encountered in a wide number of languages. M&P (1994b) show that such a restriction can be made to follow from general constraints on prosodic structure. The account proposed here follows theirs in most relevant respects.

A first requirement typically imposed on morphological categories is that they be 'mirrored' in prosodic structure. OT implementations (M&P 1993b) of this idea stemming from work by Selkirk (1981, 1984), have suggested that such requirements can be formulated as alignment constraints. In the case of the reduplicant of Fijian one might write this as:

(16) Align-Left(RED, Foot)

This constraint says that the reduplicant should begin simultaneously with a foot. A second requirement on prosodic structure in all languages is that construction of prosodic structure happen directionally. Implementing a proposal by Robert Kirchner, M&P (1993b) propose that this directionality can also be accounted for by an alignment constraint:

(17) AllFootRight $=_{def}$ Align-Right(Foot, Prwd)

This constraint says that all feet should be rightmost in some prosodic word. As such it will have the effect that, if there is only a single foot in the word, this foot must be located at the right edge of the word. If there is more than one foot, then one foot will need to be at the right edge of the word, and the remainder will be as close to the right edge as possible, given the circumstances. This gives a ‘directional’ effect with all the feet bunching up as close to the right edge of the word as possible.

The important suggestion of M&P (1994b) is that this same constraint also has a minimizing effect on prosodic words. The configuration preferred by this constraint is one where every foot is at the right edge of some prosodic word. This can only truly be met if there is no more than one foot per prosodic word. This means that the constraint in (17) will prefer words that have at most one foot. Under normal circumstances the number of feet necessary for a prosodic word is dictated by the amount of segmental material, rather than the desire to minimize the number of feet. Thus in the general case we have the ranking:

(18) Max-LS >> AllFootRight

But since reduplication is not subject to the constraint Max-LS, it will be subject to the emerging minimization effect of AllFootRight. In order for this effect to carry through in reduplication however, AllFootRight will need to outrank Max-BR, the constraint that prefers reduplication to be total. This leads to the EoU ranking in (19).

(19) Max-LS >> AllFootRight >> Max-BR

Together with the alignment constraint in (16) this provides us with an account of the foot size of the reduplicant in Fijian, as can be verified through the tableau in (20).

(20)

input: /RED + talanoa/	A-L(R,F)	Max-LS	AllFtR	Max-BR
a. ☞ [(tala)(tala)(noa)]			σ/σσσ	noa
b. [ta(lano)(tala)(noa)]	*!		σ/σσσ	a
c. [tala(noa)(tala)(noa)]	*!		σ/σσσ	
d. [ta(tala)(noa)]	*!		σ	lanoa
e. [(tala)(noa)(tala)(noa)]			σ/σσσ/σσσσ!	
f. [(tala)noa(tala)(noa)]			σ/σσσσ!	

This tableau shows the competition for the reduplicated form of *talanoa* ‘tell stories’. The alignment constraint in (16) knocks out any candidate which does not line up the left edge of the reduplicant with a foot, including candidates (20b), (20c) and (20d). AllFootRight penalizes all candidates which add more than a single foot (20e), or where excessive length of the reduplicant causes the single foot to be more than a minimal amount from the right edge of the entire form (20f). The competition between candidates (d) and (a) shows that the alignment constraint must outrank AllFootRight.

This constitutes the entire account of the foot restriction on the reduplicant in Fijian. One further refinement is suggested by the case of baseforms with an odd number of syllables such as *buta*<u>*buta*</u>*ʔo* ‘steal on a number of occasions’. The account developed so far would favor a candidate with a single light syllable reduplicant, which could form a foot together with the lone unfooted syllable of the base, resulting in the unattested *[(bu bu)(taʔo)]. There are a number of possible explanations why such a candidate is not optimal. The likely answer is that there is a requirement that the base itself must constitute a prosodic word, thus making it impossible for a foot to straddle the reduplicant/base boundary. The resulting reduplicated form is then [(buta)[bu(taʔo)]].

2.1.1.2. On the inadequacy of templatic constraints

The previous section showed that the emergence of the unmarked conception of partial reduplication can indeed account for size restrictions on the reduplicant. In this section I will review an argument due to Prince (1996) that shows that the emergence of the unmarked account of partial reduplication is the *only* account possible. In particular it demonstrates that ‘templatic constraints’ are not a feasible approach to size restrictions. This point is all the more relevant since virtually all work in the current framework has espoused the use of templatic constraints, at least as an analytic expedient (Work which relies on such constraints includes M&P 1993, 1995, Spaelti 1996, Blevins 1996, among many others). This argument can even be extended to work which derives templatic constraints through indirect reference to the morphological category (the so-called ‘Generalized Template Theory’ M&P 1994b, Urbancyzk 1995).

To understand the argument, let us consider how an analysis with templatic constraints derives the foot pattern of Boumaa Fijian. A simple implementation of this idea might involve stipulating a constraint ‘R=Foot’. This constraint requires that the phonological exponent of the morpheme RED be coextensive with a foot.

(21) R=FOOT (hypothetical)

‘the phonological exponent R of the morpheme RED is coextensive with a Foot’

This constraint will permit us to construct an analysis of the Fijian facts. In order to achieve this we will need to rank the templatic constraint in (21) above Max-BR, the constraint that favors total reduplication. The resulting situation is exemplified by the tableau shown in (22).

(22)

input: /RED + talanoa/	Max-LS	R=Ft	Max-BR
a. ☞ [(tala)(tala)(noa)]			noa
b. [(tala)(tala)]	noa!		
c. [(tala)(noa)(tala)(noa)]		*!	

While this analysis is straightforward, it also has undesirable consequences. The problem is that once we include constraints of this kind, factorial typology predicts that the following ranking is also possible.

(23)

input: /RED + talanoa/	Max-BR	R=Ft	Max-LS
a. [(tala)(tala)(noa)]	noa!		
b. ☞ [(tala)(tala)]			noa
c. [(tala)(noa)(tala)(noa)]		*!	

A hypothetical language with this constraint ranking generally permits words to be longer than a single foot. However in reduplication not only the reduplicants, but also all bases will be limited to one foot in length. This type of wholesale truncation is completely unattested in natural languages. Prince (1996, see also McCarthy & Prince 1997) calls this white elephant the ‘Kager-Hamilton Conundrum (KHC)’.

The reason this happens is that correspondence is a two-way street. This means that even though the templatic restriction is only imposed on the reduplicant, correspondence projects this restriction back onto the base. To avoid this type of situation we would need to postulate that templatic constraints may only occur in systems with the basic ranking:

(24) Max-LS >> Max-BR

This ranking is exactly the type of situation that leads to Emergence of the Unmarked. Unfortunately, if we adopt templatic constraints we must stipulate this result. Since earlier we have seen that size restriction can themselves be explained as emergence of the unmarked, Occam’s razor dictates that we should abandon templatic constraints.

This same reasoning rules out a solution that derives templatic restrictions, via indirect reference to the morphological category. For example the ‘Generalized Template Theory’ proposes that in some systems the empty morpheme RED is assigned to the morphological category *affix*. As such it will be subject to the putative constraint in (25).

(25) Affix ≤ σ

The problem is that constraint (25), in a system where Max-BR is ranked above Max-LS, also leads to a KHC configuration. The fact that the base is not itself an affix, offers no protection against the 'back projection' of the requirement imposed by (25).

(26)

input: /borar/	Max-BR	Affix ≤ σ	Max-LS
a. [bor[bo.rar]]	ar!		
b. ☞ [bor[bor]]			ar
c. [bo.rar[bo.rar]]		*!	

This tableau illustrates the situation that would result from having a constraint like (25), where this constraint and Max-BR are both ranked above Max-LS. This again leads to back copying of the size requirement onto the base, with highly improbable results.

This result is all the more dubious, since there is nothing particularly improbable about the ranking involved. In order for the constraint in (25) to have any force at all, we would expect it to be ranked above Max-LS. Thus the only real variable in most systems is the relevant ranking of Max-LS and Max-BR, which apparently is universally fixed.

The fact that the necessary ranking Max-LS >> Max-BR can be derived from a proposed 'meta-ranking' Faith-Root >> Faith-Affix is little consolation, since these considerations are all external to the theory. In contrast, if size restrictions are the result of emergence of the unmarked, the fact that such restrictions are limited to grammars with the ranking Max-LS >> Max-BR is a simple point of ranking logic.

Thus in summary we note that partial reduplication always involves the ranking in (15) repeated here:

(27) **General ranking schema for partial reduplication**

Max-LS >> 'size restrictors' >> Max-BR

On the other hand the reverse ranking with Max-BR ranked as high or above Max-LS, always leads to total reduplication.

(28) **General ranking schema for total reduplication**[6]

Max-BR , Max-LS

Any reference to 'some higher ranked constraint', always implies across-the-board application to reduplicated and non-reduplicated structures alike.

2.1.1.3. Size restrictors and a-templatic reduplication

The general ranking schema for partial reduplication shown in (27) leads to one question: What can be a 'size restrictor'? Trying to find an answer to this question will be the central topic of chapters 3 and 4. Here I will only give a brief sketch of the various possibilities.

A first type of constraint that was encountered in the analysis of Fijian are the 'prosodic minimizers' AllFootRight/Left, and AllSyllRight/Left[7]. The demonstration that AllFootRight/Left can have a limiting effect on the reduplicant was originally made by M&P (1994b). That a similar action can be derived from AllSyllRight/Left (Mester & Padgett 1994) for syllable (and smaller) size reduplicants will be shown in detail in chapter 4.

A second important size restrictor is NoCoda (P&S). M&P (1994b) show that the emergence of NoCoda in reduplication can turn a syllable size restriction into a light syllable template.

Finally, however, any markedness constraint at all, embedded into the EoU ranking in (27) can lead to size limitations. If a reduplicative system copies 'everything in the base that isn't marked', the result will be a variety of different forms of truncation of the reduplicant. This type of system is called *a-templatic reduplication* (cf. Gafos 1995), and the fact that such systems are attested will be shown to be a powerful argument against templatic theories, and in favor of the EoU model of partial reduplication. This demonstration is the central topic of chapter 3.

As a brief illustration consider the following hypothetical example: Assume that in some language the constraint C, which marks any segment with property F, is in an EoU ranking, between a higher ranked Faith-LS, and a lower ranked Faith-BR constraint. The reduplication will be total for bases without such segments, but otherwise several things can happen:

[6]An important point here is that the comma is to be understood in a technical sense, as 'no crucial ranking.' In this case this includes the three possibilities: (i) Max-BR >> Max-LS; (ii) Max-BR and Max-LS are equally ranked; (iii) Max-LS >> Max-BR, but with no crucial constraint intervening. For all practical purposes (ii) and (iii) are

If Ident(F)-BR is ranked below Max-BR it will be ‘cheaper’ to change property F for any offending segment, and thus the segment will be copied, but in altered form. This type of system is called ‘Copy & Change’ by Alderete et al. (1996).

(29) **Copy & Change** (cf. Alderete et al. 1996)

$$\text{Ident(F)-LS, Max-LS} \gg \left.\begin{array}{r}\text{C(*F)}\\ \text{Max-BR}\end{array}\right\} \gg \text{Ident(F)-BR}$$

An example of this type is Ponapean, which will be discussed in section 2.1.3.1. In Ponapean reduplication, coronal stops, which are generally tolerated in normal contexts, are changed to nasals in certain configurations. Thus for example the reduplicated form for *tot* ‘frequent’ is *tontot*, and not **totitot*.

If Ident(F)-BR is ranked above Max-BR, the segment containing the marked configuration will be avoided all together. The reduplicant will mirror the base perfectly up to the offending segment. What happens then depends on the organization constraints. If Contiguity, the requirement that the copied string form an unbroken sequence in the base, outweighs Max-BR, nothing beyond the offending segment will be copied. We might call this type of system ‘Copy & Stop’.

(30) **Copy & Stop**

$$\text{Ident(F)-LS, Max-LS} \gg \left.\begin{array}{r}\text{C(*F)}\\ \text{Ident(F)-BR}\\ \text{Contiguity}\end{array}\right\} \gg \text{Max-BR}$$

An example of this type will be seen in section 4.2.2.1. Kalar-Kalar WT avoids copying dorsal segments if possible, and when such a segment is encountered nothing beyond the segment is copied either. This can be seen in example such as *bakir* ‘small.3s’ which reduplicates as *bababakir*, rather than **bakibakir* or, skipping the [k], **baibakir*.

If on the other hand Contiguity is violable and ranked below Max-BR, everything aside from the marked segments will be copied, even if this means skipping segments in the middle of the form. This type of system can be called ‘Copy & Avoid’.

(31) **Copy & Avoid**

$$\text{Ident(F)-LS, Max-LS} \gg \left.\begin{array}{r}\text{C(*F)}\\ \text{Ident(F)-BR}\end{array}\right\} \gg \text{Max-BR} \gg \text{Contiguity}$$

An example of a Copy & Avoid system is Nakanai, which will be discussed in detail in chapter 3. In Nakanai a variety of constraints interact, forcing the reduplicant to leave out certain disfavored segments. Thus *gove* ‘mountain’ has a reduplicated form *goegove*, leaving out only the [v]. Forms such as **govegove*, or **gogove* are not possible reduplicated forms for this word.

These rankings provide the basic typology of a-templatic reduplication. A-templatic reduplication will be the main topic of chapter 3.

2.1.2. Default Segmentism as EoU

In templatic theories, default segmentism is claimed to be the result of partial pre-specification of a template. However by and large default segments are the unmarked segments of the language, a fact that is left unexplained if the default segments are a result of lexical stipulation.

In recent work, Alderete et al. (1996) propose that certain types of default segments can be explained as emergence of the unmarked. Under their analysis, default segmentism is the result of two things: avoidance of marked segments, and epenthesis of unmarked segments. Since the avoidance of marked segments occurs only in reduplication, it wll be an instantiation of the general emergence of the unmarked schema shown in (32).

(32) Max-LS >> ‘markedness’ >> Max-BR

This ranking is the ‘core’ of the constraint rankings for ‘Copy & Stop’ and ‘Copy & Avoid’ seen in the previous section. This is not surprising, since we are aiming to copy certain segments, while avoiding others.

The separation of the segment avoidance from the ‘replacement’ has consequences. Thus we might expect a default vowel to appear even though the base does not contain a vowel in the right place. This prediction is borne out. A case of this kind from Lushootssed is discussed in Urbancyzk (1995).

The upshot of this approach to default segments is that they are quite literally epenthetic. In order to see how this works let us consider an example.

2.1.2.1. Example III: Default segments in Sawai

Sawai is an Austronesian language spoken on Halmahera in Northern Maluku. The description of the language is provided by Whisler (1992). Sawai has three different forms of productive reduplication: durative reduplication, taking the shape of a light syllable; nominalizing reduplication, consisting of a heavy syllable pattern; and reciprocal reduplication, a pattern where a single consonant is copied as a coda to a prefix *fa*. As discussed in chapter 1, the division of labor between these patterns is made by the function, thus the patterns constitute 3 duplemes.

Both of the syllable patterns have a default vowel [ɛ], which also happens to be the epenthetic vowel of the language. Here I will look at the heavy syllable pattern.

(33) **Sawai CɛC reduplication** (Whisler 1992)

pɔsɛ	pɛspɔsɛ	‘cloudy’
bɛt	bɛtbɛt	‘soil’
lɛm	lɛmlɛm	‘lightning’
sakɛ	sɛksakɛ	‘between legs’
soŋ	sɛŋsoŋ	‘branch’
tubo	tɛptubo	‘the top’
sibɛ	sɛpsibɛ	‘knapsack’
tegɛl	tɛktegɛl	‘a place to step on’
tolɛn	tɛltolɛn	‘3s-to sit/chair’

As seen in these examples the reduplication copies the first two consonants of the stem, as a prefix, and a default vowel [ɛ] always appears between them. The analysis I present here is basically parallel to the type of analysis presented in Alderete et al. (1996) with a few changes. For instance, Alderete et al. (1996) suggest that the avoidance of segments is the result of emergent place markedness. In their analysis reduplication avoids copying all segments except those specified for the unmarked place.

A case like this one is a fairly common type of default segmentism. All consonants are copied, but vowels are always replaced by the epenthetic vowel of the language, [ɛ]. If we were to adopt the Alderete et al. approach, we would need to distinguish between vowel place and consonantal place, and treat this as emergent V-Place markedness.

This does raise an interesting point since one might wonder what the basis is for saying that vowel place, is more marked than consonantal place. This is especially true since vocalic default segments are cross-linguistically much more common than consonantal ones. This makes sense when one considers that consonants are generally more important to distinguishing words. Since the goal of reduplication is to obtain a recognizable repetition, the role of consonants is central. On the other hand vowels are often reduced in unstressed position. We might surmise that the loss of vocalic distinctions in the reduplicant is emergence of the markedness of vocalic distinctions in unstressed position.

This idea meshes quite well with the stress pattern of Sawai. Stress in Sawai generally falls on the penult, but it will fall on the final syllable, if it can thereby avoid falling on an [ɛ]. This demonstrates that [ɛ] is the preferred vowel in stressless position, and vice versa. The appearance of [ɛ] in the reduplicant is simply a reflection of this fact.

A suitable constraint which expresses the relevant idea might be the following:

(34) No Unstressed V-Place (NUVP)
'vocalic features must be in a stressed position'

This constraint is active in the reduplication phonology of Sawai. Before we can proceed to the analysis we must note that Sawai generally has a rather simple syllable structure. While it does permit all types of consonant clusters, these are almost completely restricted to intervocalic position. This is compatible with a CVC syllable maximum. I will adopt the ad hoc notation 'σ-Form' for the constraint, or set of constraints, that account for this. Finally the prosodic minimizer AllσRight is responsible for the limit of the reduplication to syllable size.

Beginning with the restriction on vowel place, the tableau for the form *tɛptubo* 'the top', can be given as follows:

(35)

input: /red + tubo/	Max-LS	NUVP	Max-BR	Dep
a. tuptubo		**!	*	
b. ☞ tɛptubo		*	**	*
c. tɛptubɛ	*!		**	*

This case clearly shows the emerging power of the constraint NoUnstressedVowel-Place. While Sawai does permit unstressed vowels to have features other then those of its default vowel [ɛ], in reduplication such vowels are strictly taboo. Candidate (35a), which copies the vowel faithfully, is vetoed by NoUnstressedVowelPlace, while candidate (35c) errs in the other direction by eliminating the vowel place features of an underlying vowel.

To properly see the epenthesizing action, we need to add both the constraint that enforces syllable size as well as the constraint that ensures the appropriate syllable form

The resulting tableau for *tɛlolɛn* ‘chair’ is shown in (36).

(36)

input: /RED + tolɛn/	σ-Frm	MaxLS	AllσR	NUVP	MaxBR	Dep
a. ☞ tɛltolɛn			σ/σσ		***	*
b. tlntolɛn	*!		σ		**	
c. tlntln	*!	**				
d. tɛlntolɛn	*!		σ/σσ		**	*
e. tɛlɛntolɛn			σ/σσ/σσσ!		**	**
f. tɛtolɛn			σ/σσ		****!	*

The constraint NoUnstressdVowelPlace merely forces the elimination of vowels in the reduplicant. However if only the consonants are copied, the result will be prosodically unacceptable. The constraint σ-Form makes sure that no such monstrosities are judged optimal, barring candidates such as (36b), (36c) and (36d). For that very reason the reduplicant can never have more than two consonants. The only way for three consonants to be properly syllabified in Sawai would be to add an extra vowel, as happens in the case of (36e). But such a possibility is cut short by the minimizer constraint AllσRight. On the other hand Max-BR makes sure that no reduplicant has less than two consonants, ruling out candidates with too few, such as (36f).

This completes the analysis of default segments in Sawai. As this example demonstrates, emergence of the unmarked can properly account for default segmentism, and as a consequence it accounts for the propensity of default segments to be recruited from among the least marked vowels of a given language.

2.1.3. Other phonological properties as EoU

The theory of EoU predicts that all kinds of markedness and prosodic restrictions should be possible emergent properties. A much discussed example of this kind is found in Ponapean. See for instance Itô (1986), Lombardi (1996). The current discussion owes much to the presentation by Takano (1996), which is also framed in terms of EoU.

2.1.3.1. Example IV: Ponapean coronal clusters

The Micronesian language Ponapean has a pervasive form of consonant cluster adjustment known as ‘Nasal Substitution’ (Rehg & Sohl 1981). Homorganic consonant clusters that arise through affixation, reduplication, and even across words, are turned into nasal/stop sequences.

The fact that has been most puzzling to previous analyses is that not all such clusters behave the same in all contexts. While labials and dorsals undergo Nasal Substitution in all contexts, clusters of coronals only do so when they arise through reduplication.

(37)	pap	pampap	‘to swim’(p. 75)
	p^{w}ap^{w}	p^{w}am^{w}p^{w}ap^{w}	‘to fall’(p. 75)
	kik	kiŋkik	‘to kick’(p. 75)
	tot	tontot	‘frequent’(p. 75)
	sis	sinsis	‘to speak with an accent’(p. 75)
	cac	cancac	‘to writhe’(p. 75)

The data in (37) shows examples where two identical obstruents are juxtaposed due to reduplication. In such cases the first obstruent dissimilates to a nasal. This occurs with coronals and non-coronals alike.

Similarly liquids turn into nasals when reduplication causes them to immediately precede a coronal obstruent. Examples of this kind are seen in (38).

(38)	til	tintil	‘to penetrate’(p. 75)
	tar	tantar	‘to strike, of a fish’(p. 75)
	sar	sansar	‘to fade’(p. 75)
	cal	cancal	‘to make a click-like sound’(p. 75)

In non-reduplicative contexts the effects of Nasal Substitution are limited to clusters involving non-coronals. With dorsals and labials Nasal Substitution occurs even when the clusters arise due to affixation, or across words. Examples of this kind are seen in (39). This happens even if the two consonants are not identical, just as long as they share the same place of articulation.

(39)	/sap^{w} + paa/	sampaa	‘world earth’(p. 62)
	/ɛp + p^{w}ɔtol/	ɛm^{w}p^{w}ɔtol	‘a game’(p. 62)
	/kɛɛp + m^{w}ɔt/	kɛɛm^{w}m^{w}ɔt	‘variety of yam’(p. 62)
	/witek + ki/	witeŋki	‘to be poured with’
	/ɛ saik + kɛŋwini/	ɛ saiŋkɛŋwini	‘he hasn’t yet taken his medicine’(p. 62)

Opposed to this is the behavior of coronals. If a coronal cluster is due to affixation no Nasal Substitution occurs. Since Ponapean does not tolerate such clusters however it resolves the situation with one of the many forms of epenthesis available to the language.

(40)	/m^{w}oot + to/	m^{w}oototo	'sit here'(p. 64)
	/weit + ta/	weitita	'proceed upward'(p. 63)
	/pɔt + ti/	pɔtɛti	'plant downward'(p. 63)
	/m^{w}ɛsɛl + saŋ/	m^{w}ɛsɛlisaŋ	'leave from'(p. 63)

One minor point that needs to be clarified is the question whether these two cases, i.e. Nasal Substitution in reduplication, and Nasal Substitution elsewhere, are both just sub-cases of a general process of Nasal Substitution, or whether they have different conditions imposed on them. For instance Itô (1986) takes the former position, while Rehg & Sohl (1981) and Lombardi (1996) argue the latter. The problem is that while the NS seen in (39) occurs with any CC clusters with identical place of articulation, the NS seen in reduplication would seem to require complete identity of the two consonants. However what little evidence there is, suggests that in the case of dorsal and labial clusters, NS in reduplication also only requires identical place of articulation, while for clusters involving coronal obstruents complete identity is required.

(41)	m^{w}op^{w}	m^{w}om^{w}m^{w}op^{w}	*m^{w}op^{w}m^{w}op^{w}	'to be out of breath'(p. 75)
	sɛt	sɛtɛsɛt	*sɛnsɛt	'artificially ripen breadfruit'(61)
	lus	lusulus	*lunlus	'jump'(p. 61)

This observation leads to a solution of the mystery of why coronals only undergo Nasal Substitution in reduplication contexts, but not in general. The distinction would seem to have to do with the well known cross-linguistic tendency for coronals to support more distinctions than the other places of articulation (McCarthy & Taub 1992). This is true in Ponapean as well where dorsal and labial place only know a nasal/non-nasal distinction[8], while coronal place admits distinctions for [continuant] and [anterior], and also has further sub-distinctions for coronal sonorants. The inventory of Ponapean is shown in the following chart.

[8] There is actually one further distinction possible in the case of labials, which have a contrast between velarized and plain forms. Such 'secondary' features are often disregarded for identity considerations (see discussion in Mester 1986).

(42) **Consonant Inventory of Ponapean**

	labial	*coronal*		*dorsal*
		dental	*retroflex*	
stop	p, p^w	t	c	k
continuant		s		
nasal	m, m^w	n		ŋ
liquids		l	r	

Considering the inventory of the language Nasal Substitution in the case of labials and dorsals is 'recoverable' in a way that is clearly not the case with coronal consonants. Note that this also addresses the question why, even in reduplication, coronals require identity in order to be able to undergo substitution, while labials and dorsals do not, as seen in the data in (41).

P&S, and Smolensky (1993), show how this richness of inventory can be attributed to coronal unmarkedness. The crucial ingredient in OT terms is a *universal markedness scale*, which is represented by the fixed ranking hierarchy, shown below.

(43) *Place/Dorsal, *Place/Labial >> *Place/Coronal

We can now move on to the analysis. Nasal Substitution involves a change in feature of the relevant segments, in this case at least the feature nasal. On the other hand, since it permits the two consonants to remain adjacent it simplifies the articulation. The two consonants can be realized as a single gesture, while resolving the cluster by means of epenthesis would require two. Assuming that the markedness of the gesture is represented by the *Place/… constraints, we have a conflict between such a constraint, and the requirement to faithfully realize the nasal value of the segment: Ident(nasal)-LS.

(44)

input: /witek + ki/	*Pl/Dor	Id(nas)-LS
a. witeŋki	*	*
b. witekiki	**!	

The tableau shows the case of a dorsal cluster. Since Nasal Substitution does occur in such cases, the markedness of the gesture must outweigh Ident(nasal)-LS.

The next tableau shows the case of a coronal cluster, but one due to affixation. In this case however the relative unmarkedness of the coronal articulation, compared with the markedness of changing the nasality of the segment, means that epenthesis will be the preferred solution. Note that the overall ranking:

*Pl/Dorsal, *Pl/Labial >> Ident(nasal)-LS >>*Pl/Coronal

is perfectly in accord with the fixed ranking in (43).

(45)

input: /weit + ta/	Id(nas)-LS	*Pl/Cor	Dep-LS
a. weinta	*!	*	
b. ☞ weitita		**	*

As this tableau shows, Ident(nasal)-LS will also need to outrank Dep-LS since otherwise Nasal Substitution would always be the preferred solution.

So far the analysis has oversimplified matters considerably. According to the analysis we would predict that dorsals and labials always turn to nasals before another consonant. However this happens only when the following consonant has the same place of articulation, since only in that case will the fusion of the two articulations preserve the original place specification. The requirement that a segment keep its place is mandated by Ident(Place)-LS, and this constraint must obviously outrank the hierarchy in (43), or Ponapean wouldn't have any consonants!

(46)

input: /katik + ta/	Id(Pl)-LS	*Pl/Dor	Id(nas)-LS
a. katinta	*!		*
b. ☞ katikata		*	

This tableau shows how Ident(Place)-LS prevents Nasal Substitution from occurring with segments that do not share the same place specification. The example is the form *katikata* 'to get bitter', where the root /katik-/, ending in a dorsal, is suffixed with the directional suffix /-ta/ 'upward', that has an initial coronal.

Turning next to reduplication, it is here that we see the Emergence of the Unmarked ranking in effect once again. The necessity to faithfully realize the nasality of a segment is much lower in this case, and as a result coronals can now undergo NS as well.

(47)

input: /RED + tot/	Id(nas)-LS	*Pl/Cor	Id(nas)-BR
a. ☞ tontot		*	*
b. totitot		**!	

Note however that the greater complexity of coronals has consequences. If following Padgett (1995) we assume that the place node is the locus for the specification of [continuant], then [s] and [t] for example cannot be seen as having identical place specifications. This will mean that they cannot undergo Nasal Substitution, even if they come together as a result of reduplication. The tableau for an example of this type is shown below.

(48)

input: /RED + sɛt/	Id(Pl)	Id(nas)-LS	*Pl/Cor	Id(nas)-BR
a. sɛnsɛt	*!		*	*
b. ☞ sɛtɛsɛt			**	

This concludes our example.

2.1.4. Summary

In this section we have seen that the simple assumption that reduplication is the result of an affix without an underlying form, exempting it from the regular demands of faithfulness, leads to a wide variety of effects. The generalization common to these effects can be captured by the constraint ranking:

(49) Faith-LS >> phonotactic >> Faith-BR

These effects include partial reduplication, default segmentism, as well as more specific phenomena, such as the differing behavior of coronals with respect to Nasal Substitution in Ponapean. All of these effects can be understood as a tendency for reduplication to prefer unmarked structures.

In the next section I will demonstrate how the theory predicts that there is no reverse tendency towards marked structures. The investigation of a number of problematic cases, leads to a proposal for a different model of reduplication, that in contrast to the McCarthy & Prince (1995) 'Full Model' does not require special stipulations regarding the reduplicants interaction with faithfulness.

2.2. Emergence of the Marked

The previous section explored the varied effects of the Emergence of the Unmarked. In this section I will investigate the question whether there is a corresponding ‘Emergence of the Marked’.

2.2.1. Why there is no ‘Emergence of the Marked’

The ranking which describes EoU once again:

(50) Faith-LS >> Phonotactic >> Faith-BR

This might lead one to expect a completely symmetrical *Emergence of the Marked*

(51) Faith-BR >> Phonotactic >> Faith-LS

According to the basic architecture of OT there is in fact nothing to prevent the ranking in (51). Factorial typology predicts that such a ranking should exist. Therefore the only question is: what would such a ranking mean?

The ranking in (50) says that certain marked structures which exist in the general phonology of the language are not attested in the context of reduplication. A simple example might be a certain type of segment, e.g. voiced obstruents. A language which permits voiced obstruents in general, but forbids them in reduplication might have the ranking:

(52) Ident(voi)-LS >> *[+voi,-son] >> Ident(voi)-BR

In such a hypothetical language the form *pada* would reduplicate as *patapada*, as can readily be attested with the help of the following tableau:

(53)

input: /RED + pada/	Id(voi)-LS	*voi/obs	Id(voi)-BR
a. padapada		**!	
b. ☞ patapada		*	*
c. patapata	*!		

The faithfully reduplicated candidate (53a) incurs excessive violations of the (phonotactic) constraint against voiced obstruents. Candidate (53b) devoices the obstruent(s) in the reduplicant, and thus has fewer violations of this constraint. But the lack of identity between the base and the reduplicant causes violation of Ident(voice)-BR. However since this latter constraint is low ranked, candidate (53b) beats (53a). If we try to minimize the violations of *voi/obs further by devoicing the obstruents in the base (and thereby incidentally improving the identity between base and reduplicant), the resulting form (53c) loses again, since it violates the imperative to preserve underlying distinctions. So far we have merely recapitulated the familiar EoU pattern.

Since ranking (52) leads to avoidance of voiced obstruents in reduplicated contexts only, one might naively expect the following ranking to lead to the appearance of voiced obstruents in reduplicated contexts only. This would mean 'emergence of the marked'.

(54) Ident(voi)-BR >> *[+voi,-son] >> Ident(voi)-LS

The naive expectation is defeated however. Tableau (55) demonstrates that the ranking in (54) does not lead to emergence of the marked, but simply to faithful reduplication.

(55)

input: /RED + pata/	Id(voi)-BR	*voi/obs	Id(voi)-LS
a. ☞ patapata			
b. patapada	*!	*	*
c. padapada		**!	*
d. padapata	*!	*	

In order to test for emergence of the marked we must begin with a form with only unmarked segments; in this context this means voiceless obstruents, e.g. *pata*. Candidate (55a) is faithfully reduplicated. The reduplicant copies the base form exactly. In this case there are no voiced obstruents, the base perfectly mirrors the input, and the base perfectly copies the base. The candidate has a perfect score. Candidates (55b-c) show a variety of combinations introducing marked segments. All of them fail miserably since in addition to violating the phonotactic markedness constraint they all violate a Faithfulness constraint as well.

At this point we might stop and reflect for a moment on the meaning of ranking (54). Note that it includes as a sub-ranking the following:

(56) *[+voi,-son] >> Ident(voi)-LS

This is of course a case of *Stampean Occultation*. The language that has ranking (54), and thus also (56), is first and foremost a language without voiced obstruents. Adding the constraint Ident(voice)-BR—the sole purpose of which is to insure resemblance of the reduplicant to the base—will of course never force voiced obstruents to appear.

This point can be easily verified by inspection of the following tableau:

(57)

input: /RED + pada/	Id(voi)-BR	*voi/obs	Id(voi)-LS
a. ☞ patapata			*
b. patapada	*!	*	
c. padapada		**!	
d. padapata	*!	*	*

This tableau is entirely parallel to tableau (55). The only difference is that in this case the candidates are generated from a hypothetical underlying form *pada*. Despite the difference in underlying form the result is the same as in tableau (55) above. Given that the underlying forms *pata* and *pada* both give the same result, we would expect the language learner to never even posit an underlying form *pada*. This is of course the meaning of Stampean Occultation.

From this it can be seen that the OT model of prosodic morphology predicts the existence of emergence of the unmarked, without a corresponding emergence of the marked. This is a welcome result since EoU is richly attested, while EoM seems bizarre and at least very unlikely.

This strong prediction is unfortunately undermined by more recent developments (M&P1995). The 'Full Model' of correspondence introduces an additional faithfulness dimension Faith-LR. This permits the reduplicant to take its cue directly from the underlying form. This move is argued to be necessitated by certain types of data, seen for example in Javanese and Klamath (see chapter 1). In order to restore the above prediction, M&P must stipulate a 'meta-ranking':

(58) Faith-LS >> Faith-LR

This ranking, which is supposed to be universal, insures that the reduplicant can never be more faithful to the underlying form than the base. I will now turn to a demonstration that neither the 'Full Model' nor the meta-ranking in (58) are necessary.

2.2.2. Correspondence theory revisited

A major driving force behind the entire development of the framework has been the idea that the realization of the reduplicant does not violate the regular faithfulness constraints. It is time to review this assumption.

2.2.2.1. Max and Dep

According to M&P the fact that the reduplicant does not violate the Faith-LS constraints is a reflection that BR-identity is regulated by a *separate but equal* set of constraints (often referred to imprecisely as 'Faith-BR'). These two dimensions are claimed to be completely parallel. It will therefore be instructive to contrast the two Max/Dep pairs to investigate this parallelism.

In the LS dimension, Max-LS represents the constraint 'don't delete', while Dep-LS stands for 'don't insert'. Both of these strategies—deletion and insertion—are well attested in languages of the world, both with comparable frequencies.

In the BR dimension, the importance of Max-BR is amply demonstrated, since it distinguishes between total and partial reduplication. In addition the ranking Max-LS >> Max-BR was seen to be crucial to many of the known cases of Emergence of the Unmarked.

In contrast Dep-BR has figured rather poorly in the discussion. Even more to the point, the ranking Dep-LS >> Dep-BR (or even the reverse for that matter) has never been relevant, or demonstrably crucial. This undermines the idea that Dep-BR is independent of Dep-LS in the same way as is the case with the Max constraints.

But there is a more intriguing problem involving the Dep constraints. Consider again the definition of Dep-LS.

(59) DEP-LS
$\forall y\ [(y \in \mathrm{S}) \Rightarrow\ \exists x\ ([x \in\ \mathrm{L}]\ \&\ [\langle x, y\rangle \in \Re])]$

'every surface segment corresponds to some lexical segment'

Given the simplest interpretation of this definition Dep-LS should penalize any segment present in the output not present in the input. But, since as has been repeatedly argued, no part of the reduplicant is underlying, this would seem to mean that all segments of the reduplicant should violate Dep-LS!

In order to avoid this unfortunate conclusion one will need to complicate the above definition adding a stipulation to the effect that being 'part of a reduplicant' absolves a segment of Dep-LS violations. Thus one will need some criterion to determine reduplicant-hood. One possibility would be to define reduplicanthood as participation in the BR relation but this would remove Dep-BR of its foundation, since now everything in the reduplicant would be in correspondence by definition. M&P therefore choose the alternative, which they define as *association with RED.* The problem with this is that there is no systematic way of determining association with RED.

In order to see this problem consider an example from Ponapean the form [sɛtɛsɛt], which is the reduplicated form of *sɛt* 'artificially ripen breadfruit'. In this case the crucial bit is the middle [ɛ]. This segment obviously incurs a Dep violation since it is epenthetic. But is it a Dep-BR or a Dep-LS violation? And does it even make sense to distinguish between these cases? In this case the analyst will most likely want to argue that the segment violates Dep-BR, since such an assumption means that the reduplicant is [sɛtɛ], and thus the base is [sɛt]. This in turn means that the leftmost segment of the reduplicant and the leftmost segment of the base are in correspondence, and as a result Anchor-Left will be unviolated, as indeed is generally the case in Ponapean. This example shows that this putative distinction has empirical consequences.

The contrast between these possibilities is shown in the following table.

(60)

input: /RED + sɛt/	Anchor-L	Dep-BR	Dep-LS
a. s ɛ t ɛ [s ɛ t]		*	
b. s ɛ t [ɛ s ɛ t]	*		*

This table is not an actual tableau, though it would be easy enough to turn it into one. However, it will permit us to compare the two possibilities. The phonetic realization of these two candidates will be exactly the same. The only difference is where we choose to draw the boundary between the reduplicant and the base. If we draw the boundary to the right of the epenthetic segment, we get candidate (a). In this case the epenthetic segment will be part of the reduplicant, and will therefore violate Dep-BR. If we draw the boundary to the left of the epenthetic segment, the result is candidate (b). The [ɛ] becomes part of the base, and causes violations of Anchor-L, and Dep-LS.

Factorial typology predicts that the three constraints involved in distinguishing these two candidates can be ranked six different ways, with two rankings favoring (b), and four (a). But since the two candidates are phonetically identical, there will be no observable difference in the outcome, no matter which ranking is chosen.

In summary, in order to maintain the assumption that the segments in the reduplicant do not violate Dep-LS it was necessary to (i) maintain a distinction between two Dep constraints not obviously motivated, (ii) complicate the definition in (59) with a stipulation exempting reduplicated segments from its effects, and (iii) adopt a special status 'association with RED' that cannot be independently verified.

Let us now return to the definition of Max, and see how it fares:

(61) MAX-LS
$\forall x\ [(x \in \mathrm{L}) \Rightarrow \exists y\ ([y \in \mathrm{S}]\ \&\ [\langle x, y\rangle \in \Re])]$

‘every lexical segment corresponds to some surface segment’

The only requirement imposed by this constraint is that underlying segments be realized. It has nothing to say about reduplicated segments that only exist at the surface.

But let us now engage in a *gedankenexperiment*. Let’s assume that *every* reduplicated segment is associated with *some* underlying segment (I will immediately turn to the question of which segment). Such an assumption does not affect the definition in (61) in the least. Its only concern is that every underlying segment be realized. However, I am still assuming that reduplicated segments do not *contribute* an underlying segment. Thus the only way that reduplicated segments can be associated with an underlying segment is by entering in correspondence with the underlying form of another segment. The obvious choice is of course association to the underlying form of the base segment with which the reduplicated segment is in correspondence. The consequence of this assumption is that a reduplicated segment is now a segment with two surface realizations. A possible representation of this situation is as in the following diagram.

(62) *lexical form*: k$_{1}$ ɔ$_{2}$ l$_{3}$ a$_{4}$ t$_{5}$

surface form: $\underline{\text{k}}_{1}$ $\underline{\text{ɔ}}_{2}$ $\underline{\text{l}}_{3}$ $\underline{\text{a}}_{4}$ k$_{1}$ ɔ$_{2}$ l$_{3}$ a$_{4}$ t$_{5}$

Returning to the question of how this assumption affects the constraint Max-LS, it should be clear that the number of underlying segments which have two surface realizations has no influence on the evaluation of Max-LS. This last point means that varying reduplicant size will not be penalized by Max-LS. A small reduplicant is one where only few underlying segments are realized twice, while a large reduplicant is one where many underlying segment are realized twice. Such variation has no effect on the evaluation of Max-LS, and this is the sense in which reduplicated segments ‘escape’ the effects of Faith-LS (or more precisely Max-LS).

But now we might consider how such an assumption affects evaluation of the constraint in (59), Dep-LS. Since now the reduplicated segments are associated with underlying segments, they will no longer violate Dep-LS. No special stipulation is necessary. Since reduplicated segments are now associated with underlying segments, any segments not so associated can be evaluated as violating Dep-LS. This makes it possible to give up the distinction between the two Dep's in favor of a single Dep constraint. For the same reason no special status need be accorded to segments 'associated with RED'.

Thus we see that the assumption that reduplicated segments are subject to the normal faithfulness constraints not only has no effect on emergence of the unmarked, but also considerably simplifies the definition of faithfulness. I will next consider how this assumption affects such problematic cases as that of Klamath and Javanese, where the reduplicant was seen to preserve underlying information not realized in the base.

2.2.2.2. Klamath and the Full Model

In the cases of Javanese and Klamath, it was seen that designating which part is the reduplicant, and which the base was problematic, since both parts deviate from the presumed original. At the same time however both parts also preserve information from this original independently. Consider again the relevant data from Klamath:

(63) **Klamath Distributive** (Barker 1964, Clements & Keyser 1983)

/mbody' + dk/	mbo-mpditk	'wrinkled up'
/sm'oq'y + dk/	sm'o-smq'itk	'having a mouthful'
/pniw + abc' + a/	pni-pno:pc'a	'blow out'

In this case we see that the reduplicant preserves both the vowel, and, in the case of the obstruent in 'wrinkled up' the voicing information, from the underlying form. In M&P's Basic model the reduplicant is only accessible through the base. Thus if the base does not preserve the information, then the reduplicant cannot copy it. This leads them to retract from the strong position and posit a third relation between the underlying form and the reduplicant directly.

(64) **'Full Model' of reduplicative correspondence** (M&P 1995)

lexical form: k$_{1}$ ɔ$_{2}$ l$_{3}$ a$_{4}$ t$_{5}$

LR Faith *LS Faith*

surface form: k$_{1}$ ɔ$_{2}$ l$_{3}$ a$_{4}$ k$_{1}$ ɔ$_{2}$ l$_{3}$ a$_{4}$ t$_{5}$

BR Identity

Once one adds this piece however most of the predictions concerning EoU are lost, since now it is potentially possible to have the reduplicant be *more faithful* to the underlying form than the base. In order to restore these predictions M&P must stipulate a universally fixed ranking.[9]

[9]The fact that M&P try to derive this from another 'meta-ranking' is only small

(65) Faith-LS >> Faith-LR

A similar type of case from Javanese leads Yip (1995ab) to propose that reduplication does not involve a reduplicant/base distinction at all. Considering the discussion of correspondence in the previous section, we are now in a position to give that proposal some formal content.

Instead of assuming, as do M&P, that reduplicated segments are exempt form the rigors of regular faithfulness, I am assuming they are fully subject to them just as are any other segments. This means in particular that Dep-LS (now just Dep) requires that they be associated with an underlying form. Since they do not have their own underlying form they will need to associate with the underlying form of the segment that they copy. Thus the underlying form is in correspondence with both the reduplicant, and the base, in other words the entire *Redform*. BR correspondence is internal to the redform.

(66) **The Reduplicate! model of correspondence**

lexical form: k_1 ɔ$_2$ l_3 a_4 t_5

LS Faith

surface form: $\underline{k}_1$ $\underline{\text{ɔ}}_2$ $\underline{l}_3$ $\underline{a}_4$ k_1 ɔ$_2$ l_3 a_4 t_5

BR Identity

What does this mean for Max-LS and Max-BR? As was discussed earlier, Max-LS requires only that underlying segments must be realized. Double realization of a single underlying segment has no effect on its evaluation. Conversely if base segments are realized only once, rather than twice as in partial reduplication, this will have no effect on Max-LS. On the other hand, since both the reduplicant and the base are realizing underlying segments there will be *two* chances to satisfy Max-LS. But since Max-LS is satisfied with one copy, the redform is only responsible for it once. Thus we might say that reduplication is a '2 for the price of 1 deal'.

Another way to think about this is in terms of M&P's Full Model. In the Full

consolation.

(i) Faith(stem) >> Faith(Affix)

First, if the effects of the meta-ranking in (i) are real, they seem like they should be derived rather than follow from a stipulation. Second, M&P already try to derive different reduplication behaviors from such differences in morphological status (i.e. stem/affix). Thus they would seem to predict that 'stem'-reduplication should permit Emergence of the Marked, since in that case Faith-LR would not be compelled to be ranked below Faith-LS.

Model every (reduplicated) underlying segment is realized twice. The two correspondence relations that regulate each realization are Faith-LS, and Faith-LR. But as we have seen the introduction of two 'separate, but equal' correspondence relations, leads M&P to introduce the fixed ranking presented as (65) above, and repeated here.

(65) Faith-LS >> Faith-LR

This ranking says simply: 'Faith-LR may never be higher ranked than Faith-LS.' Under the assumptions that I have introduced, however, both realizations of the underlying form are instances of Faith-LS. This means that what M&P call 'Faith-LR' is just another instance of Max-LS. But of course 'Faith-LS may never be higher ranked than Faith-LS' is trivially true. There is no need to stipulate the fixed ranking in (65).

As for BR-identity, it now becomes an internal matter of the redform. Max-BR continues to require that all the base segments be copied. All the predictions made by EoU are maintained.

According to the description given here, reduplication might seem to happen for free. The question to ask is then: what constraint or condition does reduplication violate? The answer to this question brings us back to the interpretation of faithfulness as a set of wellformedness conditions, forcing the correspondence relation to be as close to a bijective, biunique function as possible. The role of Max and Dep in this scenario is to enforce bijectivity. If an underlying element is assigned two surface elements, this does not violate bijectivity. It does however violate biuniqueness, more precisely the constraint M&P (1995) call *Integrity.* Alternately one might equate this with the constraint *Repeat (NoEcho) of Yip (1995b). More generally however unnecessary reduplication, i.e. reduplication not forced by some constraint, might simply be ruled out by *Struc.

2.2.3. Is there Emergence of the Marked after all?

In this section I look at a number of cases of what might be called emergence of the marked. All of these cases have something in common the desire for identity between the base and the reduplicant leads to a structure that is otherwise unattested in the language. I begin by reviewing the basic predictions made in this respect in M&P (1995). I then go on to look at specific cases.

The first is a case discussed by M&P (1995), that of *l*-deletion in Chumash. I show that their interpretation of these facts is problematic, and needs to be revised.

The second is a case of contextual markedness: coda devoicing in West Tarangan. Two dialects provide a mini-typology, with one dialect showing devoicing in the reduplicant despite the resulting identity failure, and the other dialect showing identity induced failure to undergo devoicing.

The third is a very commonly recurring pattern: CVC reduplication in languages which generally do not have codas. The main example of the second type that I will be looking at is Mangap-Mbula.

2.2.3.1. Identity Induced Failure of Alternation (IIFA)

M&P (1995) further develop the theory by submitting the ranking that leads to Emergence of the Unmarked to the rigors of factorial typology which is one of the fundamental tenants of OT. The result is seen in (67).

(67) a. Faith-LS >> C >> Faith-BR
b. Faith-LS, Faith-BR >> C
c. C >> Faith-LS, Faith-BR
d. Faith-BR >> C >> Faith-LS

Ranking (67a) is the by now familiar emergence of the unmarked ranking. Constraint C is only active in reduplication. The ranking in (67b) means that C is inactive in the language. Its effects are not noticeable in any context. (67c) means that C is paramount. It is observed everywhere, and configurations which violate it are never permitted.

Finally, the ranking of interest here is (67d). According to M&P this ranking results in *overapplication*. The term overapplication is a residue from derivational theories. In the current theory we have seen that identity between base and reduplicant is the result of correspondence, and any deviation from identity is the result of Emergence of the Unmarked. In derivational theories identity is generally the result of a copying process. Rules can apply to either of the two copies, but if the rule applies to both parts even though the context for the rule is met in only one, the rule is said to 'overapply'. This contrasts with a second type of situation where a rule is seen to fail to apply even though its context *is* met in one part of the reduplication (but never in both). In this latter case the rule is said to 'underapply'.

As M&P point out, in both of these cases the cause for the failure of expected application is the desire for identity between the two parts. In their framework, identity results from correspondence, which means that in the general case the two parts will look alike, and nothing more needs to be said. If however, as in ranking (67d), some constraint C prevents a particular configuration—or in derivational terms 'prevents a rule from applying'—then the higher ranked BR-identity requirement can force the offending configuration to be tolerated—or in derivational terms force the rule to overapply.

What about underapplication? Note that the previous explanation can also be read as an explanation of underapplication. If constraint C is a requirement that a particular configuration be avoided—in derivational terms if it represents the 'input to a rule'—then higher ranking BR-identity can force the configuration to be tolerated—which in derivational terms mean the rule responsible for removing the configuration will underapply. One way to interpret this is to say that this framework requires all cases of underapplication to be reanalyzed as overapplication (cf. the discussion of the 'underapplication' of the Japanese [g/ŋ] alternation in M&P 1995). More to the point however is that the distinction between over- and underapplication is analysis dependent. What is common to both situations is that an expected alternation fails to occur, and the culprit for this failure is the desire for identity between the two parts of the reduplication. I will thus adopt the neutral term *Identity Induced Failure of Alternation*, and use the other terms only when already applied to a problem by previous analyses.

A final comment relating to the putative distinction between over- and underapplication is that most cases previously analyzed as overapplication do not require the ranking in (67d) at all. In contrast all cases of underapplication (and some of overapplication) do require the ranking, and are premised on there being some higher ranked constraint X that prevents one or the other part of the reduplication from conforming with the requirement imposed by C, since otherwise the 'easiest' way to meet BR-identity in this circumstance is for both parts to conform with the pressures of C. Thus the actual ranking will need to be revised to:

(68) X >> Faith-BR >> C >> Faith-LS

This constraint can be said to constitute M&P's theory of underapplication.

2.2.3.2. Chumash l-deletion

An instructive case that will serve to illustrate this comes from Chumash (original data from Applegate 1976, cf. also Mester 1986). In Chumash clusters consisting of *l* and a following coronal are simplified by deleting the *l*. The case illustrates the failure of the over/underapplication terminology, since *l*-deletion is seen to both over- and underapply.

In their discussion of this case M&P (1995) point out that overapplication, in a form like *s<u>pit</u>pitap* 'it is falling in', from a root *pil*-, poses no problem, since both the ban on *l*-coronal clusters and the identity requirement between base and reduplicant are perfectly met. More problematic are underapplicational cases such as *<u>c'al</u>c'aluqay* 'cradles', since here the final *l* in the reduplicant is followed by a coronal in the base. M&P suggest that this is due to the 'templatic' requirement, that the reduplicant be of the form CVC. The crucial tableau is shown in (69).

(69)

input: /RED-c'aluqay/	R=$\sigma_{\mu\mu}$	Max-BR	*l[cor]	Max-LS
a. c'a – c'auqay	*!	****		*
b. c'a – c'aluqay	*!	*****!		
c. ☞ c'al – c'aluqay		****	*	

Since this case involves deletion, the Faith constraints that need to appear in the ranking of the (68) type are the Max constraints. As the phonotactic responsible for *l*-deletion they use **l*[cor]. As the constraint X forcing the underapplication M&P adopt the templatic constraint R=$\sigma_{\mu\mu}$. Unfortunately, the tableau in (69) is missing some crucial candidates. These candidates are compared with the desired winner in tableau (70).[10]

(70)

input: /RED-c'aluqay/	R=$\sigma_{\mu\mu}$	Max-BR	*l[cor]	Max-LS
c. ☹ c'al – c'aluqay		****!	*	
d. ☞ c'al – c'al			*	****
e. ☞ c'aq – c'aq				****

As this tableau demonstrates the analysis walks squarely into the jaws of what Prince (1996) calls the Kager-Hamilton Conundrum (KHC, see section 2.1.1.2.). But the fact that this problem arises is of much less interest, than why it happens.

As was seen earlier the KHC is the unavoidable consequence that results when constraints of the form 'R=…' are added to the mix, and provides the argument that templatic constraints must be abandoned in favor of an EoU conception of templates, since such reduplication induced truncation is completely unheard of in natural language.

Unfortunately, while abandoning the R=$\sigma_{\mu\mu}$ constraint does remove the analysis from the danger of the KHC, it leaves it with another problem. In order to derive an EoU template we will need to be able to rank Max-BR *below* Max-LS. As soon as we do this however, M&P's analysis of underapplication is lost.

[10]Whether (d) or (e) is the winner in this case depends on matters that are entirely outside the purview of the current discussion. Essentially the question is whether there are any constraints in the language ranked above **l*[cor] that might make (d) a more acceptable truncation than (e). Note that the incorrectly predicted winning forms *c'alc'al* (or *c'aqc'aq*) are nearly unrecognizable as reduplicated form for the form in question.

It should be noted that the ranking paradox described cannot be resolved by some ingenious ranking of constraints that have not been taken into account. It is inherent in the architecture of the argument. To summarize the problem we have the following two incompatible claims:

(71) a. Max-LS >> ‘size restrictor’ >> Max-BR (= partial reduplication)
b. X >> Max-BR >> phonotactic >> Max-LS (= over/underapplication)

Thus the analysis of over/underapplication of M&P (1995) makes the rather strange prediction that deletion can only underapply in systems with total reduplication, a prediction clearly falsified by the case of Chumash.

It seems that we need to abandon one of the two assumptions that brought us here. Since the emergence of the unmarked account of partial reduplication is generally successful, it seems preferable to give up the account of over/underapplication. This case is not a solitary one. I now turn to another from West Tarangan.

2.2.3.3. Doka Timur and Rebi WT devoicing

Doka Timur (River) and Rebi (North) WT are two of four dialects described by Nivens (1992, 1993). All WT dialects have the following properties. No word internal codas except for the liquids *(r, l)*. Word final codas are generally permitted, but voiced obstruents are not allowed.

All forms of WT permit a variety of reduplicant shapes including CVC, and CV. While the choice of reduplicant shape is an interesting topic (see chapter 4) here I focus on another property, the interaction of reduplication with obstruent voicing. In addition to CVC and CV, both DT-WT and R-WT have a ‘coda reduplication’ pattern, consisting of a single C. In this last type of pattern a single C is copied, and attached as a coda to a preceding open syllable.

(72) **Doka Timur WT** (Nivens 1992, 1993)

ɛ-laˈjir	ɛlar̲ˈjir	‘3s-white’
maraŋam	maŋ̲ˈraŋam	‘praying mantis’

As seen in the examples in (72), a single consonant ([r] in the case of ‘3s-white’, and [ŋ] in the case of ‘praying mantis’), is copied and rounds out the light syllable before the main stress, turning it into a CVC syllable.

The lack of voiced obstruents in codas is a fact of WT, and as such we would like to account for it. Nivens treats it as a Morpheme Structure Constraint, but it is also true on the surface. There are however generally no alternations involving voiced obstruents codas, except in DT-WT to be discussed below. A particular strength of OT is exactly that we can capture such cases just as well.

Systems which disallow voiced obstruents in coda position are common enough. Itô & Mester (1996) suggest that this can be understood as the cumulation of two independent markedness dimensions. First voiced obstruents are marked segments in and of themselves, and this can be expressed with a constraint *voi/obs. Second codas are marked as well, as expressed by the constraint NoCoda. However since both voiced obstruents and codas are attested in WT, neither of these constraints will have the power to rule out the relevant configuration alone. We thus need a further piece.

The crucial idea according to Itô & Mester (1996) is the concept of *local conjunction* (Smolensky 1995). The idea here is that the simultaneous violation of both *voi/obs and NoCoda in some sufficiently small domain is marked above and beyond the mere markedness of both parts.

(73) A $\&_l$ B $=_{def}$ ‘the local conjunction of A and B’

We can thus write:

(74) NoVoiObsCoda $=_{def}$ *voi/obs $\&_l$ NoCoda

Since configurations where a voiced obstruent is in a coda are unattested in WT, we must prevent potential underlying configurations of this type from surfacing. Thus we have the ranking:

(75) NoVoiObsCoda >> Faith-LS

Here Faith-LS is merely a place holder for some faithfulness constraint. In the absence of alternations we will be unable to ascertain which constraint is involved. There are a number of possibilities. Ident(voi)-LS would mean that such configurations are resolved by devoicing the offending segment, while Max-LS in that position would lead to deletion. Other possibilities are imaginable as well. While such indecision might seem strange, it can actually be viewed as a strength of OT that we need not commit to any particular ‘repair strategy’. This contrasts OT with such frameworks as Natural Phonology (Stampe 1973) or Myers’ Persistent Rules (1991). In view of the lack of evidence, any such choice would be entirely arbitrary. The general schema of the ranking in (75) is the familiar case of Stampean Occultation.

Let us now turn to the specifics of Doka Timur WT. As was pointed out earlier DT-WT has a variety of different patterns of reduplication. Among these two patterns, the CVC, and the C pattern both ‘create’ codas. Some relevant data is shown in (76).

(76)	ɛ-r-ˈtɔpa	ɛrtipˈtɔpa	'3s-R-wash'	
	i-ˈnɔŋa	iŋˈnɔŋa	'3s-steal'	

As has been noted in many systems, reduplication does not always preserve syllable structure roles. This is seen in WT as well. For example the base segment *p* in *tɔpa* 'wash' is mapped onto a coda in the reduplicant. (Note incidentally that vowels in DT-WT reduplication are replaced by default segments.)

Since reduplication can map onsets onto codas, and onsets support a voicing distinction in contrast to codas, there is a potential conflict. And this is exactly what we see. In order to avoid this conflict DT-WT devoices the segments.

(77)	jaban	jipˈjaban	'dry'	*jibˈjaban
	kudam	kitˈkudam	'cloud'	
	mata+sɛbar	matapˈsɛbar	'eye + saliva -> eye discharge'	

Straight reduplication of *jaban* 'dry' would lead to a voiced obstruent *b* falling in the coda. Instead we find this segment realized as its voiceless counterpart *p*. We can interpret this as meaning that NoVoiObsCoda outweighs copying faithfulness. Further since devoicing occurs, we now know that the relevant faith constraint is Ident(voice).

(78) NoVoiObsCoda >> Ident(voice)-BR

But here we note that the base faithfully preserves the voicing even though this will mean that the base and the reduplicant will be dissimilar. This means that the relevant faithfulness constraints referred to in ranking (75) will need to dominate the desire for the base and reduplicant segments to have identical voicing.

(79) Faith-LS >> Ident(voice)-BR

We can now combine the various rankings into a single hierarchy. The result is as seen in (80).

(80) NoVoiObsCoda >> Faith-LS >> Ident(voice)-BR

We can verify that this is the correct analysis by looking at the following tableau for the form *jaban* ‘dry’.

(81)

input: /RED + jaban/	NVOC	Faith-LS	Id$_{voi}$-BR
a. jib'jaban	*!		
b. ☞ jip'jaban			*
c. jip'japan		*!	

So far so good. Rebi WT is minimally different. According to Nivens (1993, p.363) the one relevant difference is that Rebi does not devoice in such cases. Unfortunately Nivens does not provide actual examples from Rebi that show voiced stops in the coda, but Rebi is very similar to Doka Timur. Thus the forms in Rebi equivalent to those shown in (77) would be as shown in (82) (One inconsequential difference between Rebi and Doka Timur is that Rebi does not have default segments).

(82) jaban jab'jaban (*inferred form)
kudam kud'kudam (*inferred form)

What we are seeing here is apparently Emergence of the Marked! Voiced obstruent codas are permitted if and only if they lead to greater BR faithfulness. Thus this is a case of Identity Induced Failure of Alternation. In reduplication, copying faithfulness must outweigh NoVoiObsCoda. This would seem to spell out to the following constraint ranking:

(83) Faith-BR >> NoVoiObsCoda >> Faith-LS

While the logic that leads to this ranking is impeccable, the result is of course not the desired one as was seen before. This ranking does not lead to Emergence of the Marked, as can readily be shown with the help of a tableau. In the following tableau I assume that the faithfulness constraint is Ident(voice) for concreteness.

(84)

input: /RED + jaban/	Id(voi)-BR	NVOC	Id(voi)-LS
a. ☹ jabjaban		*!	
b. japjaban	*!		
c. ☞ japjapan			*

The result is rather unfortunate. Following similar discussion in M&P (1995), the winning candidate is the one that escapes violating the phonotactic by ‘back-copying’. That is, the base is altered, making it possible to maintain BR identity, without violating

NoVoiObsCoda.

One might still try to escape this result. Note that what is happening in Rebi WT is what is traditionally referred to as ‘underapplication’. A phonological process, here: devoicing of obstruent codas, fails to apply, in an effort to maintain BR identity. M&P argue that such cases should not happen generally, but only when there is some external pressure. This external pressure should generally rule out the ‘back-copying’ case. In other words following their proposed theory of underapplication, we need to modify the analysis from (83) to as follows:

(85) X >> Faith-BR >> NoVoiObsCoda >> Faith-LS

Of course the important question is what is the mystery constraint X? Before we answer this let us consider one more case, that is very common. CVC reduplication in languages that generally lack codas.

2.2.3.4. Mangap-Mbula syllable reduplication

Mangap-Mbula is an Austronesian language from Papua New Guinea. The description of the language is provided by Bugenhagen (1995). Its reduplication system will be described in detail in chapter 5.

Mangap-Mbula has a fairly simple syllable structure. Generally it does not permit word internal consonant clusters, except for a few complex onsets consisting of a coronal + /w/ (e.g. *zwooro* ‘stretching’). It does have prenasalized segments though, which arguably can be analyzed as NC clusters (Padgett 1995). It does permit word final consonants:

(86)	posop	‘you sg. finish’
	time^{n}der	‘they stand’
	tipo^{m}bol	‘they CAUS-be strong’

These basic facts can be accounted for in familiar fashion, by the following ranking:

(87) Align-R(Stem, Prwd) >> NoCoda >> Max-LS

This ranking says that codas are generally not permitted in the language, except word finally. The ranking of NoCoda over Max-LS is a case of Stampean Occultation. The alignment constraint dominating this ensures that this prohibition is overridden at the word edge.

In reduplication, however, we find data like the following:

(88) ˈbaada badˈbaada ‘you (sg) be carrying’ (52)
ˈmooto motˈmooto ‘worms’ (52)
iˈtooro itorˈtooro ‘3sg-turn’ (262)
ˈzwooro zworˈzwooro ‘you (sg) be stretching’ (59)
ˈyaamba yamˈyaamba ‘to scold’ (27)

In reduplication however codas are permitted. But note that the reduplication is also partial, not total. As such we have seen that Emergence of the Unmarked predicts that Mangap-Mbula reduplication must have the ranking Max-LS >> … >> Max-BR. But if we add this to the earlier ranking we have the overall ranking:

(89) Align-R(Stem, Prwd) >> NoCoda >> Max-LS … >> Max-BR

This ranking would seem to rule out the possibility of reduplicant final codas. Actually one suggestion to avoid this might be to declare the reduplicant a stem. Its right edge would thus need to be aligned with a prosodic word giving a bracketing as follows:

(90) [[zwor][ˈzwooro]] ‘you (sg) be stretching’ (59)

There are two objections against this however. The first is factual. The reduplicant in Mangap-Mbula does not form a prosodic word domain. For example, the reduplicant never receives a main stress, and it only receives a secondary stress in the case of total reduplication. The second objection has to do with M&P’s interpretation of the morphological status of the reduplicant. According to their interpretation the reduplicative morpheme RED can be a stem, so that part is not a problem. However since RED does not have any underlying material, anything associated with RED at surface will be the ‘stem’. Thus the alignment does not have the power to override NoCoda in the case of reduplication. This situation can be seen in the following tableau:

(91)

input: /RED + zwooro/	Align-R	NoCoda
a.☹ [[zwor][ˈzwooro]]		*!
b. ☞ [[zwo][ˈzwooro]]		

Note that the logic that leads to this tableau is the same as the logic that leads to Emergence of the Unmarked. Thus tampering with the assumption about the stem-status of the reduplicant segments could have large scale consequences. Note incidentally that the assumption that the reduplicant segments are associated with the underlying segments doesn’t help in this case, since the final segment of the underlying form is the /o/ not the /r/.

We have thus seen three examples of ‘Emergence of the Marked’. The final rankings for these three cases were:

(92) **Chumash**: X >> **l*[cor] >> Max-LS >> … >> Max-BR
Rebi WT X >> Faith-BR >> NoVoiObsCoda >> Faith-LS
Mangap-Mbula X >> NoCoda >> Max-LS … >> Max-BR

In all of these cases we were left with the search for a mystery constraint X, that would rule out the crucial candidate. To put it bluntly the relevant constraints should be 'don't delete the *l*' for Chumash, 'don't devoice the obstruent' for Rebi WT, and 'don't delete the Coda' for Mangap-Mbula. But of course these constraints are merely the anti-constraints for the phonotactics that are giving us the problem in the first place.

There is good reason however to think that this is not the equivalent of giving up. The problem is the formulation of the phonotactics. Consider the case of Chumash **l*[cor]. As is this constraint represents an all or nothing deal. If ranked above Max-LS the language will never have *l* before coronal, but if ranked below *l*s are freely distributed. We must inquire as to the why *l* is not tolerated. Obviously *l* before a coronal is difficult to hear. Thus the effort incurred in producing such a segment is not necessarily justified. But clearly producing such a segment is not impossible, apparently not even for speakers of Chumash. If there is some reason to make the effort worthwhile, this should be enough. The reward of BR-identity should be enough. Thus there needn't be a mystery constraint X at all. However in order to implement such an approach we will need a more fine-grained approach to phonotactic constraints.

Spelling out such an approach would take me too far afield. I will thus only indicate the idea for such a solution. Consider the case of the voicing restriction on codas in Rebi-WT. Steriade (1995) suggests the following type of approach to such cases:

(93) Implement(voice) / ___ [+son] >> *Effort >> Implement(voice)

This ranking says that segments may be voiced in an onset position (i.e. before a sonorant), but that in other positions the desire to avoid effort wins out. Thus other positions will be voiceless. But in this case BR-identity might also dominate *Effort, this would lead to the following tableau for Rebi-WT:

(94)

input: /RED + jaban/	Imp_{voi}/_V	Id-BR	*Effort	Imp_{voi}
a. ☞ jabjaban			**	
b. japjaban		*!	*	?
c. japjapan	*!			*

There are a number of questions about this tableau however. First, since the Implement family of constraints covers most of the same ground as faithfulness—in particular the Ident constraints—in the M&P framework, the relation to BR-identity would need to be clarified. Second, while the evaluation of *Effort violations used in this case is intuitively clear, it needs to be given some formal basis. A related question, which becomes important in cases that involve more than one alternation, is whether *Effort is a single monolithic entity. Finally comes the question of how such an analysis could be adapted to cases which involve segment deletion, such as Chumash and Mangap-Mbula. The issue here is how an Implement-style analysis of deletion, which would spread out the single constraint Max-LS, would recapture the Emergence of the Unmarked insights that have been shown to be central to the theory of reduplication.

2.2.4. Summary

In this section it has been argued that the correspondence theory of reduplication can both be simplified, and made more consistent, by subjecting the reduplicant to the normal faithfulness constraints, contra the assumption in M&P (1994b, 1995). In addition the Reduplicate! model also explains certain data from Klamath and Javanese where the reduplicant is more faithful to the underlying form than the base, without the need of adding additional correspondence relations which only undermine the predictions made by the Emergence of the Unmarked framework.

3. Variation in reduplicant shape: Nakanai

A claim made in the previous chapter, in section 2.1.1., was that emergent markedness constraints could cause free variation of templates. Such systems are called a-templatic. In this chapter I will show that such systems exist. Nakanai reduplication exhibits sonority driven variation of template shape. This variation also reveals asymmetries in syllabification. A contrast between hetero- and tautosyllabic vowel sequences emerges in reduplicative contexts. These asymmetries provide an argument against Uniformity, a concept fundamental to derivational theories, that the same state of affairs must receive the same analysis in all contexts.

3.1. A-templatic reduplication

Autosegmental theories of reduplication, such as those explored in McCarthy (1979), Marantz (1982), M&P (1986), are 'template-driven' in the sense that in order to get reduplication, a template, i.e. a morpheme specified only as a prosodic skeleton, has to be specified. Such a theory is heavily dependent on the idea that the shape of the reduplicant can be *positively* specified.

In the present theory however templates are emergent properties, with total reduplication serving as a sort of default. The basic ranking schema for total reduplication is shown again in (1).

(1) C_A >> Max-LS, Max-BR >> C_I

Here C_A is shorthand for the set of active constraints, while C_I indicates the set of constraints that are inactive. The ranking says that everything that is marked with respect to Max-LS, i.e. incurs a violation on a constraint in C_A, is also marked with respect to Max-BR. Since only things that are unmarked with respect to Max-LS will be in the base of reduplication, everything that is present in the base is by definition also unmarked with respect to Max-BR. The result: everything in the base is copied. Reduplication is total.

Now let us assume constraint C_E is a constraint that marks any segment for property [F]. In other words C_E is the constraint *[F]. Let us further assume that instead of the ranking in (1) we have the EoU ranking in (2).

(2) C_A >> Max-LS >> C_E >> Max-BR >> C_I

This says that all segments from the base are copied, unless they have property [F], and are thus marked by C_E. In the simplest case such segments will not be copied. In essence this gives what might be called ‘pick-and-choose’ reduplication, i.e. pick only those segments from the base that you like. Let’s assume the property denoted by [F] is freely distributed. For bases which contain no segments with property [F], reduplication will be total. For other bases this will result in all kinds of selectively truncated forms. In the most general case we will have ‘templates’ of every possible size, so that the notion of template in such a language is rather meaningless. We can thus call such a reduplication system A-TEMPLATIC[11]. In contrast to the autosegmental template theory, in an a-templatic system there is no positive template specification.

Whether such systems are actually attested is of course an empirical claim. Before examining this claim, we might note that, in a general sense, in the theory we are examining here, *all* reduplication systems are a-templatic. Templatic systems, or perhaps we should say ‘templatic-looking’ systems, are simply those, where ‘size restrictors’ (see section 2.1.1.) are among the relevant constraints that take the position of C_E in (2).

But even in systems without size restrictors there are a number of things that rein in the madness that (2) might seem to predict. For instance, if constraint C is a constraint that rules out a certain type of segment, the unselective deletion that results might seem to lead to all kinds of illicit structures. However, it should be remembered that the structures available in a language are regulated by the following ranking:

(3) ‘prosodic shape constraints’ >> Max-LS

Since Max-LS in turn dominates Max-BR, by transitivity, we know that the prosodic shape constraints will also dominate Max-BR. Thus if deletion of a marked segment would lead to an illicit structure, then the even higher ranked prosodic shape constraints will simply force further adjustments, e.g. further deletion, etc. Note that as a corollary of

[11] I have taken this term from Gafos (1995), who in turn cites McCarthy (1993) and Archangeli (1991). Probably the first articulation of the approach, albeit in a derivational framework, is due to Steriade (1988). See also McCarthy (1995), Alderete et al. (1996) for analyses in OT which take this approach, as well as Itô & Mester (1992) for an analysis of Japanese loanword truncations, and Itô, Kitagawa & Mester (1996) for a disucussion of the Japanese jazz musician’s argot.

this we get the *Prosodic Morphology Hypothesis* of M&P (1986, 1993):

(4) Prosodic Morphology Hypothesis
Templates are defined in terms of the authentic units of prosody: mora (μ), syllable (σ), foot (Ft), prosodic word (Prwd)

To see why this is so, first we observe that (3) will limit the inventory of prosodic shapes in the language to a subset of the universally possible (M&P's 'authentic units of prosody'). Then there will be only two possibilities to consider. Either Max-LS dominates Max-BR, in which case the prosodic units available to reduplication will be equally limited by transitivity of ranking. Or Max-BR is the higher ranked constraint. But this case can only lead to total reduplication, in which case the reduplicant copies the properties of the base, and as a result the reduplicant will consist of the same prosodic units that the base consists of.

Let us now move into more concrete territory. Nakanai is an Austronesian language from New Britain. The description of the language is provided by Johnston (1980). Nakanai has a very simple syllable structure, only (C)V syllables are permitted. It also has a notably diverse set of reduplication patterns. However one constant is that the reduplicant is always prefixed to the final C_0VC_0V of the stem. Given this information, and before going into the details of Nakanai in the next section, let us first consider the predictions of the a-templatic hypothesis from a purely combinatorial level. In a language that is limited to CVCV bases the total number of possible 'templates' in a free-for-all pick-and-choose world is expressed as follows:

(5) $$\binom{4}{1} \cdot 1! + \binom{4}{2} \cdot 2! + \binom{4}{3} \cdot 3! + \binom{4}{4} \cdot 4! = 64$$

This number includes not only all possible combinations of segments from the base, but all order permutations of these combinations as well. While reordering of segments is not unheard of, it is clearly a rare phenomenon restricted to special circumstances (see McCarthy 1995 for discussion of such a case from Rotuman). Thus I will limit further discussion to the cases where linear order is preserved, i.e. where Linearity is undominated. This leads to the following list:

(6) a.	$\cancel{C_1}$	$\mathbf{C_1V_1}$	$\cancel{C_1V_1C_2}$	$\mathbf{C_1V_1C_2V_2}$
		$\cancel{C_1C_2}$	$\mathbf{C_1V_1V_2}$	
		$\mathbf{C_1V_2}$	$\cancel{C_1C_2V_2}$	
b.	$\mathbf{V_1}$	$\mathbf{V_1C_2}$	$\mathbf{V_1C_2V_2}$	
		$\mathbf{V_1V_2}$		
c.	C_2	C_2V_2		
d.	V_2			

The 16 possible templates that can be formed from a $C_1V_1C_2V_2$ base while respecting linearity are shown in (6). However as discussed earlier these possibilities will be further subject to the syllable structure restrictions of Nakanai. The most salient restriction is the complete absence in the language of any consonant clusters. Of the 16 patterns, 4—stricken in the example—will lead to CC clusters. This is obvious in the cases where the template itself contains a cluster. In the case of the templates C_1 and $C_1V_1C_2$, since both will of necessity be prefixed to a C initial base, the concatenation will lead to a CC cluster. The net result is that these 4 will be excluded as possible patterns, and we are left with 12.

If we add Anchoring as an unviolated constraint, then the templates fall into 4 groups (6a-d), with each group being limited in occurrence to bases beginning with C_1 (a), V_1 (b), C_2 (c), and V_2 (d) respectively. Of these, the C_2 and V_2 groups, containing a total of 3 templates, now collapse with the C_1 and V_1 groups respectively, since the initial segment is by definition C_1 or V_1. More to the point, bases where C_2 or V_2 is initial, i.e. bases of the form C_0V, are subminimal, that is they do not meet the requirement that the base contain at least two vowels. We can thus disregard those three patterns. This leaves us with 8 templates (bolded in 6).

At this point we might want to compare our predictions with the actual list of attested templates in Nakanai. The situation is summarized in (7).

(7)	*predicted patterns*	*Nakanai example*	*gloss*
	$C_1V_1C_2V_2$	<u>ligi</u>ligi	'hurting (p.148)'
	$C_1V_1V_2$	<u>kau</u>kavu	'wearing lime on the face'
	C_1V_1	<u>va</u>vai	'side (272)'
	C_1V_2	<u>ba</u>beta	'wet (150)'
	$V_1C_2V_2$	<u>osa</u>osa	'flirting (p.148)'
	V_1C_2	<u>ol</u>oli	'digging (148)'
	V_1V_2	<u>au</u>au	'steering (148 fn.)'
	V_1	(not attested)	

Of the 8 templates, all but one actually occur. The lone non-occurring template, is that consisting of a single vowel. Judging from this fact alone, this is a rather good confirmation of the a-templatic hypothesis. A templatic analysis would need to posit as many as 7 different templates, with the exact number depending on a number of other factors. Such an analysis leaves it a complete mystery why the templates just happen to cover the entire spectrum of possibilities.

One might try to rescue the templatic analysis by mopping up this variety with a single ‘common denominator’ template, and positing explanations for why the template is only partially realized. But this would be a Pyrrhic victory, since the claim of the templatic theory is that the templates drive the output realization.

It seems that in broad terms the predictions made by the a-templatic hypothesis are confirmed. However, in order to show that the a-templatic approach is superior to the templatic, we must show that it also correctly predicts the occurrence of the various patterns. I turn to this issue in the next section.

3.2. Determining the reduplicant shape in Nakanai

I now turn to the details of the Nakanai reduplicative system. As was mentioned, Nakanai is an Austronesian language spoken on the northern coast of West New Britain. It is also sometimes referred to as Lakalai, the *l* being the common realization of *n* which is absent from the language, due to a historical change. The source for the language is Johnston (1980), henceforth J, and all data cited is from that work. Page numbers, indicated in parentheses, refer to that work.

The previous section already introduced the wide variety of reduplicant shapes in Nakanai. Nakanai reduplication has been discussed repeatedly in the literature (Broselow & McCarthy 1983, Williams 1984, Davis 1986, Kitagawa 1986, see also Spencer 1991). All of these discussions use templatic frameworks. As a result they do not address the issue of why there are so many patterns. Instead they deal with the patterns one at a time, or else pick just one or two for exemplification. Here I will argue that it is crucial to treat the reduplication as an entire system.

In the previous section, the discussion of the pattern variety omitted one important factor in its comparison of templatic and a-templatic theories: *the usage of the patterns*. If it turns out that each of the 7 attested patterns corresponds to a different usage, i.e. the patterns constitute 7 duplemes, then the templatic theory might well be the more economical theory after all. This is because the one-to-one association between templates and usage will follow directly from the templates being entered in the lexicon as discrete items.

Reduplication in Nakanai does have a large number of different uses: marking of non-singular agreement, continuative habituative mood, derivation of intransitive verbs from transitives, formation of collective plural nouns, concrete nouns, and distributive numerals. However, the shape of the reduplicated form is independent of the usage. All usages occur with any of the patterns. The following examples should demonstrate this point rather thoroughly.

(8) *continuative habituative verbs*

$C_1V_1C_2V_2$	ragaraga	'jumping (148)'
$V_1C_2V_2$	osaosa	'flirting (148)'
V_1V_2	auau	'steering (148 fn.)
$V_1C_2V_2$	harari	'running (149)'
C_1V_2	sesile	'tearing (150)'
C_1V_1	gigiu	'peeling (149)'
V_1C_2	alali	'eating (150)'

concrete nouns

$C_1V_1C_2V_2$	mulugaluga	'to be first –> the first -> the leader (176)'
	tulugaluga	'walk -> trip -> sandal/shoe (176)'
C_1V_1	pulolou	'sit -> residence -> chair (176)'
	pileleho	'die -> death -> corpse (176)'

collective plural nouns

$C_1V_1C_2V_2$	bolobolo	'many pigs (167)'
$V_1C_2V_2$	taiveive	'snakes (186)'
V_1C_2	bahararu	'widows (149)'
C_1V_1	bebebe	'butterflies (149)'
$C_1V_1V_2$	paopago	'spirit residents of Mount Pago (150)'
C_1V_2	bobiso	'members of the Biso subgroup (150)'

distributive numerals

$C_1V_1C_2V_2$	ilimalima	'five (154)'
$C_1V_1V_2$	itoutolu	'three (154)'
C_1V_1	ivavaa	'four (154)'
C_1V_2	ilalua	'two (154)'

In terms of the typology introduced in section 1.2.2., the Nakanai patterns are alloduples of a single dupleme. In the rest of this section I will demonstrate that the distribution is prosodically determined. In particular I will show that the choice of patterns is the result of emergent markedness constraints, and that these same constraints also predict the actual shape of the patterns. Thus the Nakanai reduplicative system confirms the predictions made by the a-templatic hypothesis.

3.2.1. Johnston's description of the Nakanai reduplicative system

I now turn to a detailed look at the individual patterns of Nakanai.

3.2.1.1. Prosodic Structure

The prosodic structure of Nakanai is exceedingly simple. Only C_0V syllables occur, and there are no consonant clusters of any kind, except for a few recent borrowings from English and Tok Pisin. The language has five vowels, and all possible vowel sequences are attested. Main stress always falls on the penultimate vowel. The only words that do not have two vowels are clitics that never receive their own stress. This indicates that the stress foot of the language is the moraic trochee, that feet are built from the right, and that minimality is strictly enforced. Reduplication provides evidence for this as well.

J reports that the location of the reduplicant is rigidly fixed. It is always found immediately before the final C_0VC_0V of the stem. This means that if the stem or word is longer than a single moraic trochee, the reduplication is infixing. Some relevant data is provided in (9). To assist the reader, the reduplicant has been underlined, and the final foot has been enclosed in parentheses.

(9)	abiri	abiri(biri)	'washing (148)'
	kuruve	kuruve(ruve)	'many sweet potatoes (148)'
	vigilemuli	vigilemuli(muli)	'tell a story -> story (178)'
	kaiamo	kaia(mamo)	'residents of Kaiamo village (149)'
	bilau	bila(lau)	'songs (149)'
	bauba	bauba(uba)	'pig nets/netting pigs (148)'
	lua	ila(lua)	'two (154)'
	burulele	burule(lele)	'sliding on the buttocks (149)'
	vi-tau-me-tari	vitaumetai(tari)	'reciproc-man/younger sibling (186)'

While some examples can be analyzed as suffixal reduplication, it is clear that whenever the reduplication is partial, it is the first part that is reduced. This justifies the characterization as prefix to the final foot. This description also accords well with the many short forms which are exactly one foot long. In such cases it is always the first part which is reduced, and the reduplicant is a prefix.

Prefixation to the main stress foot is a very common type of infixation in reduplicative systems in Austronesian, as well as elsewhere. I will postpone discussion of how to analyze the infixation until chapter 4. In this chapter I will limit discussion, for the most part, to candidate forms which are properly infixed.

The analysis of the syllable structure is straightforward. The complete lack of consonant clusters can be accounted for by making NoCoda and *Complex undominated, and making sure that they both outrank Max-LS. This results in the following Stampean Occultation ranking:

(10) NoCoda, *Complex >> Max-LS

As was discussed in section 3.1., this automatically guarantees that the reduplication will be subject to these constraints as well.

There is only one syllable structure issue left, the status of VV sequences. Johnston argues that all VV sequences are heterosyllabic. He provides 5 arguments for this position:

1. All possible vowel clusters occur, and in all positions.
2. There are no contrasts in the language between syllabic and non-syllabic high vowels. (Nor are there are any such contrasts for non-high vowels.)
3. The length of …VV sequences is roughly equal to …VCV sequences, and both are notably longer than …V sequences.
4. Stress falls predictably on the penultimate vowel, irrespective of the quality of the vowel or the neighboring segments. Since stress shifts in suffixed forms, all vowels are potentially stressable. Witness examples such as *'abi* ‘get’, but *a'bia* ‘get it’, or *i'vaa* ‘four’, but *la iva'ala* ‘fourth’.
5. High vowels must function as vowels, since there are no closed syllables in the language.

Of these, the last argument can be dismissed, since it is exactly the point that is at issue. Of the remainder, argument 3 is of a very different nature from the others, and the most substantive, since it is based on phonetic fact. However timing facts are notoriously unreliable as a guide to syllabic status. Japanese is a celebrated case of a language which shows clear evidence for syllabic constituents, both light and heavy, while at the same time using the mora as its timing unit (see McCawley 1968, Itô 1986, Kubozono 1989, Tateishi 1990 for arguments for syllables in Japanese, and Smith 1992 for discussion of timing).

The other arguments are all of a kind, which can be summarized as ‘once a syllable, always a syllable.’ This is an example of what M&P 1994a call the *Thesis of Uniformity.* Uniformity is a staple of derivational theories, or frameworks with inviolable constraints. It makes strong predictions, since evidence gained from one example can immediately be generalized to a large number of cases. However the predictions made by Uniformity are often too strong.

In contrast, constraint violability in OT permits a principle which is generally observed to be set aside in special circumstances. For instance, inherent in the stress shift data, mentioned in argument 4, is the idea that if the *aa* sequence forms a single syllable in *i'vaa*, that this syllable will make it impossible to correctly foot the *ala* sequence in *la iva'ala*, since the foot would intersect the syllable. Exactly such a case from Tongan is discussed by Mester (1991) (see also P&S chapter 3.2). Mester argues that the correct account of this situation should be that the alignment of the foot to the right edge of the word is stronger than the integrity of the syllable.

Extending this type of reasoning, I will show that there are significant asymmetries in the behavior of different VV sequences in Nakanai reduplication, and that these are reflections of the tautosyllabic nature of certain VV sequences as opposed to others.

3.2.1.2. The reduplication patterns

The exposition in section 3.1. revealed that the range of possible reduplicant shapes covers all possible combinations of 1-2 syllables in the language. I reproduce some of the relevant data below.

(11)	CVCV	ligi	ligiligi	'hurting (p.148)'
	VCV	osa	osaosa	'flirting (p.148)'
	CVV	kavu	kaukavu	'wearing lime on the face'
	CV	bebe	bebebe	'butterflies (p.149)'
	VC	hari	harari	'running (p.149)'
	VV	au	auau	'steering (148 fn.)'

The choice among these various shapes is not free however, but is neatly determined by the prosodic shape of the base. Johnston provides a list of conditions that are supposed to determine the correct reduplicant shape for a given base. This rather daunting list of properties is provided in (12). In all of the subsequent discussion, I will capitalize on the simple syllable structure of the language, and use the following scheme to refer to the segments of the base: $C_1V_1C_2V_2$. Note that C_2 remains C_2, even if C_1 is absent. Thus C_1 always refers to the base initial consonant, and C_2 to the intervocalic one.

(12) Johnston’s list of reduplication patterns

num.	*pattern*	*conditions*	*example*
[1]	$C_1V_1C_2V_2$:	C_1 or C_2 = [r,l] but not both;	<u>ligi</u>ligi
	$V_1C_2V_2$:	C_1 = null and C_2 = [-son];	<u>osa</u>osa
	V_1V_2:	C_1 and C_2 = null;	<u>au</u>au
[2]	C_1V_1:	C_2 = null;	<u>va</u>vai
	V_1C_2:	C_1 = null;	<u>ol</u>oli
[3]	$–V_1C_2$:	C_1 not a stop, C_2 = [r,.l,m], V_1 = [-rnd];	h<u>ar</u>ari
[4]	C_1V_1:	$C_1V_1 = C_2V_2$	<u>be</u>bebe
[5]	$C_1V_1V_2$:	C_1 and C_2 = [-son], $V_1 \neq V_2$, V_1 = [e,a,o]	<u>kau</u>kavu
[6]	$C_1–V_2$:	$V_1 \neq V_2$, V_1 = [i,e,o,u] and V_2 = [a,o,e]	<u>ba</u>beta

<u>Glosses</u>: ‘hurting (p.148)’, ‘flirting (p.148)’, ‘steering (148 fn.)’, ‘side (272)’, ‘digging (148)’, ‘running (p.149)’, ‘butterflies (p.149)’, ‘wearing lime on the face’, ‘wet (150)’

Pattern [1] under Johnston’s analysis is total reduplication, while all the others are partial. J groups the two patterns seen in [2] with the description: ‘loss of V_2 occurs if there are not two Cs’. But this does not describe a natural class, and I will henceforth distinguish the two, with the C_1V_1 pattern being referred to as [2a], and the V_1C_2 pattern as [2b]. Pattern [3] is particularly intriguing, since the reduplicant is ‘moved in’ to the position after the first consonant of the base, thus resulting in an output $\dots C_1\underline{V_1C_2}V_1C_2V_2$. This ‘infixation’ is in addition to the already infixing nature of the reduplication, as can be seen in examples such as *bah<u>ar</u>aru* ‘widows (149)’.

With this description provided, we are in a better position to compare the templatic analysis with an a-templatic one. J’s description makes it clear that the templatic analysis will need a total of 7 templates, and this despite the collapsing of 3 patterns under the umbrella of total reduplication. The reason for this is that two patterns, the C_1V_1 and the V_1C_2 pattern, both occur under more than one set of conditions, and these sets cannot be collapsed. Thus we see that, in a worst case scenario, a templatic analysis might well require *more* templates than there are attested patterns. Clearly the templatic analysis is on the wrong track.

Even more problematic is the stipulative nature of the conditions. Possibly for this reason, these conditions have generally been ignored in the templatic literature, with the notable exception of Williams (1984).

There are a number of problems with this list. On the theoretical side it is not entirely clear what might motivate some of these restrictions. Consider for example the purported distinction between the total reduplication (pattern [1]) of osaosa ‘flirting’ with the VC pattern ([2b]) of *ololi* ‘digging’. Why should the obstruency of the intervocalic consonant affect the copying of the final vowel?

However, even more important are the objections from the factual side. First, the various conditions are not exclusive. Consider again the case of *osaosa*. The base *osa* actually meets the conditions for both pattern [1] and pattern [2]. Blindly following the conditions in (12) we predict the existence of a form **ososa*, but no such form is attested. Nor is this an isolated case. In fact out of a total of 98 bases with attested reduplicated forms culled from J, 37, or fully a third, meet several conditions (see the appendix to this chapter for a detailed discussion). And while a few bases do have more than one reduplication pattern such cases are clearly exceptions.

A further problem is that the conditions do not cover all possible bases. Quite a number of bases are not covered by any of the conditions, but nevertheless have a reduplicated form. For instance *mapa* ‘payments (149)’ reduplicates as *mamapa.* However a close inspection of (12) will reveal that this base is not covered under any of the sets of conditions, neither correctly nor incorrectly.

And lastly, a number of conditions seem to be formulated incorrectly. Bases that are covered by the conditions do not take the shape assigned to them by Johnston. In fact in a few cases a base meets the conditions for several of the classes, but reduplicates according to a pattern different from any of those for which it qualifies. The form *pileleho* ‘corpse (176)’ is derived from *peho* ‘die’ through insertion of the infix *il*, and subsequent reduplication. The base *leho* meets the conditions for both, patterns [1] and [6], incorrectly predicting the forms **pilehoIeho* and **piloleho*.

3.2.2. An OT analysis of the Nakanai reduplication patterns

I will now go over the various patterns in some more detail. Let us start with pattern [3] which is clearly the most unusual and has been the most challenging to previous analyses (cf. Broselow & McCarthy 1983, also Spencer 1991). According to J, it is the pattern with the most elaborate restrictions: the first consonant may not be a stop, the second consonant is limited to the sonorants of the language [m, l, r], and the first vowel should not be round. Some representative data provided by J is shown in (13).

(13)	hari	harari	‘running (149)’
	hilo	hililo	‘seeing (149)’
	baharu	bahararu	‘widows (149)’
	velo	velelo	‘bubbling forth (149)’

(14)	hugu	hugugu	‘carry (on the head) (155)’

What is most immediately striking about this pattern is that the great majority of examples have an [h] as their C_1. And as the example *hugugu* ‘carry’ demonstrates this seems to be the only relevant restriction. This is further supported by the fact that there are no forms among any of the other patterns, where the base has an initial [h]. The example *velelo* ‘bubbling forth’ seems to be an exception.[12]

This pattern can be understood as a way for the language to avoid reduplicating [h], and [h] is apparently a marked segment in the language. Indeed, Johnston reports that [h] is absent in certain dialects and is frequently dropped by speakers of the younger generation (p.10). Further evidence that [h] is not reduplicated comes from a form with medial [h]. Note that J’s conditions predict the unattested **pileholeho*.

(15)	pileho	pileleho	‘death -> corpse (176)’

With this somewhat special case out of the way we can examine the remainder more closely. All the remaining conditions fall into 3 classes: conditions on vowels, conditions on consonants, and conditions on other constituents. Taking the last case first, we have pattern [4] which consists of data like the following:

(16)	lolo	lololo	‘hearing (149)’
	bebe	bebebe	‘butterflies (149)’
	susu	sususu	‘drinking from the breast (149)’
	burulele	burulelele	‘sliding on the buttocks (149)’

This pattern occurs exactly when the base consists of two identical syllables. Total reduplication in such a case would lead to a sequence of four identical syllables. Instead the reduplicated form contains only three. This is the same type of restriction that was observed in Boumaa Fijian reduplication (see section 2.1.), and I will adopt the same account. Thus we have the ranking:

(17) Faith-LS, Ident-BR >> NoEcho >> Max-BR

[12]There are actually a few more cases that follow this pattern, and that must be classified as exceptions: *bisisi* ‘small’, *purususu* ‘descend’, *latatu* ‘child’. None of these meet the requirements proposed by J either.

The resulting tableau for the form ‘hearing’ is then:

(18)

input: /RED + lolo/	Faith-LS	Ident-BR	NoEcho	Max-BR
a. ☞ lo(lolo)			*	lo
b. (lolo)(lolo)			**!	
c. (loli)(lolo)		*!	*	

Some intriguing evidence for the action of NoEcho in Nakanai comes from vowel elision data. Vowel elision occurs only with sequences of reduplicated syllables. A syllable immediately preceding the stressed syllable is reduced if the two are identical. So *lo'lolo* is actually realized [lˈlolo]. Also if two identical syllables occur in unstressed position, then the first of the two is reduced. This type of reduction occurs, both in morphologically and lexically reduplicated cases. As it stands, our formulation of NoEcho will generally not account for these cases, since it is restricted to the foot internal domain, but I will not pursue the matter here.

Next we turn to the patterns with conditions on the vowels. The patterns with conditions on the vowels are repeated here from (12) above.

(19) [5] $C_1V_1V_2$: C_1 and C_2 = [-son], $V_1 \neq V_2$, V_1 = [a,o,e]
[6] C_1–V_2: $V_1 \neq V_2$, V_1 = [i,e,u,o] and V_2 = [a,o,e]

Pattern [6] is a rather unusual form of reduplication crosslinguistically. The reduplicant is CV, but the V that is copied is not the one immediately following the consonant. Rather the first vowel is skipped, along with any intervening consonant, and the following vowel is copied instead. A base of the form $C_1V_1C_2V_2$ that follows this pattern results in a reduplicated form $\underline{C_1}\ \underline{V_2}\ C_1\ V_1\ C_2\ V_2$. Examples follow.

(20)	pita	papita	‘muddy (150)’
	beta	babeta	‘wet (150)’
	biso	bobiso	‘members of the Biso subgroup (150)’
	sile	sesile	‘tearing (150)’
	tuga	tatuga	‘depart/walk (63/223)’
	sio	sosio	‘carrying on ceremonial litter (150)’
	toa	tatoa	‘treading/kicking (150)’

The conditions on this pattern, as described by J, are that V_1 be [–low], and V_2 be [–high] which is not particularly enlightening, until we note that this will generally mean that V_2 will be more sonorous than V_1. To be more precise, the sonority of vowels is generally assumed to place them on a scale as follows:

(21) a $\succ$ o, e $\succ$ u, i

With the help of this scale the conditions on pattern [6] can be reformulated as

(22) C_1V_2 iff $V_2 \succ V_1$

Actually (22) makes predictions which are different from J’s pattern [6] in one minor respect, since it excludes bases of the shapes CoCe and CeCo. I will return to this point immediately after looking at pattern [5], and I will argue that this difference in prediction is correct.

The formulation of the condition in (22) is considerably more concise than that proposed by J for the same pattern. Although this might be considered an improvement in and of itself, such clever manipulation of formalisms hardly commands our interest. What is more interesting is that (22) also provides us with a rationale for the choice of reduplicant shape. Clearly the language shows a bias toward the more sonorous segments in its reduplication. In a situation where the first vowel of the base is less sonorous than the second, the overall sonority profile of the reduplicated form is improved if reduplication skips right to the second vowel. It will be shown that sonority plays a role in determining the shapes of other patterns as well. Sonority effects of a similar kind are known from other phenomena as well, such as syllabification (see Dell & Elmedlaoui 1985, 1988, also P&S) and stress assignment (see Kenstowicz 1994).

Now turning to pattern [5], we note first that there is a condition that the consonants of the base both be obstruents, which I will ignore for the moment. Of more immediate interest are the condition on the vowel V_1, which must be [–high], and the overall shape of the reduplicant, which is $C_1V_1V_2$. Examples of this pattern are:

(23)	pati	paipati	‘floating (150)’
	kavu	kaukavu	‘wearing lime on the face (150)’
	gapu	gaugapu	‘beads (150)’
	kedi	keikedi	‘being careful (150)’
	sobe	soesobe	‘young women (150)’
	gove	goegove	‘mountains (150)’

The pattern presents us with a particular puzzle. According to the exposition in J, all VV sequences are heterosyllabic. But this would mean that in its reduplication, Nakanai chooses to jettison a perfectly good CV syllable in favor of an onsetless one. It is not clear what might motivate such a possibility.

The key to this puzzle lies in the condition placed on the vowel. As formulated by

J the condition on this pattern is almost the mirror image of that placed on pattern [6]. However, there is a slight overlap between the two patterns. The cases that would be subject to both patterns [5] and [6] under J's analysis are bases of the form CeCo, CoCe, CeCa, and CoCa. Under the sonority based reformulation of [6] proposed above, the first two are no longer included under pattern [6], and indeed, all instances of bases of the form CoCe in J's data take pattern [5], never pattern [6]. On the other hand all bases of the form CeCa, and CoCa, take pattern [6], e.g.:

(24) **CoCe bases—pattern [5]**

sobe	<u>soe</u>sobe	'young women'	*<u>se</u>sobe
gove	<u>goe</u>gove	'mountains'	*<u>ge</u>gove

CeCa, and CoCa bases—pattern [6]

beta	<u>ba</u>beta	'wet (150)'	*<u>bea</u>beta
mota	<u>ma</u>mota	'vines (150)'	*<u>moa</u>mota

What we see is exactly that in cases where V_1 is more sonorous than V_2 the reduplication makes sure to copy V_1, i.e. pattern [5], while if V_2 is more sonorous than V_1, then V_1 is skipped, resulting in pattern [6]. This seems to indicate that the sonority based formulation is more accurate than that specified in terms of features.

With these cases removed, pattern [5] includes only bases where V_1 is more sonorous than V_2. Actually a slight refinement in our sonority hierarchy would seem to be necessary to properly account for bases of the form CoCe. The sonority hierarchy (21) should be revised to:

(25) $a \succ o \succ e \succ u, i$

While this refinement is perfectly in accordance with intuitions about the relative sonority among the vowels, it is not entirely clear whether all the additional predictions made by this refinement are borne out. In particular it is unclear whether bases of the form CeCo ever reduplicate according to pattern [6]. I will therefore refrain from this further elaboration, and continue to use the simpler hierarchy in (21).[13]

The diagram in (26) summarizes the distribution of patterns as predicted by the sonority analysis. All the possible $C_1V_1C_2V_2$ bases are mapped out according to the sonority of their vowels. The vertical axis represents the sonority profile of V_1, with bases arranged according to declining sonority from top to bottom. The horizontal axis represents

[13]Interestingly, the few bases in the corpus that have the CeCo shape are all irregular to some extent, suggesting that perhaps their place is not fixed within the space of Nakanai reduplication patterns.

the sonority of V_2, declining from left to right. In the lower left-hand corner are the bases where V_2 is more sonorous than V_1, and this is where we find pattern [6]. The upper right-hand contains bases where V_1 is more sonorous than V_2, i.e. pattern [5].

(26)

$V_1\downarrow$ $V_2\rightarrow$	**a**	**o**	**e**	**u**	**i**
a	CaCa	CaCo	CaCe	CaCu	CaCi
o	CoCa	CoCo	CoCe	CoCu	CoCi
e	CeCa	**CeCo**	CeCe	CeCu	CeCi
u	CuCa	CuCo	CuCe	CuCu	CuCi
i	CiCa	CiCo	CiCe	CiCu	CiCi

pattern [5]

pattern [6]

Now that we have gained a better understanding of what drives the choice of reduplicant pattern, we are ready to consider the question of reduplicant shape again. As discussed in (10), we saw that the prosodic shape constraints of Nakanai will straightjacket the reduplicant into an admissible shape. The only admissible shape smaller than a foot is a syllable, thus if we assume that the goal for the reduplicant is the syllable, and that syllables in Nakanai can be maximally CVV, we can rephrase the question as; why do pattern [5] bases result in CVV syllable sized reduplicants, while pattern [6] bases only result in CV? The answer is that, since for pattern [5], $V_1 \succ V_2$, the VV sequence will have the form of an off-glide, with the syllable peak squarely on V_1. In the case of pattern [6] however the greater sonority of V_2 would mean that either the syllable peak would be less sonorous than the margin, or that the peak would be on V_2. Both of these possibilities are either ruled out universally or highly marked (cf. Rosenthall 1995). A third possibility would be to copy CVV, where the two vowels form separate peaks. But this would result in an onsetless syllable. While onsetless syllables are permissible in Nakanai in general they are apparently not in reduplication, giving us once again the familiar EoU pattern.

(27) Max-LS >> Onset >> Max-BR

This has resulted in a very tight analysis, since the criterion for the choice of alloduple, i.e. the relative sonority of the vowels, is also the explanation for the shape of the alloduple.

However, the analysis is based on the assumption that CVV is a possible syllable in Nakanai. This goes counter to the claim put forth by J that all VV sequences are heterosyllabic. It is thus worth recalling the arguments put forward by J in support of the heterosyllabic analysis. These arguments were (i) the timing facts, and (ii) Uniformity. I already suggested that the timing facts are not a reliable indicator of prosodic structure, leaving only Uniformity, i.e. ‘once a syllable, always a syllable.’

If we give a uniform analysis to all VV sequences, we also expect them to behave the same. Under such an analysis the differing behavior of different VV sequences in reduplication is a mystery, and must be stipulated (cf. Williams 1984). In the OT analysis presented here this type of situation is the expected result of a constraint conflict between ‘phonetically’ grounded constraints, which are gradient and asymmetrical, and ‘phonological’ constraints, which favor categorical distinctions and symmetry (cf. discussion in Hayes 1996). In this case, the sonority represents the physical side, while the tendency to symmetry leads to the availability of all possible VV sequences.

As was shown above, in reduplication contexts Nakanai shows a preference for the most sonorous syllable nuclei. This preference can be seen in a further case not readily apparent from the description given in J. Consider the following data involving bases of the form $V_1C_2V_2$.

(28)	bauba	baubauba	‘netting pigs (148)’	*baububa
	osa	osaosa	‘flirting (148)’	*ososa
	taive	taiveive	‘snakes (186)’	
	ota	otaota	‘veins (148)’	
(29)	abi	ababi	‘getting (148)’	*abiabi
	oli	ololi	‘digging (148)	*olioli’
	avu	avavu	‘wrap (155)’	
	aso	asaso	‘smell -> sniffing (138)’	
	kaiamo	kaiamamo	‘residents of Kaiamo village (149)’	

Bases of this form have two possible reduplicant forms. Either the reduplicant is $V_1C_2V_2$ as in (28), a form of total reduplication (i.e. pattern [1]) in J’s typology. Or the reduplicant has the shape V_1C_2 as in (29), J’s pattern [2b]. According to J, pattern (28) is chosen if the consonant is an obstruent, but the data clearly do not support this. The forms *abi* ‘get’, *avu* ‘wrap’, and *aso* ‘smell’ all choose pattern (29) despite the fact that their lone consonant is an obstruent. Instead the criterion that determines the choice of pattern is again the sonority of the vowels. Pattern (28) is chosen if, and only if, $V_2 \succ V_1$.

The preference for the most sonorous nuclei is reminiscent of Imdlawn Tashlhiyt Berber syllabification (data and original analysis due to Dell & Elmedlaoui 1985, 1988). In their 1993 analysis, P&S propose a constraint HNUC to account for this preference:

(30) **HNUC**

if $|x| > |y|$ then $\mathrm{Nuc}/x \succ \mathrm{Nuc}/y$

This says that for two segments *x* and *y*, if the intrinsic prominence of *x* is greater than that of *y*, then *x* is the better nucleus than *y*.

The evaluation of this constraint is done in parallel. The nuclei of the different candidates are compared in order of descending sonority, i.e. the most sonorous nuclei against each other first, than the next most sonorous, etc. An example that shows the working of this (from P&S):

(31)

input:	/txznt/	HNUC
a.	.tX.zNt.	n | x!
b.	.Tx.zNt.	n | t!
c.	.tXz.nT.	x! | t
d. (☞)	.txZ.Nt.	n | z
e.	.T.xZ.nT.	z! | t | t

The example shows a comparison between a few of the possible syllabifications for the Berber form /txznt/ 'you sg. stored, perf.'. Syllable boundaries are marked by periods, and the syllable nuclei are indicated by capital letters. HNUC will evaluate the candidates against each other, judging by the most sonorous nucleus first. Candidates (c) and (e) are inferior to the others, since their most sonorous nucleus is only a fricative, while the other candidates have a nasal among their nucleus inventory. Moving on to the next nucleus we need only compare candidates (a) (b) and (d) against each other, the others having been eliminated. Here (d) emerges victorious, since its next best nucleus is a voiced fricative, which is more sonorous than either (a)'s—a voiceless fricative, or (b)'s—a voiceless stop.[14]

There is one last point to address before we can proceed to the analysis: the question of the restriction on consonants. The overall generalization is that a reduplicant never has more than one obstruent (including the sole nasal obstruent of the language [m]). It is not clear what might motivate this restriction, or that this is indeed the constraint that drives the pattern. But since it is surface true in the language, we might imagine that it is learnable and comes in the form of a parochial, language particular constraint:

[14]In the actual analysis of Berber, candidate (d) is ruled out by the higher ranked constraint Onset, so that in actual fact (a) is ruled best.

(32) ***2 Obs** (Nakanai)

“a reduplicant may not have more than one obstruent (including nasals)”

With these constraints in hand, we can now consider how their interaction can account for the complex pattern of reduplication of Nakanai. First an example with a CVV reduplicant, *gapu* ‘beads’. This is J’s pattern [5] (see data set 23).

(33)

input: /RED + gapu/	*2-Obs	HNUC	Onset	Max_{BR}	Contig
a. .ga.pu.ga.pu.	*!	a | u			
b. ☞ .gau.ga.pu.		a		p	*
c. .ga.ga.pu.		a		pu!	
d. .gu.ga.pu.		u!		ap	*

Total reduplication of the base would lead to a violation of *2 Obs, as demonstrated by candidate (a). This leaves us with only three viable alternatives. (Since Anchoring and Linearity are undominated in Nakanai, candidates that would violate these constraints have been omitted.) Candidate (d), although a possible pattern in Nakanai generally, does not choose the most sonorous vowel, and is therefore bested by the other candidates. Finally the decision among the remainder is made by Max-BR, resulting in the reduplicated form *gaugapu*. This case clearly demonstrates one of the aspects that make Nakanai reduplication rather unusual. Candidate (b) is optimal even though the copying skips segments. In OT terms this is expressed by having Max-BR dominate Contiguity.

Our next case is a base that takes the CV_2 pattern. Examples of this kind were shown in example (20), and the datum used here is *beta* ‘wet’, which has a reduplicated form *babeta.*

(34)

input: /RED + beta/	*2-Obs	HNUC	Onset	Max_{BR}	Contig
a. .be.ta.be.ta.	*!	a | e			
b. .be.a.be.ta.		a | e	*!	t	*
c. .be.be.ta.		e!		ta	
d. ☞ .ba.be.ta.		a		et	*

As in the previous example, *2 Obs will knock out the candidate with total reduplication, leaving the same three alternatives as before. The difference in this case lies in the relative sonority of the vowels involved. Here the second vowel is more sonorous than the first, and as a result HNUC will rule out candidate (c). Another consequence of this sonority situation is that the two vowels cannot be included in the same syllable, and thus the CVV candidate (b) will violate Onset. With all its competitors eliminated (d) is the winner, correctly giving us the form *babeta*.

Bases where one of the two consonants is a liquid do not violate *2 Obs, and thus have reduplicated forms where the CVCV is completely duplicated. Examples of this type are very common in Nakanai. A few are shown below.

(35)	ligi	ligiligi	'hurting (148)'
	raga	ragaraga	'jumping (148)'
	voro	vorovoro	'pounding (148)'
	mila	milamila	'salty (148)'
	palo	palopalo	'wakening/baskets(148)'
	golu	golugolu	'things (210)'
	mari	marimari	'know (219)'
	karusu	karusurusu	'ribs/battens (148)'
	sekela	sekelakela	'one at a time (148)'
	vigilemuli	vigilemulimuli	'tell a story -> story (178)'

The analysis developed here predicts the correct form for such cases as well, as can easily be determined with the help of the following tableau for *palo* 'baskets'.

(36)

input: /RED + palo/	*2-Obs	HNUC	Max-BR	Contig
a. ☞ .pa.lo.pa.lo.		a | o		
b. .pao.pa.lo.		a	l!	*
c. .pa.pa.lo.		a	lo!	
d. .po.pa.lo.		o!	al	*

In this example the presence of a liquid as one of the two consonants of the base means that there will not be any violation of *2-Obs. Thus the determination of the winner is made by the other constraints. Total reduplication will of course guarantee that the most sonorous nucleus from the base is also present in the reduplicant, passing the decision on to Max-BR, which obviously prefers total reduplication.

The analysis presented here has made good use of the constraint HNUC. After proposing this constraint P&S go on to discuss the possibility of decomposing HNUC into a series of binary constraints as seen in (37/38). We might wonder if such a decomposition is possible for Nakanai as well.

(37) a ≻ e ≻ i ≻ …

(38) … >> *P/i >> *P/e >> *P/a

It turns out that such a tactic is not possible for Nakanai. The reason is that in the conversion from (37) to (38) we are moving from the realm of positive, relative counting of violations, into that of negative, absolute counting. Negative counting always implies that a version of *Struc is built in, because negative counting follows the maxim 'no violation is a good violation.' Since absence of structure means absence of marked structures, having no structure incurs no violations As a result the hierarchy in (38) penalizes candidates for having *any* nuclei, not just insufficiently sonorous ones. In order for this type of analysis to even get off the ground, the relevant part of the hierarchy must be ranked below Max-BR, which makes it inactive. In the analysis of Berber, ill consequences are avoided, since all candidates have the same segmental content. But in our case we are trying to determine *the size* of the reduplicant, and thus it will be crucial to be able to compare candidates with differing number of syllables. Clearly then *Struc must be ranked separately from, and below, HNUC. Even ignoring the interaction with Faith the atomized ranking does not derive the correct result. Consider again the case of *palo* 'baskets' which should be totally reduplicated to *palopalo*.

(39)

input: /RED + palo/	*P/i,u	*P/e,o	*P/a	Max-BR
a. ☹ .pa.lo.pa.lo.		*!	*	
b. ☞ .pao.pa.lo.			*	l
c. .pa.pa.lo.			*	lo!
d. .po.pa.lo.		*!		al

The atomized ranking penalizes all nuclei at some point along the way. Thus a candidate with two nuclei can never be optimal.

There is however another important reason why a hierarchy of the type shown in (38) is not possible. There is no absolute sonority cut-off for when a Peak is acceptable. Instead whether a peak is acceptable or not depends on the alternative. There is thus no place within (38) where a constraint could be interleaved. For instance we try to rescue the situation in (39) by placing Max-BR between *P/*i,u* and *P/*e,o*. This would alleviate the problem temporarily only to have it reappear with a word like *golu* 'things'. If we solve that case by moving Max-BR further up to lie above *P/*i,u*, we will have deactivated the sonority contrasts completely, bringing us back to square one. I will therefore keep the original formulation of HNUC.

We are now left with the task of verifying that the analysis covers other cases as well. Of particular interest in this respect are vowel initial bases, for example the differing reduplication of the data discussed earlier in (28) and (29). An example of the former type is *bauba* 'pig nets'

(40)

input: /RED + bauba/	HNUC	Onset
a. ☞ .ba.u.ba.u.ba.	a | u	**
b. .ba.u.bu.ba.	u!	*

Since in this case V_2 is more sonorous than V_1 the reduplicant which includes V_2 will be more harmonic with respect to HNUC, and will therefore beat out the alternative, which does not, even though doing so increases the number of Onset violations. This case thus provides a ranking argument for HNUC >> Onset.

A question that arises in a case like this one is whether, considering arguments presented earlier the sequence *ba.u* shouldn't form a single syllable. It should be recalled that reduplication provides evidence that the footing in this case is *ba (u.ba)(u.ba)*, and since the *au* sequences span two feet, they are not likely to be tautosyllabic. This illustrates again the failure of Uniformity, which requires us to treat like sequences alike. In Nakanai VV sequences are syllabified together only if no higher constraints object.

Now considering VCV bases, where V_1 is more sonorous than V_2, such as *abi* 'getting' offers a different picture. The appropriate tableau is:

(41)

input: /RED + abi/	HNUC	Onset
a. .a.bi.a.bi.	a | i	**!
b. ☞ .a.ba.bi.	a	*

In this case reduplicating the whole base does nothing to improve the candidate's rating with respect to HNUC, and as a result Onset makes its presence felt, knocking off candidate (a) and leaving the form *ababi* the winner.

A few more cases remain. Considering VV bases next, we have examples like the form *au* 'steer' which has a reduplicated form *auau*. One competitor is the form *aau* which fares as well as the winner on the constraints HNUC and Onset. However this only passes on the decision to Max-BR, which favors the complete <u>*au*</u>*au*.

(42)

input: /RED + au/	HNUC	Onset	Max-BR
a. ☞ .<u>au</u>.au.	a	**	
b. .<u>a</u>.au.	a	**	u!

The sonority effect emerges with VV bases as well, as witnessed by the form *paia* ‘dog’ which has the reduplicated form *pa<u>ia</u>ia* ‘many dogs’.

(43)

input: /RED + paia/	Anchor	HNUC	Onset
a. ☞ .pa.<u>i</u>.<u>a</u>.i.a.		a | i	****
b. .pa.<u>a</u>.i.a.	*!	a	***
c. .pa.<u>i</u>.i.a.		i!	***

In this example the greater sonority of V_2, compared with that of V_1, will force it to be copied, even though this means amassing more Onset violations.

At this point we can take another look at the V_1C_2 (J’s pattern [3]) which has proved so difficult to earlier analyses in the templatic mold (see 13 for the relevant data). The unusual fact about this pattern is that the reduplicant is ‘pushed in’ over the initial consonant of the CVCV stem. Thus the *hari* ‘run’ will reduplicate as *h<u>ar</u>ari* rather than *<u>*hari*</u>*hari*. While this is clearly an alignment problem, the winning candidate does not violate Anchoring. In other words it still obeys ‘Marantz’s Generalization’, since the reduplicant copies the segments immediately to its right. Candidates that violate Anchoring include *<u>*a*</u>*hari* or *<u>*ri*</u>*hari*. This suggests again that, despite the parallelism between Anchoring and Alignment pointed out in M&P 1994b, reduplicants do differ from other morphological constituents by being subject to both types of constraints. Thus Anchoring is not simply the equivalent to Alignment in the BR domain, but an additional dimension specific to reduplication.

The alignment violation that we are seeing in such cases is clearly related to the constraints that make Nakanai reduplication infixing in the first place. As such this issue will need to await further elucidation in the next chapter. For current purposes it will be sufficient to say that the base must be a prosodic word, and thus minimally constitute a foot.

As was suggested earlier, this pattern emerges as a way to avoid reduplicating *h* which is a marked segment in the language. Thus the driving force will be a constraint against this type of segment, *[h]. We now predict the form *harari* ‘running’ correctly.

(44)

input: /RED + hari/	*[h]	‘Base=Prwd’	Max-BR
a. ☞ .ha[(ra.ri)]	*	*(r)	i
b. .ha.ri[(ha.ri)]	**!		
c. .ha[(ha.ri)]	**!		ri
d. .ha[(ri.ri)]	*	**!(ri)	

The constraint *[h] does work in other contexts as well. For instance with the form *peleho* the base for reduplication consists of the sequence *leho*, and since this base contains a liquid we would generally expect total reduplication, just as predicted by J’s conditions. This possibility is ruled out by *[h] however, and the by now familiar constraints do the rest.

(45)

input: /RED + peleho/	*[h]	HNUC	Onset	Max_{BR}	Contig
a. .pe.le.ho.le.ho.	*!	e | o			
b. .pe.le.o.le.ho.		e | o	*!	h	*
c. ☞ .pe.le.le.ho.		e		ho	
d. .pe.lo.le.ho.		o		eh	*!

This tableau shows how the current analysis correctly predicts the outcome for *peleleho* ‘corpse’, contra J, provided *e* and *o* are treated as equally sonorous. An interesting point demonstrated by this example is that, although Contiguity is frequently violated it nevertheless makes its presence felt. This type of evidence is support for the view, fundamental to OT, that constraints are not ‘turned off’, but merely obscured by the effects of other constraints.

So far we have accounted for all the patterns described by J, and even improved some of his descriptions. There is, however, an entire class of cases for which J’s patterns fail to make any prediction at all. This class typically follows a C_1V_1 pattern, and applies to bases with two obstruents (where ‘obstruent’ includes the nasal [m]), and either two identical vowels, or the vowels *u* and *i*. An example of the first type is the form *mapa* ‘payments’.

(46)

input: /RED + mapa/	*2-Obs	HNUC	Onset	Max_{BR}	Contig
a. $.\underline{ma_1}.\underline{pa_2}.ma_1.pa_2.$	*!	a | a			
b. $.\underline{ma_1}.\underline{a_2}.ma_1.pa_2.$		a | a	*!	p	*
c. ☞ $.\underline{ma_1}.ma_1.pa_2.$		a		pa	
d. $.\underline{ma_2}.ma_1.pa_2.$		a		ap	*!

As shown by tableau (46) the analysis developed here also correctly predicts the reduplication for this form as well. Total reduplication is again ruled out by *2-Obs, leaving the usual array of partially reduplicated forms. Since the two nuclei of the base are equally sonorous, HNUC does not decide between these possibilities. However, Onset rules out the option where both vowels are copied. Since the remainder are equally successful with respect to Max-BR, the decision is handed to Contiguity which favors the C_1V_1 reduplicating candidate (c), giving the correct form *ma̲mapa*.

One further candidate that is not considered in this tableau is that where the two vowels are joined into a single syllable. The unavailability of this possibility points to a constraint against long vowels. Whether such a constraint is active in the phonology of Nakanai as a whole, or only emergent in reduplication is a question that cannot be answered. J’s description is of no help in this matter since he considers all VV sequences to be heterosyllabic apriori.

While in the case of *ma̲mapa* the decision between C_1V_1 and C_1V_2 reduplication was made on purely theoretical grounds, bases of the form CuCi clearly demonstrate that C_1V_1 is the right choice. Since *u* and *i* are treated as equally sonorous by HNUC, the evaluation of the candidates for the form *guvi* ‘arrive’ will be entirely parallel to that seen for the form *mapa* in (46).

(47)

input: /RED + guvi/	*2-Obs	HNUC	Onset	Max-BR	Contig
a. $.\underline{gu}.\underline{vi}.gu.vi.$	*!	u | i			
b. $.\underline{gu}.\underline{i}.gu.vi.$		u | i	*!	v	*
c. ☞ $.\underline{gu}.gu.vi.$		u		vi	
d. $.\underline{gi}.gu.vi.$		i		uv	*!

The important difference between this tableau and (46), is that in this case the distinction between candidates (c) and (d) corresponds to a difference in realization, since the two base vowels are manifestly distinct. The correctly predicted winner is *guguvi*.

Despite the complexity of the Nakanai reduplication, there should be no doubt as to its productivity. That the choice of pattern is phonologically motivated rather than morphological is demonstrated with the following example.

(48) tuga tatuga 'depart/walk (63/223)'
tuga+ul tulugaluga 'walk -> trip -> sandal/shoe (176)'

The base *tuga* 'walk' has two obstruents and is thus barred from undergoing total reduplication. It therefore chooses the most sonorous nucleus possible, in this case V_2, resulting in the pattern *tatuga*. If this same form is joined with the infix *ul* the resulting base will now include a liquid and can undergo total reduplication, giving the form *tulugaluga* 'sandal'. Such a switch is exactly what is expected under a phonologically driven analysis. While if the choice of reduplication pattern were a morphological property of the base such a switch would be mysterious.

Another interesting case is that of the borrowed word *masin(i)*. The word is clearly foreign not only because it ends in a consonant, a prosodic no-no that apparently triggers epenthesis optionally, but also because *n* is an otherwise unknown segment in Nakanai. The segment *n* changed to *l* historically, and there is a certain awareness of this fact as preserved in the name, which is commonly spelled with *n* despite the actual pronunciation.

(49) masin(i) masisini 'machine (287)'
masinisini

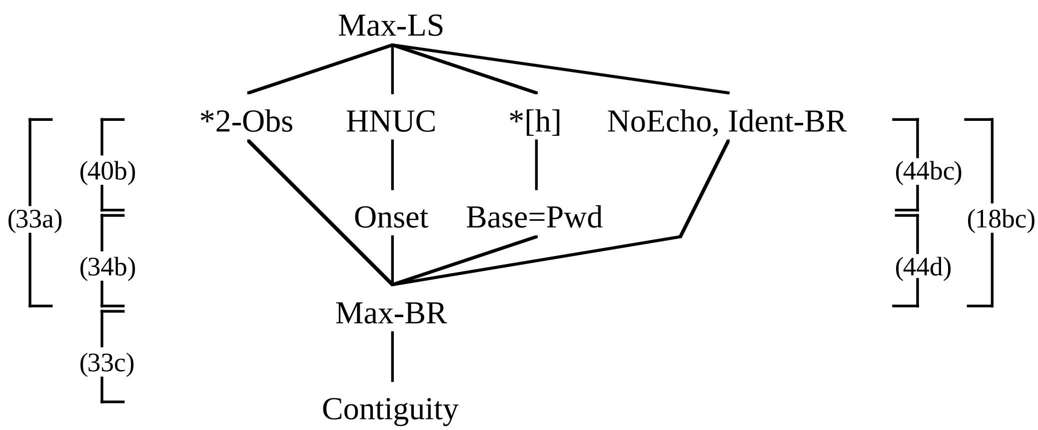
This form admits two reduplicated forms. This makes sense once we consider that the *n* can either be interpreted as a nasal stop, in which case we expect a CV reduplicant, or it can be treated as its relative *l* in which case we expect total CVCV reduplication.

3.3. Summary of the Analysis

The full ranking of the constraints worked out for this analysis is shown in (50). For all justified rankings the tableau, and candidate number that provides the ranking argument has been indicated. The overall ranking schema of this analysis is that of *Copy & Avoid* (see section 2.1.1.3.), which means the reduplicant copies all segments of the base while avoiding those considered marked. The hallmark of the Copy & Avoid ranking is the low ranked Contiguity, which must be below Max-BR. Also clearly evident is the

Emergence of the Unmarked structure.

(50) **Summary of the constraint rankings for Nakanai reduplication**



As a way of reviewing the analysis I will briefly go over the role of each constraint:

- ***[h]** forces any candidate with initial [h] to move the left edge of the base over the [h]. The result is J's pattern [3].
- ***2-Obs** rules out the possibility of total reduplication for any base with a CVCV structure, where the two consonants are both obstruents (including nasals). Conversely any base of the form CVCV, where at least one of the consonants is a liquid will choose total reduplication.
- **NoEcho** will bar total reduplication for bases of the form CVCV where the two CVs are identical.
- **HNUC** leads to the sonority effect: If the base is consonant initial, and V_2 is more sonorous than V_1, then copying will 'skip' to the last vowel. This is J's pattern [6]. If V_1 is more sonorous than V_2, the pattern will be CVV, i.e. J's pattern [5]. Here the current analysis makes a prediction that differs from that predicted by J. If the base does not have a medial consonant, J predicts a CV pattern (his [2a]), but it seems that CVV is more accurate. If the base is vowel initial the choice of pattern will be between VCV and VC, depending on the sonority of V_2. This is the distinction between J's patterns [1] and [2b]. Here the predictions made by the current account, based on sonority, are clearly superior to J's which are based on the quality of the intervocalic consonant. If the base is VV, the reduplicant will always be VV. Copying of V_1 is forced by Anchoring. Copying of V_2 is forced by HNUC if V_2 is more sonorous than V_1. Otherwise V_2

can form a syllable with V_1, and its presence will be forced by Max-BR.

- **Onset** rules out the possibility of a CVV pattern for any base where the two vowels sequence cannot be syllabified together as an off-glide. This will include any case where the Vs are identical, or identical in sonority.
- **Max-BR** favors CVV reduplication over CV, and total reduplication over any unnecessary truncation. A further crucial role of Max will be seen in the analysis of infixation in the next chapter.
- **Contiguity** is the ‘beating boy’ of the analysis. However it stills asserts itself, when the vowels are identical in sonority

Appendix: the reduplication patterns of Nakanai

Explanation to the data

The following list contains all the data that was used to conduct this study. All data is from Johnston (1980), and all page numbers refer to that work. It is limited to data for which both the reduplicated and the unreduplicated form could be substantiated independently. The latter requirement was imposed in order to avoid including lexically reduplicated items, which might well be irregular. Even so this list is likely to be biased toward the irregular since for instance the word list provided as an appendix to J, seems to provide the reduplicated form only if it is considered irregular.

The list includes a total of 138 forms. Of these, 5 have two reduplicated forms. The forms have been arranged according to the 7 patterns described by J. For each pattern I have listed all forms which follow the pattern, as well as all forms predicted to follow the pattern by J, even though the attested pattern might be different. For that reason many forms are listed a number of times. For each form I have listed (a) the unreduplicated form, (b) the pattern number(s) predicted by J, (c) the reduplicated form, and (d) the gloss and page number in J.

(1) shows the predictions made by J concerning the patterns. For each pattern I indicate: the number of forms predicted by J to follow the pattern, how many actually follow the pattern, and of the latter how many have multiple predictions.

(1)

pat#	*predicted*	*attested*	*multiple*
[1]	70	42	(12)
[2a]	21	10	(1)
[2b]	18	13	(9)
[3]	11	5	(5)
[4]	6	6	(1)
[5]	15	10	(2)
[6]	26	12	(7)
total	167	98	(37)

Generally Js predictions are too imprecise. 37 forms out of 98, or approximately 1/3, have more than one pattern predicted (compared with 5 forms with attested mulitple patterns). This means that J’s conditions only specify the sufficient conditions for a form to undergo a pattern, not necessary conditions.

(2) shows the number of times J’s predictions miss the mark completely. In 18 cases J’s conditions predict 1 pattern, and in 5 cases 2 patterns, but where the attested pattern is none of the predicted patterns. However, many of these forms should be considered irregular, and have not been accounted for in the current analysis either.

(2)

1 pattern	18 forms
2 patterns	5 forms
total	23 forms

(3) shows the lack of complete coverage. Since all of J's conditions are formulated positively there are a certain number of forms which do not fit any of J's conditions. Since OT is based on the *elsewhere principle*, the current analysis predicts forms for all cases.

(3)

No pattern predicted:	total	17 forms
…of these CV_iCV_i bases:	total	12 forms
…CuCi bases:	total	3 forms

Of the 17 forms for which J makes no prediction, 15 fall into two categories according to the shape of their base. Both categories have vowels of identical sonority. The remaining two forms *(masta* and *mak)* are both borrowings which do not conform to the regular syllable structure of the language.

(4) shows the patterns that these 17 forms take. Virtually all regular forms reduplicate according to a CV pattern.

(4)

pattern	CV_iCV_i	CuCi	*other*	*total*
-VC [3]	2	-	-	2
CV	10	3	-	13
CCV	-	-	masta	1
CVCV	2	-	mak	3

(two examples have both CV and CVCV forms)

(5) is a gauge of the overlap between J's conditions. 36 forms have two predicted patterns, while 5 have 3 predicted patterns.

(5)

2 patterns	36 forms
3 patterns	5 forms

The Patterns

Pattern 1

pattern 1 predicted and attested

abiri	1	abiribiri	‘washing (148)’
balava	1	balavalava	‘get luckily (264)’
bili	1	bilibili	‘kill (138, 179)’
bolo	1	bolobolo	‘many pigs (167)’
golo	1	gologolo	‘deceive (180)’
golu	1	golugolu	‘things (210)’
gulutu	1	gulutulutu	‘cooking -> cooking place (284)’
karusu	1	karusurusu	‘ribs/battens (148)’
koli	1	kolikoli	‘help (263)’
kuruve	1/6	kuruveruve	‘many sweet potatoes (148)’
lege	1	legelege	‘laughing (148)’
ligi	1	ligiligi	‘hurting (148), pain (179)’
lima	1/3/6	ilimalima	‘five (154)’
luku	1	lukuluku	‘dig taro (191)’
luma	1/6	lumaluma	‘house (152)’
luveli	1/3	luveliveli	‘Tolai (262)’
mari	1/3	marimari	‘know (219)’
mata+ul+baka	1	bulakalaka	‘eye + rape -> lustful (142)’
mila	1/3/6	milamila	‘salty (148)’
muga+ul	1	mulugaluga	‘to be first–>the first->the leader(176)’
paamuli	1	paamulimuli	‘see-after (264)’
palo	1	palopalo	‘wakening/baskets(148)’
paru	1	paruparu	‘fall (278)’
polo	1	polopolo	‘over (264)’
raga	1	ragaraga	‘jumping (148)’
rovi	1	rovirovi	‘know (244, 148)’
rutu	1	ruturutu	‘gathering food for a feast(148)’
rutu	1	ruturutu	‘wives (191)’
sekela	1/6	sekelakela	‘one at a time (148)’
tabara	1	tabarabara	‘brother (273)’
tabuli	1	tabulibuli	‘lie (223)’
tuga+ul	1	tulugaluga	‘walk -> trip -> sandal/shoe (176)’
vigilemuli	1	vigilemulimuli	‘tell a story -> story (178)’
vikara	1	vikarakara	‘talk (268)’
vore	1/6	vorevore	‘sway (265)’
voro	1	vorovoro	‘pound (221, 148)’

VCV bases

bauba	1/2b	baubauba	‘pig nets/netting pigs (148)’
osa	1/2b	osaosa	‘flirting (148)’
ota	1/2b	otaota	‘veins (148)’
taive	1/2b	taiveive	‘snakes (186)’

VV bases

au	1	auau	‘steering (148 fn.)
paia	1	paiaia	‘many dogs (150 fn.)’

pattern 1 predicted, but not attested

baharu	1/3	bahararu	‘widows (149)’
buli	1	bubuli	‘roll (277)’
hari	1/3	harari	‘running (149)’
haro	1/3	hararo	‘days (149)’
hilo	1/3/6	hililo	‘seeing (149)’
latu	1	latatu	‘child, offspring (286)’
pileho	1/6	pileleho	‘death -> corpse (289)’
purusu	1	purususu	‘descend (276)’
sile	1/3/6	sesile	‘tearing (150)’
suli	1	susuli	‘help (262, 290)’
tali	1	taitali	‘cry (132)’
tari	1	taitari-la	‘child-3p sg. in. (273)’
taro	1	tataro	‘away (151)’
tolo	1	totolo	‘chop (276)’
tolu	1	itoutolu	‘three (154)’
velo	1/3/6	velelo	‘bubbling forth (149)’

VCV bases

abi	1/2b	ababi	‘getting (148)’
agi	1/2b	agagi	‘loudly/too much (62, 222)’
aso	1/2b	asaso	‘smell -> sniffing (138)’
avu	1/2b	avavu	‘wrap (155)’
barautu	1/2b	barautùtu	‘cut (277)’
bautu	1/2b	baututu	‘piece (277)’
kaiamo	1/2b	kaiamamo	‘residents of Kaiamo village (149)’
mautu	1/2b	la maututu-la	‘village (287)’
ovi	1/2b	ovovi-a	‘dig-3ps. (128)’
ubi	1/2b	ubibi	‘shoot/inject (111, 239)’

pattern 1 attested, but not predicted

komaga		komamaga/komagamaga	‘beetle [sp.] (286)’
mak		makimaki	‘mark (287)’
masin(i)		masisini/masinisini	‘machine (287)’
tavu	5	tatavu/tavutavu	‘towards (263, 191)’

Pattern 2a

pattern 2a predicted and attested

baa	2a	babaa	‘spaces (148)’
beu-a	2a	bebeu-a	‘returning (149)’
bilau	2a	bilalau	‘songs (149)’
giu	2a	gigiu	‘peeling (149)’
goo	2a	gogoo	‘smouldering (149)’
pou	2a	popou	‘sitting (149)’
pou+ul	2a	pulolou	‘sit -> residence -> chair (176)’
sae	2a	sasae	‘climb (262)’
vaa	2a	ivavaa	‘four (154)’
vai	2a	vavai	‘side (272)’

pattern 2a predicted, but not attested

bau	2a	baubau	‘sing (155)’
ilua	2a/6	ilalua	‘two by two (150)’
kue	2a/6	vi-kokue	‘rec-fight (151)’
pai	2a	paipai	‘mullet (43)’
parau	2a	paraurau	‘white man (288)’
sai	2a	saisai	‘pack down tight (289)’
sio	2a/6	sosio	‘carrying on ceremonial litter (150)’
toa	2a/6	tatoa	‘treading/kicking (150)’
toi	2a	tototoi	‘call, as naming (291)’
vokakea	2a/6	vovokakea/vokakakea	‘white man, caucasian (292)’

Pattern 2b

pattern 2b predicted and attested

abi	1/2b	ababi	‘getting (148)’
agi	1/2b	agagi	‘loudly/too much (62, 222)’
ali	2b	alali	‘eating (150)’
aso	1/2b	asaso	‘smell -> sniffing (138)’
avu	1/2b	avavu	‘wrap (155)’
baoli	2b	baololi	‘mutually (151)’
barautu	1/2b	baraututu	‘cut (277)’
bautu	1/2b	baututu	‘piece (277)’
kaiamo	1/2b	kaiamamo	‘residents of Kaiamo village (149)’
mautu	1/2b	la maututu-la	‘village (287)’
oli	2b	ololi	‘digging (148)’
ovi	1/2b	ovovi-a	‘dig-3ps. (128)’
uru	2b	ururu	‘great/big (152)’

pattern 2b predicted, but not attested

bauba	1/2b	baubauba	'pig nets/netting pigs (148)'
osa	1/2b	osaosa	'flirting (148)'
ota	1/2b	otaota	'veins (148)'
taive	1/2b	taiveive	'snakes (186)'
ubi	1/2b	ubibi	'shoot/inject (111, 239)'

Pattern 3

pattern 3 predicted and attested

baharu	1/3	bahararu	'widows (149)'
hari	1/3	harari	'running (149)'
haro	1/3	hararo	'days (149)'
hilo	1/3/6	hililo	'seeing (149)'
velo	1/3/6	velelo	'bubbling forth (149)'

pattern 3 predicted, but not attested

burulele	3/4	burulelele	'sliding on the buttocks (149)'
lima	1/3/6	ilimalima	'five (154)'
luveli	1/3	luveliveli	'Tolai (262)'
mari	1/3	marimari	'know (219)'
mila	1/3/6	milamila	'salty (148)'
sile	1/3/6	sesile	'tearing (150)'

pattern 3 attested, but not predicted

hugu		hugugu	'carry (on the head) (155)'
latu	1	latatu	'child, offspring (286)'
bisi		bisisi	'small, young -> young ones (273)'
purusu	1	purususu	'descend (276)'

Pattern 4

pattern 4 predicted and attested

bebe	4	bebebe	'butterflies (149)'
burulele	3/4	burulelele	'sliding on the buttocks (149)'
galolo	4	galololo	'constantly (272)'
lolo	4	lololo	'hearing (149)'
sasa	4	isasasa	'one (154)'
susu	4	sususu	'drinking from the breast (149)'

Pattern 5

pattern 5 predicted and attested

basi	5	baibasi	‘bandicoots (186)’
gapu	5	gaugapu	‘beads (150)’
gove	5/6	goegove	‘mountains (150, 192)’
kavu	5	kaukavu	‘wearing lime on the face (150)’
kedi	5	keikedi	‘being careful (150)’
kes(i)	5	la keikesi	‘case (285)’
pago	5	paopago	‘spirit residents of Mount Pago (150)’
pasi	5	papasi/paipasi	‘very, extremely (288)’
pati	5	paipati	‘floating (150)’
sobe	5/6	soesobe	‘girls (155), young women (150)’

pattern 5 predicted, but not attested

beta	5/6	babeta	‘wet (150)’
kapu	5	kakapu	‘pulp (277)’
katu	5	kakatu	‘pound (277)’
peho	5/6	pepeho	‘die (264)’
tavu	5	tatavu/tavutavu	‘towards (263, 191)’

pattern 5 attested, but not predicted

bau	2a	baubau	‘sing (155)’
pai	2a	paipai	‘mullet (43)’
parau	2a	paraurau	‘white man (288)’
sai	2a	saisai	‘pack down tight (289)’
tali	1	taitali	‘cry (132)’
tari	1	taitari-la	‘child-3p sg. in. (273)’
tolu	1	itoutolu	‘three (154)’
vi-tau-me-tari	1	vitaumetaitari	‘reciproc-man/younger sibling (186)’

Pattern 6

pattern 6 predicted and attested

beta	5/6	babeta	‘wet (150)’
biso	6	bobiso	‘members of the Biso subgroup (150)’
ilua	2a/6	ilalua	‘two by two (150, 154)’
kusa	6	kakusa	‘shouting (150)’
mota	6	mamota	‘vines (150)’
pita	6	papita	‘muddy (150)’
sile	1/3/6	sesile	‘tearing (150)’
sio	2a/6	sosio	‘carrying on ceremonial litter (150)’
toa	2a/6	tatoa	‘treading/kicking (150)’
tuga	6	tatuga	‘depart/walk (63, 223)’
vokakea	2a/6	vovokakea/vokakakea	‘white man, caucasian (292)’

pattern 6 predicted, but not attested

gove	5/6	goegove	'mountains (150, 192)'
hilo	1/3/6	hililo	'seeing (149)'
kue	2a/6	vi-kokue	'rec-fight (151)'
kuruve	1/6	kuruveruve	'many sweet potatoes (148)'
lima	1/3/6	ilimalima	'five (154)'
luma	1/6	lumaluma	'house (152)'
mila	1/3/6	milamila	'salty (148)'
peho	5/6	pepeho	'die (264)'
pileho	1/6	pileleho	'death -> corpse (289)'
sekela	1/6	sekelakela	'one at a time (148)'
sobe	5/6	soesobe	'girls (155, young women (150)'
velo	1/3/6	velelo	'bubbling forth (149)'
vore	1/6	vorevore	'sway (265)'

CV reduplication pattern

The first batch of cases has two identical vowels in the base:

A. $C_1 = C_2$ (already accounted for by pattern 4)

bebe	4	bebebe	'butterflies (149)'
burulele	3/4	burulelele	'sliding on the buttocks (149)'
galolo	4	galololo	'constantly (272)'
lolo	4	lololo	'hearing (149)'
sasa	4	isasasa	'one (154)'
susu	4	sususu	'drinking from the breast (149)'

B. C_2 = null. (already accounted for by pattern 2a)

baa	2a	babaa	'spaces (148)'
goo	2a	gogoo	'smouldering (149)'
vaa	2a	ivavaa	'four (154)'

C. remainder

bakisi		bakikisi	'a bit (277)'
bisi		bibisi	'small, young -> youthfulness (283)'
bokisi		bokikisi	'box (283)'
boto		boboto	'short (277)'
gutu		vi-gugutu	'cook (151)'
komaga		komamaga/komagamaga	'beetle [sp.] (286)'
mapa		mamapa	'payments (149)'
masin(i)		masisini/masinisini	'machine (287)'
mata		mamata	'eye (287)'
sapa		sasapa	'sweep (131)'
taga		tataga	'afraid (155)'
tolo	1	totolo	'chop (276)'

The second batch of cases has two different vowels in the base:

I. V_2 is copied:

in all cases $V_2 \succ V_1$ (already accounted for by pattern 6)

beta	5/6	babeta	'wet (150)'
biso	6	bobiso	'members of the Biso subgroup (150)'
ilua	2a/6	ilalua	'two by two (150)'
kusa	6	kakusa	'shouting (150)'
lua	2a/6	ilalua	'two (154)'
mota	6	mamota	'vines (150)'
pita	6	papita	'muddy (150)'
sile	1/3/6	sesile	'tearing (150)'
sio	2a/6	sosio	'carrying on ceremonial litter (150)'
toa	2a/6	tatoa	'treading/kicking (150)'
tuga	6	tatuga	'depart/walk (63, 223)'
vokakea	2a/6	vovokakea/vokakakea	'white man, caucasian (292)'

II. V_1 is copied:

A. C_2 = null (already accounted for by pattern 2a. note that here $V_1 \succ V_2$)

beu-a	2a	bebeu-a	'returning (149)'
bilau	2a	bilalau	'songs (149)'
giu	2a	gigiu	'peeling (149)'
pou	2a	popou	'sitting (149)'
pou+ul	2a	pulolou	'sit -> residence -> chair (176)'
sae	2a	sasae	'climb (262)'
vai	2a	vavai	'side (272)'

B. remainder

in these cases 'Avoid h' might force the pattern. Also note CeCo vowel pattern

peho	5/6	pepeho	'die (264)'
peho+il	1/6	pileleho	'die -> death -> corpse (176)'

in all cases we have CuCi vowel pattern

buli	1	bubuli	'roll (277)'
guvi		guguvi	'arrive (60)'
suki		susuki	'strip (276)'
suli	1	susuli	'help (262, 290)'
suvi		susuvi-a-e	'dig-3ps.-here (128)'

these just seem to be irregular/exceptional

kapu	5	kakapu	'pulp (277)'
katu	5	kakatu	'pound (277)'
taro	1	tataro	'away (151)'

Some special cases:

kue	2a/6	vi-kokue	'rec-fight (151)'
masta		mastasta	'white man (287)'
toi	2a	tototoi	'call, as naming (291)'

Forms for which J does not (correctly) predict the redup

CV pattern: two identical Vs [maybe J considers these to be pattern 4?]

bakisi		bakikisi	'a bit (277)'
bisi		bibisi	'small, young -> youthfulness (283)'
bokisi		bokikisi	'box (283)'
boto		boboto	'short (277)'
gutu		vi-gugutu	'cook (151)'
komaga		komamaga/komagamaga	'beetle [sp.] (286)'
mapa		mamapa	'payments (149)'
mata		mamata	'eye (287)'
sapa		sasapa	'sweep (131)'
taga		tataga	'afraid (155)'
tolo	1	totolo	'chop (276)'

non-identical Vs

buli	1	bubuli	'roll (277)'
guvi		guguvi	'arrive (60)'
kapu	5	kakapu	'pulp (277)'
katu	5	kakatu	'pound (277)'
peho	5/6	pepeho	'die (264)'
peho+il	1/6	pileleho	'die -> death -> corpse (176)'
suki		susuki	'strip (276)'
suli	1	susuli	'help (262, 290)'
suvi		susuvi-a-e	'dig-3ps.-here (128)'
taro	1	tataro	'away (151)'
tavu	5	tatavu/tavutavu	'towards (263, 191)'

irregular CVV pattern

bau	2a	baubau	'sing (155)'
pai	2a	paipai	'mullet (43)'
parau	2a	paraurau	'white man (288)'
sai	2a	saisai	'pack down tight (289)'
tali	1	taitali	'cry (132)'
tari	1	taitari-la	'child-3p sg. in. (273)'
tolu	1	itoutolu	'three (154)'
vi-tau-me-tari	1	vitaumetaitari	'reciproc-man/younger sibling (186)'

VC-infix or final CV?: ambiguous

bisi		bisisi	‘small, young -> young ones (273)’
hugu		hugugu	‘carry (on the head) (155)’
purusu	1	purususu	‘descend (276)’

unambiguous

latu	1	latatu	‘child, offspring (286)’
ubi	1/2b	ubibi	‘shoot/inject (111, 239)’

foreign loans with unusual clusters

mak		makimaki	‘mark (287)’
masin(i)		masisini/masinisini	‘machine (287)’
masta		mastasta	‘white man (287)’

special

kue	2a/6	vi-kokue	‘rec-fight (151)’
toi	2a	tototoi	‘call, as naming (291)’

4. Infixing Reduplication: the Aru languages

Reduplication has generally been a step-child of morphology. Phonological theories of morphological behavior, such as Lexical Phonology (Kiparsky 1982, 1985, Hargus & Kaisse 1993) have made good sense of varying affix behavior by grouping affixes into 'levels' with common properties, and correlating these levels with the order of affixation. Reduplication fits rather uneasily in this scheme. For one, reduplication always seems to home in on the root/stem even though many uses of reduplication are inflectional and should thus be external to other affixes. Despite this position as innermost affix, reduplication most often constitutes the 'last level' of affixation, in the sense that it needs to 'happen' after other processes. This is because other processes often affect the base, and their effects must be copied by the reduplicant. These contradictory aims can give rise to ordering paradoxes of a kind first pointed out by Bloomfield (1933).

However this schizophrenic behavior has a common purpose. As M&P (1995) state: '[r]eduplication is a matter of identity'. In order for reduplication to be effective it requires two parts which are noticeably identical. Both of reduplication's seemingly conflicting properties serve to achieve this goal. First, in order to be recognizable as repetition, the two strings should be maximally similar. This explains the tendency for reduplication to 'apply last'. In the current theory, correspondence guarantees this similarity (see section 1.4.2, also M&P 1995). Second, for the repetition to be recognizable it should seek the part of the word that is maximally distinct, since only the distinctness of the reduplicant from one form to the other will guarantee that the *identity relation* is perceived as the relevant property of the affixation, rather than the segmental content. This explains why the reduplication seeks the root/stem, since only the root/stem is guaranteed to be distinct from one form to the other. In this chapter I address the question how the current theory accounts for this second property.

4.1. Affixation to the Optimal Word

The analysis of Nakanai in the last chapter left a promissory note. It is time to repay this debt. As will be recalled the analysis of Nakanai depended on the location of the reduplicant being correctly specified before the final CVCV of the stem, which also happens to be the main stress foot of the word. Systems of this kind are abundant:

(1) **Nakanai** (Johnston 1980)

aˈbiri	abiri(ˈbiri)	‘washing (148)’
vigileˈmuli	vigilemuli(ˈmuli)	‘tell a story -> story (178)’
biˈlau	bila(ˈlau)	‘songs (149)’
buruˈlele	burule(ˈlele)	‘sliding on the buttocks (149)’

Samoan (Marsack 1962)

aˈlofa	alo(ˈlofa)	‘love’
ʔaˈlaŋa	ʔala(ˈlaŋa)	‘shout’
maˈfai	mafa(ˈfai)	to be able
faʔamaˈlosi	faʔamalo(ˈlosi)	to encourage

Temiar (Benjamin 1976)

səˈlɔg	sɛg(ˈlɔg)	‘to lie down’
ˈkɔɔw	kɛw(ˈkɔɔw)	‘to call’

There are two questions to address. One is how to properly describe the location of the reduplicant. This question has received a significant amount of attention in the literature. But the other, which has largely escaped notice, is: why does infixation of this kind happen so frequently with reduplication, but so rarely with other types of affixation?[15] I begin by discussing the first question, and past approaches to this problem.

4.1.1. Generalized Alignment and infixation

There are two ways to describe the location of the reduplicant in such systems, and both have been pursued in the literature. The first approach is typified by Broselow & McCarthy (1983), who call this ‘affixation to a prosodic constituent’.[16] This approach to the problem describes the location of the reduplicant as ‘before the main foot’, or ‘before

[15] The only known case of this type of affixation with a regular affix is that of the possessive in Ulwa (Hale & Lacayo Blanco 1989, see also M&P 1993b). One other non-reduplicative case is English expletive infixation.

[16] Actually Broselow & McCarthy distinguish between systems like Nakanai and Samoan on the one hand, and systems like Temiar on the other. Under their conception only the former are considered affixation to a prosodic constituent, while the latter are considered ‘true infixes’. This distinction is unnecessary as the discussion of the Aru languages will reveal.

the main stress', or simply 'before a foot'. For present purposes we can refer to this approach as AFFIX TO PCAT. Implementations of this proposal in OT include M&P (1993), Gafos (1995), and Spaelti (1996), and are generally formulated in terms of an alignment constraint like the following:

(2) Align (RED, Right, Foot, Left)

The second approach is originally due to M&P (1986). Their suggestion is that we can describe this as affixation to the MINIMAL PROSODIC WORD. As a way to implement this they propose the introduction of a *minimality operator*, which returns for any given category the minimal category of that type.

The distinction between these two proposals is subtle. In practical terms it is difficult to imagine a scenario where the predictions made by these two proposals will differ, although I will suggest a case below. From the theoretical side there are a number of objections against the formulation in (2), and in favor of the MinWord approach.

A first difference is that, in the affix to PCat approach, the non-peripheral affixation is achieved by varying the *to*-relation between the affix and the affixed constituent. In other words, while common peripheral affixes attach to a morphological category, or to a prosodic word, non-peripheral affixes of the kind shown in (1) attach to the main stress foot. With the MinWord approach this relation is held constant, since the affix always attaches to a prosodic word. Instead the variation is internal to the affixed constituent, i.e. whether the affixed constituent is minimal, or not. The MinWord approach thus meets a stricter definition of locality.

A second objection against the affix to PCat solution is the stipulative nature of the constraint in (2). With such a constraint the special infixing behavior derives entirely from the specification of the two categories. We might ask why RED, and why to the foot? And why opposite edges, rather than the same?

A third problem with the affix to PCat solution has to do with its implementation in terms of the *Generalized Alignment Schema* (M&P 1993b).

(3) **Generalized Alignment Schema** [GA] (M&P 1993b)

Align(Cat1, Edge1, Cat2, Edge2) $=_{def}$

$\forall$Cat1 $\exists$Cat2 such that Edge1 of Cat1 and Edge2 of Cat2 coincide

Where

Cat1, Cat2 $\in$ PCat $\cup$ GCat

Edge1, Edge2 $\in$ {Right, Left}

The schema in (3) is formulated with maximum generality, and clearly admits the constraint in (2). However, proposals for instantiations such as (2) with differing values for Edge1 and Edge2 have been extremely few, and much less useful, than those with the same value for Edge1 and Edge2. In fact (2), with minor variations in formulation, is to my knowledge, the only instance of a ‘counter-edge’ alignment constraint that has been proposed.[17]

Moreover, many traditional uses of counter-edge alignment have been replaced favorably with ‘same-edge’ formulations. A typical example is the alignment necessary for common affixation, which is traditionally handled with a subcategorization frame. Example (4a) shows such a frame for a prefix, together with its generalized alignment formulation.

(4) a. ______$_{AFF}$] [$_{BASE}$ … Align(Aff, <u>Right</u>, Base, <u>Left</u>)

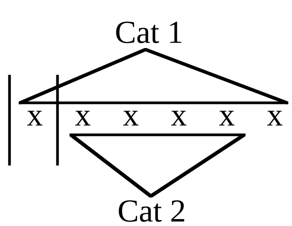
b. [$_{CAT}$ [$_{AFF}$ _____ … Align(Aff, <u>Left</u>, Cat, <u>Left</u>)

M&P (1993) show that by recasting (4a) as (4b) they can readily account for prosodically motivated infixation, such as occurs with the Tagalog affix *um*. This affix appears as a prefix with vowel initial stems such as *aral* ‘teach’, witness *<u>um</u>aral*. But with consonant initial stems such as *sulat* ‘write’ it is minimally infixed resulting in *s<u>um</u>ulat*. The success of their analysis is due to the fact that (4b) readily permits them to qualify this notion of *minimal* misalignment.

Underlying this case is a more general problem. No attempt at formalization of (3) has succeded in providing a unified definition of both same-edge, and counter-edge alignment, which also permits us to properly assess minimal misalignment. In the remainder of this section I will briefly try to outline this problem.

A diagram which can serve to illustrate the concepts of same-edge alignment, and minimal misalignment, for two categories Cat1 and Cat2, is shown in (5).

(5)

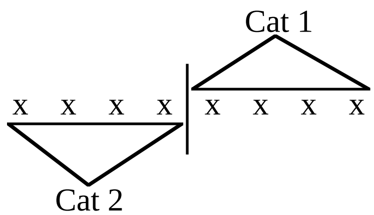


[17]Actually one further type of counter-edge alignment has been proposed by Itô, Kitagawa & Mester (1996) to account for the reversal of prosodic material encountered in the Japanese jazz musician’s language *zuuja-go*. However language games often employ strategies which are otherwise unattested in natural language.

The definition that will be necessary for same-edge alignment must require the periphery of Cat1, and the periphery of Cat2, to overlap maximally. Alternatively, the amount of misalignment will need to be defined in terms of the amount by which the periphery of one category *does not* overlap the periphery of the other. (For concrete proposals defining the notion periphery see Spaelti 1994, Itô, Kitagawa & Mester 1996).

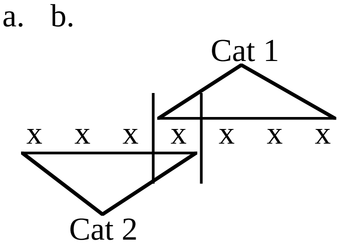
Now consider the case of counter-edge alignment:

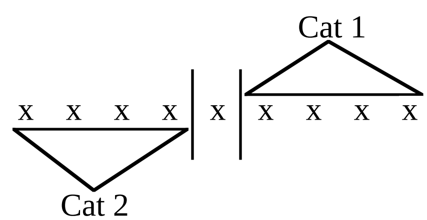
(6)



Apparently the definition necessary for counter-edge alignment will require minimal overlap (i.e. Ø) between the peripheries of the two categories. However mere disjointness of the two peripheries is not a sufficient condition as (7b) demonstrates. In both (6) and (7b) the peripheries of Cat1 and Cat2 are disjoint. However only in the case of (6) would we want to say that Cat1 and Cat2 are perfectly aligned. In order to capture this distinction the definition will need to refer to the superstructure containing both Cat1 and Cat2, as well as any potential misalignment. This reference to structure outside of Cat1 and Cat2, which is unnecessary in same-edge cases, is a first important difference between the two forms of alignment.

(7) a. b.





Another difference occurs when trying to define what constitutes minimal misalignment. Misalignment in counter-edge alignment separates into two non-unifiable cases (7a) and (7b). And which is worse?

None of this is to say that these problems are unsurmountable. However it casts serious doubt on the idea that same-edge and counter-edge alignment form a natural class. Thus the proposal for a restricted alignment schema:

(8) **Generalized Alignment Schema** [Revised] (cf. M&P 1994b)

Align-Edge(Cat1, Cat2) $=_{def}$

$\forall$Cat1 $\exists$Cat2 such that Edge of Cat1 and Edge of Cat2 coincide

Where

Cat1, Cat2 $\in$ PCat $\cup$ GCat

Edge $\in$ {Right, Left}

With ‘counter-edge’ alignment excluded in principle we must abandon (2). In the rest of this section I will discuss the affix to MinWd approach, and show how it can be incorporated in the current theory.

4.1.2. An OT implementation of ‘affix to the Minimal Word’

A question that was posed at the beginning of this section was: why does affixation to the main stress occur so frequently with reduplication, and so rarely with regular affixation? This ties up with a theme sounded at the beginning of the chapter, that reduplication generally seeks the most distinctive location, i.e. the root/stem. Note that none of the systems in (1) are 100% infixing. On the contrary. Even in Nakanai, where the amount of material ‘skipped’ by the prefix can be several feet, in the vast majority of cases the reduplicant is simply a prefix to a CVCV stem. Of course the CVCV stem, is the prototypical stem of Nakanai, and the majortiy of stems are exactly of that size. The infixing cases are therefore treating the stressed foot as if it constituted the entire stem, which most often it does. Thus we can reinterpret this infixation pattern as *prefixation to the prototypical stem* of the language.

This idea bears an obvious resemblance to the idea first suggested in M&P (1986) of affixation to the *Minimal Prosodic Word*. In that paper they conjecture the existence of a ‘minimality operator’. OT has a built-in minimality operator, through the device of minimal violation (P&S). In order to understand how this can be exploited, we need a few more pieces.

4.1.2.1. Affix to Prosodic Word

As the name implies, affixation to the Minimal Word is but a special case of a much broader notion, that of *affixation to a prosodic word*. Many languages distinguish classes of affixes, with one class attaching only to bases which are ‘phonologically complete’, while the other class attaches to morphemes, that may or may not, form legitimate stand-alone words. Such a distinction arguably characterizes the difference between ‘level 1’ and ‘level 2’ affixes in English. Modifying slightly a proposal by M&P

(1993) to account for such a case in the phonology of Axininca Campa, we have:

(9) AFFIX TO PRWD
Align-Edge(Base, Prwd)

I will assume that certain affixes are subject to such a constraint. By this I mean that they require of the constituent they are affixed to, that it be a Prwd. Or in other words they *license* a Prwd.

To see how this works consider for example an affix that is not so inclined. Such an affix will have the choice of joining with a base in a number of ways. First some general principles of prosodic organization will require that the affix together with the base constitutes a Prwd. This leaves at least the two different possiblities seen in (10).

(10) a. $[_{Prwd}$ affix $[_{Prwd}$ base]]
b. $[_{Prwd}$ affix base]

In case (10a) the base forms a Prwd on its own, and the affix and the base form another Prwd together. In (10b) only the compound forms a Prwd. Surely considerations of parsimony (*Struc) will favor the latter possibility. Independently the recursion of Prwd might be penalized. Selkirk (1995, see also M&P 1993b) specifically proposes a constraint to rule out such cases. I will refer to this constraint as NORECURSION. A limited form of this constraint that will be sufficient for the current discussion is given below.

(11) NORECURSION (cf. Selkirk 1995)
Prwd may not dominate Prwd

While constraint (11) universally favors structure (10b), some affixes presumably *require* that their base be a Prwd. Such affixes are subject to the constraint AffixtoPrwd (9), and it is this requirement that will force the recursive structure, as long as the constraint AffixtoPrwd dominates the constraint NoRecursion. Thus they will require the constraint ranking:

(12) Affix-to-Prwd >> NoRecursion

Returning to the description of our infixation patterns, this requirement constitutes the first piece of the analysis.

4.1.2.2. Size Restriction

The second piece of the analysis might seem much less obvious. Alternately it might seem too obvious to bother with: infixing systems of the kind presented in (1) are always *restricted in size.*

In traditional terms size restrictions were imposed through templates. In the current system, as argued in section 2.1.1., size restrictions are always the result of Emergence of the Unmarked. In particular they are the result of the following ranking:

(13) Max-LS >> 'size restrictors' >> Max-BR

This simple diagram belies hidden complexity. The crucial part is of course what in the ranking schema is summarily referred to as 'size restrictors'.

The constraints that make up the size restrictors are generally constraints of prosodic organization. We can divide them into three groups:

- **Delimiters**:
  Align-Edge(MCat, PCat)
- **Minimizers**:
  Align-Edge(Ft, Prwd) "AllFtEdge"
  Align-Edge(σ, Prwd) "AllσEdge"[18]
- **Maximizers**:
  Parse-σ

The DELIMITERS are typically alignment constraints. They guarantee that a given morphological constitutent is mirrored in prosodic structure. These will guarantee some minimal realization of the 'template'.

The MINIMIZERS consist of the prosodic organization constraints which are also responsible for directionality (M&P 1993b, Mester & Padgett 1993). These constraints typically take the form Align-Edge($PCat_1$, $PCat_2$) where $PCat_1$ is a category that is properly dominated by $PCat_2$. The effect of these constraints is to favor structures where there is at most one $PCat_1$ per $PCat_2$, thus minimizing $PCat_2$.

The MAXIMIZERS consist of the prosodic organization constraints which require that a given PCat is included ('parsed') in higher prosodic structure. As such they form part of the constraints that enforce the Strict Layer Hypothesis (Selkirk 1981, 1984, Nespor & Vogel 1986). In the terms of Selkirk (1995), they are the reverse of Exhaustivity, since they require all instances of $PCat^i$ to be dominated by the next higher type of category $PCat^{i+1}$. The effect of these constraints is to ensure that there are sufficient instances of $PCat^i$ to warrant a superstructure consisting of $PCat^{i+1}$, thus 'filling up', or maximizing $PCat^{i+1}$.

The workings of these three constraints will become clearer with the help of an

[18]The possibility of using this constraint to explain syllable-size reduplication was suggested to me by Armin Mester (pc).

example. M&P (1994b) first proposed a schema of this kind to account for a minimal Prwd ‘template’. Their analysis is composed as follows:

(14) **Delimiters**: Align-Left(Stem, Prwd), Align-Right(Stem, Prwd)
Minimizer: AllFootRight (or AllFootLeft)
Maximizer: Parse-σ

The EoU aspect of this ‘template’ is of course the interaction of these constraints with Faith. As long as Faith is ranked above these constraints, lexical items *can* be longer than a single foot. This is seen in the tableau in (15).

(15)

input = / $\sigma_1\ \sigma_2\ \sigma_3\ \sigma_4$ /	Faith	Align-L	Parse σ	AllFtRt
a. ☞ [($\sigma_1\ \sigma_2$) ($\sigma_3\ \sigma_4$)]				**
b. [$\sigma_1\ \sigma_2$ ($\sigma_3\ \sigma_4$)]			**!	
c. [σ_1 ($\sigma_2\ \sigma_3$) σ_4]			**!	*
d. [($\sigma_1\ \sigma_2$)]	**!			
e. [σ_1]	***!		*	

Given an input which is 4 syllables long Faith will immediately object to any form of truncation. But it is exactly the form (d), cut to the size of a single foot, that is preferred by both the minimizer constraint AllFootRight, and the maximizer constraint Parse-σ. With this possibility eliminated, the constraints will choose among the faithful as their ranking dictates. In this case (a) is judged best.

(16)

input: / $\sigma_1\ \sigma_2\ \sigma_3\ \sigma_4$ /	Align-L	Parse σ	AllFtRt	Faith
a. [($\sigma_1\ \sigma_2$) ($\sigma_3\ \sigma_4$)]			**!	
b. [$\sigma_1\ \sigma_2$ ($\sigma_3\ \sigma_4$)]		**!		
c. [σ_1 ($\sigma_2\ \sigma_3$) σ_4]		**!	*	
d. ☞ [($\sigma_1\ \sigma_2$)]				**
e. [σ_1]		*!		***

In this tableau we see clearly how, with the restraining influence of Faith gone, the minimizer and maximizer constraints take over. The minimizer, AllFootRight, favors forms (b), (d) and (e) with no more than one foot neatly aligned at the right edge. The maximizer, Parse-σ, prefers (a) and (d) where the available feet have been maximally filled in, with no stray syllables left. The two forces can only agree on a single foot, and truncation to that size, candidate (d), is the result.[19]

M&P's crucial suggestion is that we can turn this effect into a minimal word template for reduplication, by embedding these minimality-enforcing constraints in the usual EoU sandwich.

(17) Max-LS >> Parse-σ, AllFootRight >> Max-BR

Since Max-LS is ranked above Parse-σ and AllFootRight, underlying material will not generally be subject to their effects. But exactly the reverse will be the case for reduplicative material since Max-BR is ranked below these constraints.

Following this basic receipe we can construct a variety of different templates. A heavy syllable template will result from the following ranking:

(18) Max-LS >> Parse-σ, AllσRight >> Max-BR

In all of this, we should not be deceived by the seeming silence of the delimiter constraints. As it stands they ensure that the relevant type of prosodic category will be present. However their crucial role will become clear once we consider more fleshed out analyses.

Coming back to the analysis of infixing reduplication, we note that this same strategy can be used to limit the size of this type of reduplication as well.

4.1.2.3. Edgemost versus Minimality

Of course not all languages turn their prefixes and suffixes into infixes in the manner of the languages in (1), so one more piece will be necessary. The extra piece is simply the alignment constraint that requires the affix to be at the edge:

(19) Align-Edge(Aff, Prwd)

In common, edge-tropic affixation systems this constraint is undominated. As was discussed in section 4.1.1., this same type of constraint can be dominated, and thus be forced to be minimally violated. Such a situation was seen to occur in Tagalog, where prosodic requirements force the prefix *um* to be minimally infixed.

However in the situation we are considering, it is the *minimality requirement of the base* that is forcing violation of this constraint. And this minimality requirement is

[19]There is a factorial typology issue here, since presumably no languages are restricted to minimal words. Though perhaps the Sinitic languages do constitute such a case.

enforced by none other than Max-BR. As was first discussed in section 1.3.5.1, Max-BR can be met in two possible ways:

- by having the reduplicant copy everything in the base (Max-R)
- by making the base smaller, and thus cutting down on the amount to copy (Min-B)

The first strategy is of course the one that leads to total reduplication. This will be preferred in particular if Max-BR is ranked as high as Max-LS. In partial reduplication systems, however, we have seen that Max-LS must always outrank Max-BR. In such systems, this possiblity is frequently curtailed.

The second strategy, however, is generally blocked by higher ranked Max-LS as well, or so it would seem. Any truncation of the base would immediately incur such a violation. But truncation is not the only option for minimizing the base. Moving the reduplicant away from the edge, and into the base ‘shortens’ the base as well. These possibilities are compared in the table shown in (20), for a given input /RED + vigilemuli/.

(20) Strategies for avoiding Max-BR violations

input:	/RED + vigilemuli/	*violations*	*comments*
a.	vigi[vigilemuli]	lemuli !	
b.	vigilemuli[vigilemuli]	:	total copying (Max-R)
c.	muli[muli]	:	base truncated (Min-B)
d.	vigilemuli[muli]	:	reduplicant infixed (Min-B)

Example (a) shows a form that is partially reduplicated. As such it may well be optimal in some system, but this can only happen at the expense of Max-BR. Examples (b-d) show a variety of alternatives that will be preferred if Max-BR has any say in the matter. Possibility (b) shows the familiar total reduplication. However this is not the only possibility condoned by Max-BR. Example (c) where the base has been truncated, and (d) where the reduplicant has been moved inside the form, shortening the base will also receive perfect marks. The decision between these possibilities will need to be made by other constraints present in the grammar.

Possibility (d) conflicts with constraint (19), which demands that the affix be peripheral. Infixation of the type we are seeking to explain will only happen if Max-BR dominates that constraint. Thus it will require the ranking:

(21) Max-BR >> Align-Edge(RED, Prwd)

At this point an answer emerges to the question we posed at the beginning of the section. The reason this type of infixation is limited to reduplication is that the infixation is driven by the constraint Max-BR, which of course is not present with regular affixation.

4.1.2.4. Connecting the parts: minimization of the Base

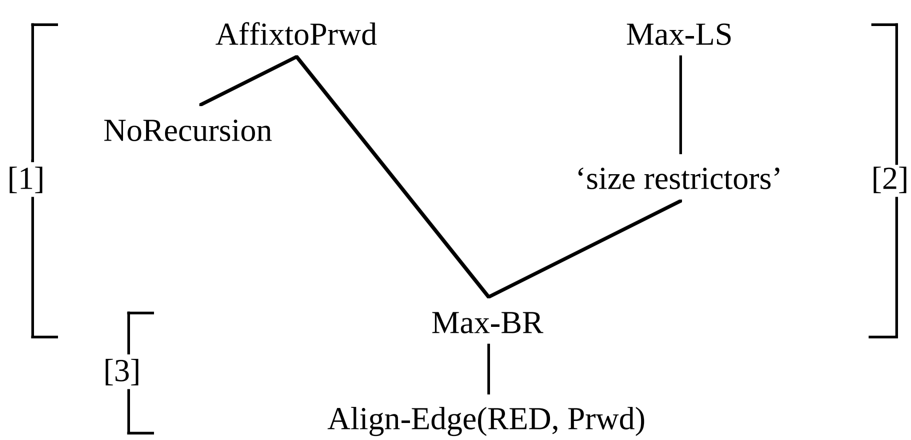
To review so far, we have three pieces:

1. a requirement that the base constitute a prosodic word
   Affix-to-Prwd >> NoRecursion
2. a size restriction imposed on the reduplicant
   Max-LS >> 'size restrictors' >> Max-BR
3. a balance between the desire to affix at the edge, and the desire to minimize the base
   Max-BR >> Align-Edge(RED, Prwd)

Note that 3 does indeed constitute a balance, since as long as there are other options to fulfill Max-BR, the alignment constraint might well be able to assert itself. This is however where 2 is important. If the reduplicant is restricted in size, then maximzing the reduplicant will not be an option. And since 2 also implies that Max-LS is ranked even higher, truncation of the base will not be an option either. This leaves only one possibility, and that is infixation.

Finally, 1 serves as a sort of brake, since otherwise the minimizing force of the various constraints might well minimize the base out of existence. In order to ensure this braking function AffixtoPrwd will need to outrank Max-BR. The overall ranking schema that results is shown in (22).

(22) **General Ranking Schema for 'Affix to Optimal Word'**



While the Min operator of M&P (1986) was a crude one-size-fits-all type axe, the current implementation is fully embedded in the general EoU structure that typifies reduplication. This means that, as with any other EoU ranking, the ‘Min Word’ for a given language will be subject to all the same requirements that are imposed on its non-minimal counterparts as well. As such it is truly the prototypical word of the language. In fact such requirements might well include a size that is greater than the permissible minimum in the language. All this suggests, that a more appropriate term, rather than minimal word, would be OPTIMAL WORD.

We are now ready to see how the schema in (22) is put into practice on the basis of a few examples.

4.1.3. Example I: Oykangand

Our first example comes from Oykangand, a Pama language indigenous to the Cape York region of Australia. The particular interest of this case, is that it demonstrates how certain requirements placed on Optimal Words can serve to distinguish this proposal from the ‘affix to PCat’ approach.

The source for the language is Sommer (1972, 1981). Oykangand has in the past attracted attention, because it was argued to have syllables of the shape VC*. While such language particular reformulation of the basic principles of syllabification might seem extreme, considering the somewhat peculiar phonotactics of Oykangand, the reasons for this proposal become clear. The following properties typify Oykangand prosodic words:

- All words are vowel initial
- Vowels are always separated by at least one, and up to four consonants[20]
- All words end in a consonant

It should be noted that these properties are phonological properties of Oykangand. Sommer gives examples of words that are C initial phonetically, but in such cases it can be shown that an underlying initial vowel has been elided.

Note that the second property would entail that in addition to Oykangand’s unusual syllable structure it would be in the unique position of having obligatory Codas. Further grist for the mill of the VC* hypothesis would seem to come from the reduplication pattern of the language, exhibited in (23).

[20]Sequences of 4 consonants always include a homorganic stop-nasal-stop sequence. It seems likely that such sequences should actually be analyzed as a stop-prenasalized stop cluster.

(23) Oykangand (Sommer 1972, 1981)

eder	ededer	'rain' -> 'heavy rain'
algal	algalgal	'straight' -> 'really straight'
igun	igigun	'go walk' -> 'keep walking'
*elbmben	elbmbelbmben	'red'
ondar	ondondar	'keep wait-/stop-(?) ing'
ukin	ukukin	'keep pulling(?)'
id^{j}ar	id^{j}id^{j}an	'ate' -> 'eating'

In all these examples, the reduplication seems to be achieved through copying of the first 'syllable' of the word, provided we adopt the VC* hypothesis. However M&P (1986, see also 1993) point out that a more natural solution is possible. The reduplication prefix is indeed a syllable, and copying to this syllable is maximal, with additional material copied to serve as the onset of the now no longer initial onsetless base.

The attractiveness of this proposal becomes even more apparent once we begin to flesh it out. We might recall that Oykangand always requires a consonant to break up vowel sequences. This means that, despite the word initial facts, Oykangand actually has a highly ranked Onset constraint. Ignoring the word initial facts for the moment, we have:

(24) Onset >> Max-LS >> NoCoda

This ranking will ensure that Oykangand has obligatory onsets and optional codas, leading to a CVC* type syllable structure. With this basic analysis of Oykangand syllable structure complete, we may turn to the reduplication next. The size restriction on the reduplicant can be accounted for by the EoU ranking:

(25) Max-LS >> 'σ-size' >> Max-BR

Implementing the idea of 'maximal copying to a syllable' simply means that Max-BR must be higher ranked than NoCoda. As the constraint that accounts for the restriction to syllable size, we can adopt AllσRight. Combining these pieces leads to (26).

(26) Onset >> Max-LS >> AllσRight >> Max-BR >> NoCoda

This ranking will indeed give us VC* reduplication in a language like Oykangand, as the following tableau demonstrates.

(27)

input: /RED + ondar/	Onset	MxLS	AllσR	MxBR	NoCd
a. o.on.dar	**!		σ/σσ	ndar	**
b. o.non.dar	*		σ/σσ	dar!	**
c. ☞ on.don.dar	*		σ/σσ	ar	***
d. on.da.ron.dar	*		σ/σσ/σσσ!		***

The tableau in (27) compares the most important candidates that are likely to be considered as possible reduplications for the baseform *ondar* 'wait'. Candidate (a) has a reduplicant consisting of a stand-alone syllable [o]. However this type of reduplicant leads to vowel hiatus, something which is never permitted in Oykangand. This candidate is eliminated by Onset. Candidate (d) has a reduplicant that is a complete copy of the base. This runs afoul of the minimizing force of AllσRight. Finally the choice falls to Max-BR, which favors the candidate that copies maximally to a syllable.

So far so good. But there is some further data from Oykangand, which paints a somewhat more complex picture. Consider the data below:

(28)

iyalmey	iyalm[almey]	'play' -> 'keep playing'
anaŋumin	anaŋum[umin]	'peek' -> 'keep peeking'
oralgŋal	oralgŋ[algŋan]-aɣ	'go walk about' -> 'will go walk about'
aliyan	aliy[iyan]	'keep thinking(?)'

These data show that in many cases the reduplicant is not actually prefixed, but is sometimes infixed. What distinguishes the examples in (23) from those in (28) is that in the former all baseforms are only two syllables long, while in the latter all baseforms have three syllables or more. In all the examples in (28), the reduplicant is infixed so as to make the base two syllables long, i.e. a foot. The disyllabic foot is exactly the size of the vast majority of stems in the language (Hamilton p.c.). Infixation of the reduplicant allows these longer stems to conform to this requirement, and thus the pattern in (28) can be understood as another example of prefixation to the prototypical stem.

But actually there is a problem here. Recall that earlier we attempted to argue that syllabification in Oykangand should be of the normal type. This means that 'play' should be syllabified [.i.yal.mey.] The relevant foot would thus be (yal.mey) and the reduplicated form should be **iyalyalmey*. Clearly this is not the desired result.

The solution to the problem is that the reduplicant is not prefixed to the foot, but to the Optimal Word. As argued before, the ranking in (22) guarantees that Optimal

Words will always be subject to the same requirements as other prosodic words of the language. Since the grammar of Oykangand imposes a requirement on prosodic words that they be vowel initial, this requirement will be passed on to the Optimal Word as well. Since *yalmey* is not V initial it is not a possible Optimal Word.

An important point is that the Optimal Word that I am assuming forms the base for affixation is an abstract unit. The syllabification of the form 'keep playing' is still *i.yal.mal.mey*.

4.1.3.1. Analysis of Oykangand syllable structure

Before we can procede to the analysis, we must confront the crucial property that makes Oykangand syllable structure so unusual: why must all words be vowel initial?

This property bears an obvious relation to the fact that many languages freely tolerate onset violations word initially, even though they never do so word internally. Axininca Campa is a language of this kind. In fact Oykangand itself is of this kind, since word internal vowel sequences are strictly prohibited.

A second related fact is responsible for the genesis of this pattern in several Cape York languages: word initial consonant loss. Word initial consonant loss is most likely due to the exposed position of such consonants perceptibly.

As was first demonstrated in work by Liberman et al. (1967), consonants depend for their perception on accoustic signals, or *cues*, that exist only in their transition to, or from, a neighboring segment, typically a vowel. Once this transition is removed they are no longer perceptible as consonants. Therefore we can say that the *licensing* of consonants happens on the basis of the accoustic cues arising from these transitions. A proposal of roughly this kind is put forth in Steriade (1995).

The transitions that serve as licensers for consonants are both those from the consonant to the following segment, which we might represent as C$^{\rightarrow}$V, as well as those from the preceding segment onto the consonant, i.e. V$^{\rightarrow}$C. In most cases the former are more important than the latter, a situation that we might represent as in (29). Properly elaborated, (29) might also explain the crosslinguistic fondness for onsets.

(29) C$^{\rightarrow}$V $\succ$ V$^{\rightarrow}$C

A point made by Steriade, however, is that for some types of consonants, the transition from the preceding segment is more important than that to the following (e.g. retroflexes).

Since word internal consonants will always have both types of transitions, they are generally more securely licensed, than consonants at word edges, which are always missing one transition. Onsets are missing the V→C transition. Thus we might assume that the unusual aspect of Oykangand prosodic structure is that it is the V→C transition that is crucially required to license consonants.

(30) LICENSE C (Oykangand)
‘every C must be licensed by (the accoustic cues of) a V→C transition’

This language particular constraint must crucially dominate Onset, and since it is surface true also Faith-LS. The net result will be that all words of the language must begin with a vowel.

One final point must of necessity remain speculative considering the limited amount of information about the language. The requirement stipulated in (30) might be related to the segment inventory. For instance a prominent retroflex/non-retroflex distinction in the inventory might skew the licensing to favor the V→C transition over the more usual C→V.

4.1.3.2. Analysis of Oykangand Infixation

With syllable strutcure properly accounted for, we can now turn to the actual analysis of the infixation pattern. The theory developed above requires three parts. The first part is the affix to the prosodic word requirement:

(31) Affix-to-Prwd >> NoRecursion, Max-BR

The second part is the size restriction on the reduplicant. As discussed above, a syllable template can be achieved with the help of the minimizer AllσRight (AllσLeft would serve as well). Max-BR itself can serve as the maximizer giving the following EoU ranking:

(32) Max-LS >> AllσRight >> Max-BR

In order to ensure that the reduplication realizes a syllable we will also need a delimiter: Align-L(RED, σ).

The third piece is the ‘minimize the base’ component, repeated here for reference:

(33) Max-BR >> Align-Left(RED, Prwd)

Putting all of these pieces together we can show how the system accounts for a form like *iyalmalmey* ‘keep playing’. The relevant tableau is shown in (34).

(34)

input: /RED + iyalmey/	AfPwd	MxLS	AllσR	MxBR	Aln-L
a. ☞ i.yal[mal.mey]			σσσσ	ey	iy
b. i.yal.me.yey	*!		σσσσ		iyal
c. i.ya[lal.mey]			σσσσ	mey!	iy
d. i.yal.me[yal.mey]			σσσσσ!		iy
e. al[mal.mey]		iy!	σσσ	ey	
f. i[yi.yal.mey]			σσσσ	almey!	

A number of things have been omitted from the tableau for clarity. First the constraints NoRecursion, and the delimiter constraint are not included in the ranking. Also indication of the footing, as well as the PrWd bracketing the entire form, have been left out from the candidates. Finally, the violation markings have been simplified somewhat. For instance, violations of AllσRight are generally calculated as distance from the edge, in a relevant unit, for each syllable: 0 for the first, 1 for the second, etc. Instead here it has been given in the form of one mark per syllable, since the only relevant effect of the constraint will be that of minimizing the number of syllables. Irrelevant marks have also been left out from the column of the constraint Affix-to-Prwd. This constraint, which was formulated as an alignment requirement between the base and a Prwd in (9), is violated by every single candidate. However this violation is minimal (in most candidates) and forced by the higher ranking Onset, as will be discussed below.

Now to the discussion of the candidates: (b) shows a candidate where the base does not form a prosodic word, permitting the reduplicant to move in sufficiently to avoid violation of Max-BR. Its defect is obvious and fatal. Candidates (c) and (d) show cases where the size restriction is breached. In (c) the reduplicant has copied too little, thus failing Max. In (d) the reduplicant copies too much, requiring an extra syllable, and is immediately penalized by AllσRight. Candidates (e) and (f) show the impossibility of realizing the reduplicant as a prefix, as it is with shorter forms. In (e) the base is truncated in order to meet the needs of minimality, but this is ruled out by Max-LS. Finally straight out prefixation (f) runs afoul of the base minimizing effect of Max-BR

The last thing that needs to be considered is how the vowel initiality requirement is applied to the base. Ideally this would follow directly from a fully developed theory of the kind discussed in section 4.1.3.1. Such a theory would need to address why the licensing required by constraint (30) cannot happen across a stem boundary.

For the present purposes we might make use of an idea developed by Hayes (1996). Hayes suggests that rather than having the phonetics serving directly as the source of constraints, that the phonology builds its own constraints which mirror restrictions that are grounded in phonetic fact. In our case we might imagine that the principles that form the basis of the constraint in (30) are implemented in the language by means of the parochial constraint shown in (35).

(35) Align-Left(Stem, V) [Oykangand]

This constraint straightforwardly expresses the idea that morphological constitutents in Oykangand must be vowel initial.

The tableau in (36) shows that Onset and the constraint in (35) work together to correctly predict that the base of reduplication will need to be vowel initial.

(36)

input: /RED + iyalmey/	Onset	A-L(Stem,V)	A-L(Pwd,B)
a. i<u>yal</u>[$_{Pwd}$ |$_{Base}$yalmey		*!	
b. ☞ iy<u>al</u>[$_{Pwd}$ <u>m</u> |$_{Base}$almey			*
c. iy<u>alm</u>[$_{Pwd}$ |$_{Base}$almey	*!		

This concludes our analysis of Oykangand.

4.1.4. Example II: Nakanai

A second example that will serve to show our implementation of Affix to the Optimal Word is Nakanai, which is already familiar from the previous chapter. We can thus proceed directly to the analysis, beginning with the size requirement on the reduplicant.

In the previous chapter it was argued that Nakanai had no template requirement imposed on its reduplication. However, the analysis fully relied on the fact that the base was always restricted to a CVCV foot. In other words the restricted size of the reduplicant was simply a reflection of the restricted size of the base.

Now we find that the tables are turned. The size restriction on the base is simply a case of the base copying the reduplicant. This means that the restriction to foot size seen in the base is an EoU template after all. A foot size template can be imposed as in (37).

(37) Max-LS >> Parse-σ >> AllFtRight >> Max-BR

The ranking of the maximizer Parse-σ over the minimizer AllFootRight simply reflects the fact that Nakanai builds feet from the right and is fully footed. Thus we see that the stress system of Nakanai itself takes care of the size restriction. Or to put it another way, the size of the reduplicant is a reflection of its attempt to fit into the rhythmic pattern of the language. This should not come as a surprise, since reduplication is *prosodic morphology.*

In much of the discussion so far, the delimiters were not seen doing much work. In this case, however, the crucial role of the delimiter will quickly become apparent. The constraint ranking in (37), responsible for the size of the reduplicant, will actually only lead to a reduplicant which minimally perturbs the rhythm. In order to ensure that the reduplicant is a full foot, we need to 'anchor' it in this rhythmic stream as follows:

(38) Align-L(RED, Foot)

This constraint will need to be ranked above the footing constraints (i.e. Parse-σ and AllFootRight) as usual. However at this point it will be important to recall our analysis from the previous chapter. In that analysis it was seen that a number of constraints (*2-Obs, *[h], NoEcho, Onset) interfere with the reduplicant's desire to reach its full size. Since (38) tries to enforce that size, there is a conflict, and the fact that these restrictions are effective tells us that they must dominate (38).

The reason (38) leads to a foot size reduplicant is that the right edge of the reduplicant is immediately next to the base. And the base must itself form a Prwd. The constraint that ensures this is one of our standard pieces, and the ranking necessary for it to be active is given once again:

(39) Affix-to-Prwd >> NoRecursion, Max-BR

Since our delimiter Align-L(Red, Foot) (i.e. 38) requires the left edge of the reduplicant to begin with a foot, and since the right edge of the reduplicant is bounded by the Prwd constituting the base, this foot will need to be realized completely on the reduplicant, thus guaranteeing its size. In order for this to happen (38) will need to be ranked below Affix-to-Prwd as well.

This leaves us with only one more piece as usual: minimization of the base.

(40) Max-BR >> Align-L(RED, Prwd)

An interesting point is the close similarity between the delimiter constraint (38), and the edgemost constraint., Align-L(RED, Prwd). This is reminiscent of a proposal made in M&P (1994b), concerning the possibility of evaluating constraints of the type Align(MCat, Prwd) hierarchically. Essentially their proposal is that such a constraint can be read as: 'Align MCat with a Prwd. If not a Prwd, then a foot. If not a foot, then a syllable.’ The current analysis suggests that the way to implement this proposal is in the form of a Smolenskyian fixed ranking. Implementing such a ranking for the reduplicant, we get the hierarchy shown below.

(41) Align-L(Red, σ) >> Align-L(Red, Foot) >> Align-L(Red, Prwd)

Combining the ranking derived at the end of chapter 3, with the constraints necessary to correctly account for the infixation, derives the ranking shown in (42).

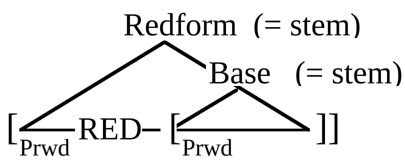
(42) **Constraint Organization for Nakanai reduplication**

	Max-LS	‘a-templatic restrictions’
	*[h] HNUC *2-Obs NoEcho	
	Onset	
Align-L(Red, σ)		
	Affix-to-Prwd	‘affix to Prwd’
Align-L(Red, Foot)		‘size restriction’
	Parse-σ	
	AllFootRight	
	Max-BR	‘minimize base’
Align-L(Red, Prwd)		
	Contiguity	

In this ranking diagram I have offset the constraints that form the hierarchy in (41). I have also highlighted the two Max constraints responsible for the EoU character of the analysis. Interestingly the entire analysis of Nakanai is bracketed by these two groups of constraints. One caveat; while the above diagram shows a ranking that is overall consistent with the rankings that have been justified in chapter 3 and in the explanations of this chapter, not *all* rankings implied by the vertical order have been justified. For example *2-Obs is ranked below Max-LS, as argued in chapter 3, and above Align-L(RED,Ft), as explained above. However it is not obviously ranked with respect to the constaints Onset, Align-L(RED,σ), or Affix-to-Prwd. Nevertheless (42) shows that the rankings that have been justified are consistent with a total ranking.

The constraint hierarchies in (41) and (42) bring up one more interesting point. In their original discussion of how to create EoU templates, McCarthy and Prince (1994b) propose that templates derive from the morphological constituency of the reduplicant through indirect reference to its morphological category. Under that conception the reduplicant in Nakanai would need to be a *stem*, since stem is the category that M&P equate with the Prwd. From that stipulation though, the fact that the reduplicant is subject to a hierarchy, such as that seen in (41), follows automatically. It must be said however, that apart from the (occasional) CVCV size, the reduplicant shows no Prwd properties. More likely the fact that the reduplicant is subject to (41) is not a consequence of its own stem status, but rather that it forms a stem together with the base, as seen in (43).

(43) morphological analysis of the reduplicated form



This diagram also makes it clear why it is the *left edge* that is subject to such constraints, while no constraints referring to the right edge have been encountered in the current analysis. The right edge of the reduplicant has no special status.

Finally we may want to verify that the analysis arrived at above does indeed give the right predictions. Choosing a suitably long form, *vigilemuli* 'tell a story', a verb which reduplicates to form a concrete noun *vigilemulimuli* 'story'. The tableau in (44) demonstrates how the analysis correctly accounts for the size restriction.

(44)

input: /RED + vigilemuli/	Al(RED,F)	Parse-σ	AllFtR	Max-BR
a. ☞ vi(gi.le)(mu.li)[(mu.li)]		σ	ΦΦΦ	
b. (vigi)(le.mu)[(mu.li)]	*!		ΦΦΦ	li
c. vi.gi.le.mu[(mu.li)]	*!	σσσσ	Φ	li
d. vi.gi.le(mu.li)[(mu.li)]		σσσ!	ΦΦ	
e. vi(gi.le)(mu.li)[(gi.le)(mu.li)]		σ	ΦΦΦΦ!	

The candidates (b) and (c) do not have proper foot sized reduplicants, and thus fail to meet the standard imposed by the delimiter constraint Align(RED,Ft). They are thus removed from further consideration. Candidate (d) does not fully foot the form, and this defect is marked by Parse-σ. Finally candidate (e) shows the minimizing effect of

AllFootRight. Any attempt to create a longer reduplicant will be ruled out by this constraint.

With the reduplicant size tightly restrained in this fashion, we can again proceed to show how this restriction is projected back on the base. The tableau in (45) provides the candidates relevant to the comparison.

(45)

input: /RED + vigilemuli/	AllFtR	Max-BR	Align-L
a. ☞ [vi(gile)(muli)[(muli)]]	σσ/σσσσ		vigile
b. [(vigi)(lemu)[le(muli)]]	σσσ/σσσσσ!	li	vigi
c. [vi(gile)[(gile)(muli)]]	σσ/σσσσ	muli!	vi
d. [(vigi)[vi(gile)(muli)]]	σσ/σσσσσ!	lemuli	

This tableau shows again the ‘minimize the base’ action of Max-BR. The alignment constraint prefers any form that is prefixal. With long forms, such as the one under discussion, the result would be a long base, and hence mean that there is more to copy. But because the reduplicant size is held in check, Max-BR will favor forms where the base is shortened through rightward displacement of the reduplicant, bringing the reduplication as near total copying as the prosodic word status of the base will allow.

This concludes our analysis of ‘affixation to the Optimal Word’. In the rest of this chapter I will discuss a series of closely related languages, that demonstrate neatly the extent of variation permitted by this system.

4.2. Analysis of the Aru languages

In the rest of this chapter, I look at how the Affix to the Optimal Word scheme can account for the variation within a group of closely related languages from Maluku. Of particular interest is a type of infixing reduplication first described by McCarthy & Broselow (1983), which they call true infixing. Two examples, both from Aru languages, are given below.

(44)

Rebi WT	taˈpuran	tarˈpuran	‘middle’
Kola	duˈbam	dumˈbam	‘seven’

In this type of reduplication the reduplicant does not always form a prosodic constituent, appearing sometimes, as it does here, as only a single consonant. While the Aru languages all have similar forms of infixing reduplication, they do not all show this particular type of reduplication. This interlinguistic variation provides the clue to what causes this unusual behavior.

4.2.1. Affix to PCat versus 'true infixation'

A standard distinction in Prosodic Morphology originated in work of McCarthy (1979) is that between concatenative and non-concatenative languages. Non-concatenative languages are often argued to have a variety of special properties, such as consonants and vowels segregated onto tiers, and word shapes restricted by prosodic templates. These properties are then correlated with other special behavior, such as 'tier-based' spreading (also called 'gemination at a distance').

Broselow & McCarthy (1983) find a further correlate of this distinction in the realm of infixing reduplication. They distinguish two types of infixing reduplication: 'affix to a prosodic constituent' and 'true infixing' reduplication. The latter type, they claim, is attested only in non-concatenative languages. A representative example of such a system is provided by the Austro-asiatic language Temiar.

(45) **Temiar** (Benjamin 1976)

səˈlɔg	sɛgˈlɔg	'to lie down'
ˈkɔɔw	kɛwˈkɔɔw	'to call'

Temiar is an example of a sesquisyllabic language. All stems consist either of a single heavy syllable, or a heavy syllable with a preceding 'half-syllable'. This special shape requirement is taken to be evidence for its non-concatenative status. The reduplication, of which examples are shown in (45), has a reduplicant which always immediately precedes the stressed syllable. Unlike the more common prefix to prosodic constituent systems, the Temiar reduplicant does not have a consistently identifiable size. Sometimes the size of the reduplicant is a 'half-syllable' consisting of two consonants with a predictable epenthetic vowel, while in other cases the reduplicant is a single consonant. Furthermore, it seems that the reduplicant does not consistently copy the immediately following material. For instance in *sɛglɔg* 'to lie down' the reduplicant does not start copying with the [l] as one would expect in 'affix to PCat' type reduplication, but rather skips to the final consonant. Alternatively one might claim that reduplication is copying from the 'wrong' side, and this is the analysis that Broselow & McCarthy adopt. A similar tack is taken by Alderete et al. (1996) for a case from Nancowry.

Gafos (1995) reviews the evidence for tier-based spreading, and argues against a distinguished class of non-concatenative languages with special properties. He does maintain a distinction between different types of reduplication, however. According to his classification Temiar reduplication is a-templatic. In this dissertation I have argued that all reduplication is a-templatic, and this means that there is no special class of reduplication, of which Temiar is an example.

In a nutshell the argument is based on the following type of near minimal pair taken from two dialects of West Tarangan

(46)	**Popjetur WT**	taˈporan	tapor̲ˈporan	'middle'
	Rebi WT	taˈpuran	tar̲ˈpuran	'middle'

In Broselow & McCarthy's terms the reduplication of Popjetur WT would be affixation to a PCat, while that of Rebi WT would be 'true infixing'. None of the West Tarangan dialects show any notable non-concatenative language properties. Thus the appearance of the distinction in this case is spurious.

I will show instead that the two types of reduplication receive straightforward analyses in terms of the Affix to Optimal Word schema. The sole distinction lies in the ranking of the delimiter constraint, which is responsible for the realization of the reduplicant as a certain type of prosodic constituent. In Popjetur WT the delimiter outranks the minimizing constraint that prefers fewer syllables in the output. Thus the reduplicant must form its own syllable, even though this means an extra syllable overall. In Rebi WT on the other hand, minimization of the number of syllables has the upper-hand, and existing syllables are 'recycled' rather than creating new syllables. The crucial contrast can be gleaned from the following two tableaus.

(47)

Popjetur: /RED + taporan/	Align-L(Red,σ)	AllσRight
a. ☞ ta.por.po.ran		σ/σσ/σσσ
b. tar.po.ran	*!	σ/σσ

(48)

Rebi: /RED + tapuran/	AllσRight	Align-L(Red,σ)
a. ta.pur.pu.ran	σ/σσ/σσσ!	
b. ☞ tar.pu.ran	σ/σσ	*

Thus this rather unfamiliar form of reduplication, that always involves a single consonant, can be understood as an almost overzealous form of syllable maximization that insists on first filling-up an availble light syllable, rather than starting a new one. I will thus call this type of reduplication SYLLABLE RECYCLING.

Syllable recycling is in fact considerably more common than might appear. It is found in a widely distributed number of languages. See McCarthy & Broselow (1983) for a collection of examples.

4.2.2. Reduplication in the Aru languages

The cover term Aru[21] languages, used here, refers to two Austronesian languages, West Tarangan and Kola, spoken in the Aru archipelago in Maluku, Indonesia. West Tarangan, consists of a series of related dialects of which four—Kalar-Kalar, Popjetur, Rebi, and Doka Timur—are described in detail in Nivens (1992, 1993).The description of Kola is provided by Takata (1992), and Takata & Takata (1992). I will henceforth ignore the dialect/language distinction, and refer to all of them as 'languages'. These languages show a continuous spectrum of properties in their reduplicative systems, that includes infixation, varying reduplicant size, and default segmentism.

A few properties are shared by all of the Aru languages. For one thing, all of them have a variety of reduplication patterns. They also all have a wide array of uses for reduplication. These uses include nominalization, relative clause formation, forming of ordinal numbers from cardinals, marking of progressive aspect, subordination, negative agreement, diminutives, compounding, plurality, intensification, and others more. Notably however, except for one use in Doka Timur WT (see section 1.2.2.), none of the many functions of reduplication are linked to a specific pattern. All patterns are used for all functions, and the choice of pattern is determined by the prosodic shape of the base in a predictable way. Thus the various patterns in each language are alloduples of a single dupleme.

A further generalization that holds for all of the Aru languages is that the reduplicant always appears right before the main stress. Stress in these languages always falls on either the penultimate or the final syllable of the root in a (mostly) predictable fashion. There are only few suffixes and they are never longer than a single syllable. Such suffixes are never stressed. In West Tarangan, the most common root shape by far is CVCVC with stress on the initial/penult syllable, and this can be considered the prototypical root/word shape. In such cases the reduplicant is a prefix. But whenever there is a prefix or if the stem is longer, all material preceding the stress is ignored, and the reduplicant is infixed. Examples are seen below.

[21] I use the name 'Aru languages' purely as a convenient cover term for the purposes of this discussion, to refer to Kola and West Tarangan only. There are a number of other languages spoken on Aru, including both Austronesian and Papuan.

(49) **Infixation of the reduplicant in the Aru languages**

Kalar-Kalar WT	maˈnɛlay	manɛlˈnɛlay	‘sour’
Popjetur WT	taˈporan	taporˈporan	‘middle’
Rebi WT	payˈlawa-na	paylawˈlawana	‘friendly-3s’
Doka Timur WT	kaˈrɛp	kapˈrɛp	‘many’
Kola	afˈral	afalˈral	‘morning’

A final commonality is that all of the languages have a light (CV) syllable pattern as one of their alloduples, which is employed, either when a consonant final reduplicant would lead to a geminate cluster, or when there is no consonant immediately following the first vowel of the base.

(50) **Geminate avoidance**

Kalar-Kalar WT	ituˈtut	‘3s-hammer’	*itutˈtut
Popjetur WT	raˈraray	‘hot’	*rarˈraray
Rebi WT	naˈnanay	‘hot’	*nanˈnanay
Kola	dubaˈbabi	‘seventh’	*dubˈbabi

In all of these examples, the expected reduplication pattern, shown in the last column, would lead to a geminate cluster. None of the languages permit geminates, and this possibility is avoided by choosing the light syllable alloduple. Note incidentally that this fact follows directly from our conception of reduplication. The fact that none of the languages in question permit geminates is expressed by the ranking:

(51) NoGeminate >> Max-LS

Since the reduplicant shape has been shown to always be a consequence of emergence of the unmarked, the constraints that determine the reduplicant size will necessarily be ranked below Max-LS, and thus below NoGeminate by transitivity of ranking. Thus NoGeminate will rule out the generally predicted form of reduplication, and the common denominator of partial reduplication, the light syllable, appears instead.

(52) **No consonant following the base initial vowel**

Kalar-Kalar WT	kanɔˈnɔirna	‘hungry.3s-3s’
Popjetur WT	dɔˈdɔam	‘pound’
Rebi WT	ruˈrua	‘two’
Doka Timur WT	liˈlɔir	‘clean-3s’
Kola	takaˈkuan	‘deaf’

The data in (52) shows cases where there is no consonant following the first vowel of the base. In such cases all of the Aru languages choose a light syllable reduplicant. This is a reflection of the fact that only the consonant following the base initial vowel can ever be used to form a coda in the reduplicant. I will return to this point.

I will now turn to a discussion of the individual languages in more detail, paying particular attention to two properties: the shape variation of the reduplicant, i.e. the set of alloduples; and whether the reduplicant must always form its own constituent, i.e. whether the language permits syllable recycling. The latter property is taken to be the indicator of Broselow & McCarthy's affix-to-PCat/true infix distinction.

4.2.2.1. Kalar-Kalar WT

Kalar-Kalar WT (also referred to as Coast WT) has the three alloduples seen in (53a): a light syllable, a heavy CVC syllable, and a foot pattern consisting of two light syllables. When the reduplication is infixing, the reduplicant must always begin its own constituent syllable (53b). Thus the form *ɛlaˈjir* '3s-white' reduplicates as *ɛlajirˈjir*. Those Aru languages which do not have this last requirement, permit the reduplication to 'recycle' an existing syllable. In Doka Timur WT the corresponding from is *ɛlarˈjir*.

(53) **Kalar-Kalar WT**

a.	kaˈnɔir-na	kanɔˈnɔirna	'hungry.3s-3s'	
	ˈtɔp	tɔpˈtɔp	'short'	
	ˈborar-na	boraˈborarna	'small-3s'	
b.	maˈnɛlay	manɛlˈnɛlay	'sour'	*malˈnɛlay
	ɛ-laˈjir	ɛlajirˈjir	'3s-white'	*ɛlarˈjir

The distribution of the three patterns is discussed in detail in Spaelti (1996), which provides an analysis using templatic constraints, and also stipulates the affix location with an alignment constraint. Both of these points have been argued to be problematic and are addressed in the current analysis.

The basic distribution of the patterns can be described in terms of an 'elsewhere' statement, a type of situation that is inherently conducive to a treatment in terms of OT. I will follow Spaelti (1996) in assuming that the heavy syllable alloduple is the primary pattern, and that the others are chosen if this would lead to the violation of a phonotactic restriction. This heavy syllable pattern can be understood as the result of trying to realize the reduplicant simultaneously as a syllable and a foot constituent. Enforcement of the size requirement imposed on the reduplicant was argued to be the responsibility of the delimiter constraints, in particular the following hierarchy, encountered in the analysis of Nakanai, in section 4.1.4.

(54) Align-L(Red, σ) >> Align-L(Red, Foot) >> Align-L(Red, Prwd)

This hierarchy is the same which also ensures that the reduplication is basically prefixing. Other properties, such as size restrictions, are the result of the interaction of (54) with other constraints in the grammar, in particular the prosodic minimizers. Since the current case is arguably syllable reduplication the relevant minimizer is AllσRight, and since Kalar-Kalar WT permits disyllabic, foot-size reduplicants, this minimizer needs to be ranked below Align-L(Red, Foot) in the hierarchy in (54). Embedding this in an EoU schema leads to the following constraint ranking, which constitutes the basic account of the reduplicant shape of Kalar-Kalar WT.

(55) Max-LS, Align-L(Red, σ) >> Align-L(Red, Foot) >> AllσRight >> Max-BR

The three alignment constraints of this ranking are best satisfied if the reduplicant is a heavy syllable, which in West Tarangan always means a CVC syllable, since only a heavy syllable is both a syllable and a foot, and leads to minimal increase in the number of syllables. If a suitably ranked phonotactic rules out a CVC syllable reduplicant, then a foot-sized reduplicant made up of two light CV syllables is the preferred option, in deference to higher ranked Align-L(Red, Foot), and despite the fact that this leads to more violations of AllσRight. If such a foot-sized reduplicant is ruled out as well, the minimizer constraint can reassert itself, and a light syllable reduplicant is the result.

The constraint which forces CVCV reduplication is a coda constraint, which restricts the reduplicant final segment to sonorants. There are however a number of complications, and I will not pursue the formulation of this constraint here (see Spaelti 1996 for details), since it is only tangential to the issue at hand. However this constraint will need to be ranked above AllσRight in the ranking diagram in (55), since it forces the reduplicant to be two light syllables rather than a single heavy syllable, counter the minimizing effect of AllσRight.

Turning now to the light syllable alloduple, one situation where such a pattern is chosen is when a CVC reduplicant would lead to a geminate cluster. This point was already addressed above. There are however two further cases which lead to a CV reduplicant. The first is when the potential second consonant of the reduplicant is a dorsal segment. Included in this restriction are the glides, making the class of segments to which this restriction applies [k, ŋ, y, w].[22] A full chart of the consonants of WT is provided in (61) below. Examples showing the effects of this restriction are given in (56).

[22]Two further segments which are potentially affected by this restriction are [g] and [j]. However these segments never appear in the appropriate position in the base.

(56) **Dorsal place restrictions**

bakir	baˈbakir	‘small.3s’	*bakiˈbakir
paylawa-na	paylaˈlawana	‘3s-afraid’	*paylawaˈlawana
jaŋil	jaˈjaŋil	‘rotten.3s’	*jaŋiˈjaŋil

In all of these examples the second consonant of the base is a dorsal segment. This consonant would either form the coda of a CVC reduplicant, or constitute the intervocalic consonant of a CVCV reduplicant. I will assume that this restriction is the result of a place markedness restriction of the type proposed by P&S and Smolensky (1993) (cf. also the discussion of Ponapean in section 2.1.3.1.).

(57) *Pl/Dor

While dorsals do show their markedness in WT in a number of ways—for example [k] is often reduced to a glottal stop—they are nevertheless possible segments. Thus the constraint in (57) is inactive, and ranked below Max-LS. However its emergent effects in reduplication show that it is ranked above Max-BR. Moreover since it forces violation of the foot-size requirement it must outrank Align-L(Red, Foot) as well. This leads to the following constraint ranking:

(58) Max-LS >> *Pl/Dor >> Align-L(Red, Foot) >> Max-BR

This tableau shows how the analysis accounts for the dorsal restriction.

(59)

input: /RED + bakir/	Max-LS	*Pl/Dor	A-L(Ft)	Max-BR
a. (baki)(bakir)		**!		r
b. ☞ ba(bakir)		*	*	kir
c. (bar)(bar)	**!			

The expected reduplication for a form like *bakir* ‘small.3s’, as mandated by the size restrictors, would be *bakibakir*, as in candidate (59a). This leads to an extra violation of *PL/Dor that can be avoided by reduplicating only a light syllable, as in the winning candidate (59b). The violation of *Pl/Dor incurred by the winning candidate is due to the dorsal segment in the base. But trying to eliminate that violation by removing the dorsal from the base leads to a violation of the higher ranked Max-LS, as shown in the case of candidate (59c). This is the typical emergence of the unmarked configuration. Underlying segments must be realized despite their markedness. But with reduplicated segments the power of the markedness constraint emerges, and the marked segments are avoided.

The ranking in (58) would seem to rule out dorsals in reduplication altogether, a claim which is obviously false as witnessed by such examples as *kɔlakɔlat* ‘spoon’. The reason that reduplicant initial dorsals are not eliminated is the constraint Anchoring, which is undominated in Kalar-Kalar WT. Anchoring ensures that the initial segment in the reduplicant corresponds to the initial segment in the base, and since this requirement outranks the constraint in (57), base initial dorsals are copied despite their marked status.

A second restriction on reduplication which calls for the light syllable pattern, is an OCP type restriction against reduplicants with two consonants that have the same place of articulation. Examples are shown in (60).

(60) **Place OCP restrictions**

a.	i-bɛbar	ibɛˈbɛbar	‘3s-afraid’	*ibɛbaˈbɛbar
	m-abak	maˈmabak	‘2s-pluck’	*mabaˈmabak
b.	pɔpˈjɛtur-na	pɔpjɛˈjɛturna	‘Popjetur-3s’	*pɔpjɛtuˈjɛturna
	i-sɛtak	isɛˈsɛtak	‘3s-sever’	*isɛtaˈsɛtak
c.	ɛ-r-lora	ɛrloˈlora	‘3s-R-calm’	*ɛrloraˈlora

The data in (60a) have bases where the potentially copied consonants are both labial. The set (60b) shows cases where the consonants are both coronal obstruents.[23] Liquids are also subject to co-occurrence restrictions as demonstrated by (60c). Cases with two dorsals are already ruled out by the more inclusive restriction against dorsals discussed above. The complete overview over these restrictions is shown in (61).

[23]The data is actually slightly more complicated, than the current discussion lets on. There are examples where the two base consonants are [t…d] or [d…s], and which reduplicate according to a CVCV pattern. According to the current analysis these cases must be considered exceptions, but the data is inconclusive as to whether such exceptions are more systematic (cf. discussion in Nivens 1993).

(61) **Consonant Inventory of Kalar-Kalar WT**

	labial	*coronal*	*palatal*	*dorsal*
voiceless stop	p [ɸ]	t		k
voiced stop	b	d	j	g
continuant		s		
nasals	m	n		ŋ
liquids		l, r		
glides			y	w

A few comments about this chart. The voiceless bilabial stop [p] is generally realized as a fricative [ɸ] in onset position, but never in a coda. The two voiced stops [j] and [g] are in complementary distribution with the glides, the voiced stops appearing only foot and word initially, and the glides everywhere else. For this reason, Nivens treats [j] and [g] as underlying glides. There are however no synchronic alternations involving [j/y] or [g/w], so this analysis remains abstract. OT permits this distribution fact to be addressed directly without the detour via an abstract underlying form.

In the chart in (61) the segments affected by the dorsal restriction are shaded. The boxes indicate groups of segments which are subject to OCP restrictions. Kalar-Kalar WT again shows the typical pattern whereby all labials are grouped together with respect to place restrictions, while coronals are further subdivided (cf. the discussion of Nasal Substitution in Ponapean, section 2.1.3.1.). This typically leads to different behavior of the nasals. Thus while [b…m] pairs are subject to the OCP, [d…n] pairs are not. Turning now to the formalization of this constraint, I will again adopt the account of OCP restrictions proposed in Itô & Mester (1996, see section 2.1). According to their proposal such restrictions can be understood as self conjunction of constraints. Since the current case concerns place markedness, the relevant simple constraints are the following, argued by P&S and Smolensky (1993) to be universally ranked.[24]

(62) *Pl/Dor >> *Pl/Lab >> *Pl/Cor

[24]The ranking *Pl/Dor >> *Pl/Lab is more controversial than that of both of these above *Pl/Cor. I assume the former because of the dorsal constraint discussed above. Possibly this part of the ranking is specific to Kalar-Kalar WT. For a further argument in favor of this ranking from Japanese, however, see Itô & Mester (to appear).

From this hierarchy we can derive further constraints, along with their respective rankings, by self conjunction. The result is shown in (63). The line divides those constraints that are active in Kalar-Kalar WT reduplication, from those that are inactive.

(63) **Place OCP**

$*\text{Pl/Dor}^2_{\text{Foot}}$ >> $*\text{Pl/Lab}^2_{\text{Foot}}$ >> $*\text{Pl/Cor}^2_{\text{Foot}}$

$\searrow$ $\searrow$ $\searrow$

*Pl/Dor >> *Pl/Lab >> *Pl/Cor

According to the definition of local conjunction, the conjoined constraint must always dominate both of the conjuncts. By the same reasoning a self conjoined constraint must always outrank the corresponding simple constraint. Thus $*\text{Pl/Dor}^2$ will need to outrank *Pl/Dor, etc. However from this it still does not necessarily follow that $*\text{Pl/Dor}^2$ must outrank $*\text{PlCor}^2$. For this one further piece is necessary.

A reasonable assumption concerning the ordering of conjoined constraints is that if a constraint cons_1 dominates another constraint cons_2, then the conjunction of cons_1 with some constraint should dominate the conjunction of cons_2 with the same constraint. I will adopt this assumption, as a hypothesis.

(64) **Universal Conjoined Constraint Ranking Hypothesis** (UCCRH)

$\forall\ \text{cons}_1, \text{cons}_2, \text{cons}_\alpha \in\ Con$

if $\text{cons}_1 >> \text{cons}_2$, then $\text{cons}_1\ \&_l\ \text{cons}_\alpha >> \text{cons}_2\ \&_l\ \text{cons}_\alpha$

Assuming that local conjunction is commutative, we can derive the following as a lemma:

(65) **Self-Conjunction Ranking Lemma**

$\forall\ \text{cons}_1, \text{cons}_2 \in\ Con$

if $\text{cons}_1 >> \text{cons}_2$, then $\text{cons}_1^{\ 2} >> \text{cons}_2^{\ 2}$

Proof: Since $\text{cons}_1 >> \text{cons}_2$, we know that $\text{cons}_1\ \&_l\ \text{cons}_1 >> \text{cons}_2\ \&_l\ \text{cons}_1$, by the UCCRH. Similarly it follows that $\text{cons}_1\ \&_l\ \text{cons}_2 >> \text{cons}_2\ \&_l\ \text{cons}_2$. By transitivity of ranking we get $\text{cons}_1\ \&_l\ \text{cons}_1 >> \text{cons}_2\ \&_l\ \text{cons}_2$.

Returning to the specifics of the Kalar-Kalar WT case, there are still the restrictions against the coronal obstruents, and the liquids to be accounted for. These can also both be formulated as self conjunction ($*[\text{Pl/Cor}, -\text{son}]^2_{\text{Foot}}$, $*[\text{Pl/Cor}, +\text{approx}]^2_{\text{Foot}}$). The ranking of these above $*\text{Pl/Cor}^2_{\text{Foot}}$ likely also follows from general considerations. The full ranking accounting for the place restrictions on the Kalar-Kalar WT reduplicant is shown in (66).

(66) **Place restrictions on Kalar-Kalar WT reduplicant**

Max-LS

>> *Pl/Dor$^{2}_{\text{Foot}}$, *Pl/Lab$^{2}_{\text{Foot}}$, *[Pl/Cor, –son]$^{2}_{\text{Foot}}$, *[Pl/Cor, +approx]$^{2}_{\text{Foot}}$, *Pl/Dor

>> Align-L(Red, Foot), Max-BR

>> *Pl/Cor$^{2}_{\text{Foot}}$, *Pl/Lab, *Pl/Cor

Since all of the restrictions on place force a light syllable reduplicant, they must be ranked above Align-L(Red, Foot) [underlined in the ranking schema]. The EoU nature of these restrictions indicates that they are intercalated between Max-LS and Max-BR, while the inactive constraints are ranked below both. In order to bring out the EoU nature of this ranking more clearly, I have highlighted the two faithfulness constraints.

The following tableau illustrates the account of the OCP restriction. I have chosen an example where the base contains two labials.

(67)

input: /RED + m-abak/	Mx-LS	*P/Lab^2	A-L(Ft)	Mx-BR	*P/Lab
a. (maba)(mabak)		**!		k	****
b. (mab)(mabak)		**!		ak	****
c. ☞ ma(mabak)		*	*	bak	***
d. (mak)(mak)	**!				**

Unlike dorsals, labials are not so marked that they cannot be copied at all. However the cumulation of two labials in a single foot is avoided.Candidates (67a) and (67b) which have foot-size reduplicants for the baseform *mabak* ‘2s-pluck’ violate the OCP constraint *Pl/Lab$^{2}_{\text{Foot}}$ once more than necessary. This violation is avoided by the candidate with the light syllable reduplicant (67c), and this candidate is judged superior. As in the case of the dorsal restriction, the winning candidate nevertheless incurs a violation of this segmental markedness restriction. But since that violation is incurred by the base, it is unavoidable. Candidate (67d) manages to avoid the penalty only by violating the higher ranked Max-LS.

The overall ranking in (66) where a phonotactic constraint forces avoidance of certain segments in reduplication, makes Kalar-Kalar WT another example of an a-templatic reduplicative system. In terms of the typology developed in section 2.1.1.3 it is a Copy & Stop system, since once a marked segment is encountered, copying does not proceed beyond that segment. For example a form such as *bakir* ‘small.3s’ cannot reduplicate as **bakibakir* due to the dorsal restriction. However it could easily meet the heavy syllable requirement by skipping to the last segment, and reduplicating as **barbakir*. The fact that such a possibility does not occur is the hallmark of a Copy & Stop system. This is expressed by having Contiguity ranked above Max-BR.

The properties of Kalar-Kalar WT reduplication are summarized below.

(68)

Kalar-Kalar WT reduplication	
alloduples:	CVCV, CVC, CV
syllable recycling:	no
segment conditions:	*Pl/Dor, Place-OCP
default segments:	—

Kalar-Kalar WT was seen to have 3 alloduples: a foot, a heavy syllable, and a light syllable pattern. The reduplicant always has to form a complete constituent, there is no syllable recycling. A number of segmental markedness conditions impose restrictions on the realization of the reduplicant. There are no default segments in Kalar-Kalar WT.

4.2.2.2. Popjetur WT

The dialect most closely resembling Kalar-Kalar is Popjetur WT (also referred to as Plains WT). The main distinction according to the available data is the number of attested alloduples. The Popjetur WT dupleme has only two variants, both syllable-sized, one a heavy CVC syllable and one light.

(69) **Popjetur WT**

a.	ˈdɔam	dɔˈdɔam	‘pound’	
	ˈkɛy	kɛyˈkɛy	‘wood’	
	ˈborar	borˈborar	‘small’	*boraˈborar
b.	taˈporan	taporˈporan	‘middle’	*tarˈporan

As the data in (69a) shows, the reduplicated forms for *dɔam* ‘pound’, and *kɛy* ‘wood’ are exactly the same as they would be for Kalar-Kalar WT. However the reduplicated form *borar* ‘small’ is not **boraborar*, but simply *borborar*. The lack of a foot-sized alloduple that is not simultaneously a syllable argues that in place of the ranking in (55) that accounts for the variation in reduplication shape of Kalar-Kalar WT, Popjetur has the following ranking:

(70) Max-LS, Align-L(Red, σ) >> **AllσRight** >> **Align-L(Red, Foot)** >> Max-BR

The difference between (55) and (70) is the inverted ranking of the two constraints indicated in bold. Nivens (1993) argues that the Popjetur system is reflective of the older state of the language. If this view is correct we can explain the change from that system to that of Kalar-Kalar as the result of a *reranking* of AllσRight below Align-L(Red, Foot), and below the coda condition that forces the CVCV pattern.

In all other respects, Popjetur reduplication seems to be identical to Kalar-Kalar WT. The reduplicant must always be a complete prosodic constituent as can be seen in (69b). In addition Popjetur seems to have similar, or identical segmental markedness restrictions imposed on its reduplication. Thus the same analysis as that for Kalar-Kalar WT, can account for these as well.

The various properties of Popjetur WT reduplication are again summarized in tabular form in (71).

(71)

Popjetur WT reduplication	
allodupl es:	CVC, CV
syllable recycling:	no
segment conditions:	*Pl/Dor, Place-OCP
default segments:	—

4.2.2.3. Rebi WT

In contrast to the two languages seen so far, the remaining languages all have a notable distinguishing property. They all permit reduplication to Recycle an existing syllable. This means that when the reduplication is infixing, instead of having a full CVC syllable reduplicant, a preceding light (open) syllable has a single reduplicated consonant added to it. This consonant thus forms the coda of a heavy syllable, just as it would if the reduplication had copied a full CVC syllable.

For example in Rebi WT (also known as North WT) the form *taˈpuran* 'middle', which would have a reduplicant [pur] (cf. Popjetur *tapor*ˈ*poran*) if it realized the full heavy syllable, instead attaches the coda *r* to the preceding light syllable *ta*, resulting in the redform *tar*ˈ*puran*. If however the preceding syllable is heavy the full CVC syllable is realized, as in *paylaw*ˈ*lawana* 'friendly-3s'.

(72) **Rebi WT**

a.	ˈdɔam	dɔˈdɔam	‘pound’
	ˈlɔpay	lɔpˈlɔpay	‘cold’
	biˈtɛm-na	bimˈtɛmna	‘small-3s’
b.	taˈpuran	tarˈpuran	‘middle’
	payˈlawa-na	paylawˈlawana	‘friendly-3s’

The data in (72a) shows the full array of reduplication patterns in Rebi WT. This includes the usual heavy and light syllables, as well as the single coda consonant pattern discussed above. The availability of this last pattern of course always means that the reduplicant need not be a full prosodic constituent, though it will do so when no recyclable syllable is available (72b).

The claim being made in the current analysis is that this type of single consonant reduplication always depends on a number of other properties.

The first, perhaps somewhat obvious requirement is that the reduplication must be *infixing*. This is necessary, since otherwise there will not be a light syllable for the coda to attach to. There are however two other possible sources for this light syllable. The first is seen in Sawai reciprocal reduplication.

(73) **Sawai reciprocal faC reduplication** (Whisler 1992)

ŋamo	famŋamo	‘to argue with one another’
duk	fakduk	‘to meet one another’
gali	falgali	‘to help one another’

In Sawai a prefix *fa* serves as the light syllable to which the coda can attach, leading to forms such as *fakduk* ‘to meet one another’ from a base form *duk*.

A second possible source for the light syllable is default segmentism. Such a case is seen in Nancowry, which is discussed in Steriade (1988) and Alderete et al. (1996).

(74) **Nancowry reduplication** (Radhakrishnan 1981)

cɯt	ʔitcɯt	‘to go, to come’
ɲuan	ʔinɲuan	‘to growl’
kəp	ʔupkəp	‘to bite, to sting’
ɲiak	ʔukɲiak	‘to bind’

In Nancowry, the reduplicant always has the form of a glottal stop followed by a high vowel. If the mono-syllabic base is closed by a stop or a nasal, this segment is copied as a coda to the glottal stop/high vowel syllable.

Both of these cases are sufficiently ‘infixing’, since the reduplication always co-occurs with a light syllable, as required by the reduplicant.

The second property that this form of reduplication always depends on, is a reduplication paradigm that includes a heavy CVC alloduple. This heavy syllable pattern is chosen, whenever the coda alloduple is not possible, due to the lack of a light syllable that can be recycled. Typically however, in cases such as the Sawai reciprocal, which always co-occur with a given prefix, there will always be an available light syllable so only the coda pattern is ever seen. Crucially I am claiming that there are no systems where the *only* alternative to the syllable recycling pattern is a light CV syllable pattern.

Both of these properties are met by a system like that of Popjetur WT. Therefore the only remaining question is: what part of the analysis makes the difference between Popjetur WT, which always requires the reduplicant to be a full prosodic constituent, and Rebi WT, which permits the reduplicant to recycle a syllable? The constraint, that compels the reduplicant of Popjetur WT to be a full syllable, is the delimiter constraint Align-L(Red, σ). In Rebi WT, this requirement is apparently less important than the desire to minimize the number of syllables. Thus the constraint ranking in (70), that accounts for the reduplication patterns of Popjetur WT, can be made to account for Rebi WT by simple reranking of those two constraints, giving the following:

(75) Max-LS >> **AllσRight** >> **Align-L(Red, σ)** >> Align-L(Red, Foot) >> Max-BR

Here the high ranking of AllσRight forces minimization of the number of syllables, leading to the coda reduplication pattern whenever possible. If no recyclable syllable is available, then the reduplicant must form its own syllable. The reduplicant is never greater than a single syllable, but a heavy syllable is preferred, in accordance with Align-L(Red, Foot). Only when the syllable recycling and the heavy syllable alloduples are ruled out, does the reduplicant choose the light syllable alloduple. Thus the ranking in (75) accounts for the reduplication patterns of Rebi WT.

Now for the remaining properties. Unlike the previous two languages, Rebi WT has no segmental conditions which affect the choice of alloduple. And in contrast to the two languages to be discussed below it does not have any default segments. Table (76) provides a summary of all properties.

(76)

Rebi WT reduplication	
allodulpes:	CVC, CV, …C
syllable recycling:	yes
segment conditions:	—
default segments:	—

4.2.2.4. Doka Timur WT

In keeping with the language chain that has developed so far, Doka Timur WT (also known as River WT) is minimally dissimilar from Rebi WT. It shares with Rebi the same set of alloduples, seen in (77a), and the fact that the reduplicant does not realize its own syllable when a preceding light syllable is available, as in example (77b). The three reduplication patterns are again a light syllable pattern, a heavy CVC syllable pattern, plus the coda pattern, which recycles a preceding light syllable.

(77) **Doka Timur WT**

a.	ˈlɔir	liˈlɔir	‘clean.3s’
	ˈles-ay	latˈlesay	‘male-3p’
	gaˈsira	garˈsira	‘old’
b.	kalˈpaŋir	kalpimˈpaŋir	‘obstinate.3s’
	taˈkur	tarˈkur	‘coconut shell’ -> ‘sago/coconut mix’

Doka Timur WT also shares with Rebi WT the lack of any segmental markedness conditions, which affect the reduplicant size. The only relevant difference between the two languages is that Doka Timur WT replaces any vowels in the reduplicant with default segments. A complication here is that there are two default segments: [a], which occurs only with 3rd plural forms, and [i], which occurs with everything else.

(78) **Default segmentism in Doka Timur WT**

ˈtɔp	tipˈtɔp	‘short’
ˈtɔp-di	tapˈtɔpdi	‘short-3p’
ˈlɔir	liˈlɔir	‘clean.3s’
ˈlɔar-ay	laˈlɔar	‘clean-3p’

Nivens (1992, 1993) suggests that while the [a] is epenthetic, the [i] default is actually the 3rd person infix, used with inalienably possessed nouns and adjectives. This proposal has several points in its favor. The first is that [a] can generally be considered the default vowel of WT, since the vast majority of unstressed vowels are [a], which is usually reduced to shwa. Epenthetic [a] also occurs with consonantal person suffixes that appear on roots that are too short to have the infixing forms. For example monosyllabic *pes* 'breath' takes the first person suffix -ŋ rather than the infix -*u*-. In order to avoid a consonant cluster an [a] is infixed, resulting in the form *pesa*ŋ. A second point is that the 3rd person -*i*- infix generally replaces an [a] in a stem. This agreement marker is seen for instance in the form *lɔir* 'clean.3s' (78), where it also replaces the [a] of the stem *lɔar*. A third point is that the idiosyncratic form of reduplication that occurs only with stative predicates (see section 1.2.2) also has a default vowel [a].

A problem with this proposal is that the occurrence of the [i] default vowel is considerably wider than that of the -*i*- infix. For one, it occurs with reduplicants that are not 3rd person, though they are still singular *minmɔna* 'you shot it' from /m-ɔn-na/ '2s-shoot-it'. Also it occurs with nouns that are not inalienable *kike* 'wood', as well as with non-stative verbs ɛ*rdidɔam* '3s-R-DUP-pound'.

I will adopt this idea nevertheless. I will assume that the broadening of the usage in this case results from an 'underparsing' of the syntactic features of the morpheme, along the lines of analyses proposed by Tranel (1996) and Grimshaw & Samek-Lodovici (1995). For instance Tranel argues that the suppletive forms of French determiners that occur with vowel initial nouns, are in fact the determiners of identical function, but with the opposite gender. Thus vowel initial feminine nouns appear with the determiner *mon* 'my' rather than the usual feminine determiner *ma*. This leads to examples such as *mon âme* 'my soul-FEM' rather than **ma âme*. The suppletive determiner is identical in form to the masculine determiner. Tranel argues that it *is* in fact the masculine determiner, and that it can occur here because the onset requirement outweighs the necessity to realize the masculine feature of *mon*. Similar examples appear in reverse. For instance *cet aprèsmidi* 'this afternoon-MASC', rather than **ce aprèsmidi,* where the determiner *cet* 'this' is phonetically identical to the feminine determiner *cette*.

A complete analysis of the Doka Timur WT case would require a fully developed analysis of agreement markers, something that is well beyond the scope of the current analysis. A model that will be sufficient for the present purposes is one where agreement markers are specified for a number of features that need to be *checked* against the features of the lexical item to which they are attached. In the current case the agreement marker -*i*- is a 3rd person singular marker, and it will need to be specified for these features. In addition it will be necessary to account for the fact that its distribution is restricted to stative predicates and inalienably possessed nouns. It does not seem entirely accidental that these two groups share the same affixes, and they both share the idea of permanence. Thus I will assume that -*i*- carries a feature [+permanent][25]. I will further assume that the realization of these morphological features is regulated by constraints in a manner similar to the way phonological features are regulated by the constraint Ident.

As was argued in section 2.1.2., default segments are essentially epenthetic, meaning their appearance in the reduplicant violates the constraint Dep(-LS). Clearly then the fact that the -*i*- agreement marker appears instead is a reflection of the fact that it is ‘cheaper’ to use the agreement marker, rather than epenthesize a vowel. This is true even if the use of the marker is not entirely appropriate, e.g. when the reduplicated item is not stative. On the other hand, the [+singular] feature of the morpheme may not be left unparsed, and in such cases the epenthetic [a] is preferred. This situation can be expressed with the help of the following constraint ranking.

(79) Ident([number]) >> Dep >> Ident([permanent])

Thus the -*i*- infix can be ‘bent’ to serve as default vowel in the singular, even if its semantics are not entirely appropriate, but not in the plural where it is ‘cheaper’ to insert a vowel. The exact working of this analysis is demonstrated below.

(80)

input: /RED + lɔir/	*Copy-V	Id[num]	Dep	Id[perm]
a. ☞ lilɔir				
b. lalɔir			*!	
c. lɔlɔir	*!			

Example (80) shows the tableau for the form *lilɔir* ‘DUP-clean.3s’, which according to the current analysis uses the agreement marker as its default vowel rather than an epenthetic [a]. Since the baseform is a stative predicate, and also a 3rd singular form, it is completely compatible with the morphological requirements of the agreement marker. In fact the baseform is infixed with this marker itself (lɔir). Thus candidate (80a), which uses the agreement marker as the default vowel for the reduplicant, is judged superior to candidate (80b), which epenthesizes an [a]. Reduplicating the plural form of the same

[25] NB: This specification represents a *morphological* feature, not a semantic one.

word changes the situation, as the following tableau makes clear.

(81)

input: /RED + lɔar/	*Copy-V	Id[num]	Dep	Id[perm]
a. liləar		*!		
b. ☞ lalɔar			*	
c. lɔlɔar	*!			

In this case the morphological requirements of the agreement marker are violated by a candidate, such as (81a), which employs the agreement marker as the default vowel for the reduplicant. The marker is only compatible with singular forms. Thus candidate (81b), which has an epenthetic vowel in the reduplicant, is preferred.

Other properties of the agreement marker are violable, as can be seen in (82).

(82)

input: /RED + ɛ-r-dɔam/	*Copy-V	Id[num]	Dep	Id[perm]
a. ☞ ɛrdidɔam				*
b. ɛrdadɔam			*!	
c. ɛrdɔdɔam	*!			

The form *ɛrdɔam* ‘3s-pound’ does use the agreement marker as the default vowel for its reduplicant, leading to the reduplicated form seen in candidate (82a). This is possible even though the form is not a stative predicate, and cannot use this marker to mark agreement. For this latter purpose, it uses the prefix ɛ. Candidate (82a) is therefore preferred over one that uses an epenthetic vowel (82b).

Only one detail remains. Consider the data in (83).

(83) **Lack of default vowel with vowel initial bases**

ˈɔpa	ɔˈpɔpa	‘wrap’
ˈɛpir	ɛˈpɛpir	‘good.3s’

As these examples show, whenever the base is vowel initial, the vowel is not replaced with a default segment, but instead it is copied faithfully. In the current analysis this can be accounted for by having Anchoring dominate the constraint which forces the non-copying of vowels in the general case.[26]

[26] A point that I am leaving open is the exact nature of this constraint. In section 2.1.2, following Alderete et al. (1996), it was suggested that non-copying is the result of place markedness constraints. This clearly will not work in the current case, since the default vowel may be either of two vowels with differing quality. Thus if in a case like *kan'kinir* ‘female’, the failure to copy the base vowel [i] follows from the place markedness

This completes the account of default segments in Doka Timur WT. A summary of all the properties of Doka Timur WT reduplication is given in (84).

(84)

Doka Timur WT reduplication	
alloduples:	CVC, CV, …C
syllable recycling:	yes
segment conditions:	—
default segments:	i/a

4.2.2.5. Kola

While the last language in the series is not as closely related to the others, and is also separated from the others geographically, it nevertheless fits neatly into the chain of reduplicative systems presented. Kola is spoken on the northernmost tip of Aru, on Kola island, and in the surrounding area. Kola's reduplicative system is very much like that of Doka Timur WT. It has the three alloduples seen in (85a): a heavy syllable pattern, a light syllable pattern, and the syllable recycling pattern consisting of a single consonant. There is however one important difference to the WT systems. The heavy syllable pattern is always VC, without an onset. This unusual requirement also has repercussions for syllable recycling (85b). When a light syllable precedes the infix location, the pattern is the same as in WT, with a single consonant reduplicated to form a coda to the pre-stress syllable. But if the relevant syllable is closed, the reduplicant forms a VC heavy syllable and recruits the final consonant of the closed syllable as an onset.

(85) **Kola**

a.	ˈlima	amˈlima	'five'
	paˈnua	panaˈnua	'village'
	buˈtebi	bubˈtebi	'gentle'
b.	duˈbam	dumˈbam	'seven'
	afˈral	afalˈral	'morning'

The upshot of all this is that the reduplicant never contains more than a single consonant. One might of course try to derive this fact in a number of ways. For example of the vowel, then we are left with the mystery of explaining why the same does not apply to the agreement infix -*i*-.

one might argue that the ‘no onset’ restriction imposed on the reduplicant is a requirement similar to that observed earlier in the case of Oykangand (see section 4.1.3). However in Oykangand the restriction forms part of a pattern that pervades the language. In Kola this restriction has no observable effects outside of reduplication. It would thus need to constitute a case of emergence of the unmarked. But considering that such a constraint has little cross-linguistic validity, it seems an unlikely candidate for a markedness condition. Attempting to derive the Kola pattern completely from general considerations might be a case of trying too hard.

One question is how such a system might arise. Most likely, the current system derived form a system more like that of Doka Timur WT. Earlier it was argued that Doka Timur WT is basically a CVC reduplication pattern. In Kola however it seems that the syllable recycling pattern has been reinterpreted as the basic pattern, and its use expanded even to cases where there is no syllable to recycle, such as *lima* ‘five’ which then reduplicates as *<u>am</u>lima*. Thus the fact that the reduplicant may never have more than one consonant was generalized, and turned into a parochial, language specific constraint.

(86) ***2C** (Kola)[27]

‘the reduplicant may not have more than one consonant’

This constraint amounts to another segment condition, that affects the shape of the reduplicant, similar to the kind seen in Nakanai in chapter 3, and Kalar-Kalar WT.

One final property of Kola reduplication, shared with Doka Timur WT, is the fact that base vowels are not copied, but instead replaced with a default segment. Unlike Doka Timur WT however the replacing vowel is consistently [a]. There is good reason to believe that [a] is also the default vowel in the language.

The summary of all the properties of Kola reduplication is shown below.

(87)

Kola reduplication	
allodupes:	VC, CV, …C
syllable recycling:	yes
segment conditions:	*2C
default segments:	a

[27]This can again be interpreted as an OCP type constraint, and a formulation in terms of Local Conjunction could be given for it.

This concludes the overview of the properties of the individual languages. I will now turn to the actual analyses of these languages, combining the various pieces introduced earlier, and demonstrating how the variety among these languages can be accounted for through minimal changes in the analysis.

4.2.3. Affixation to the Optimal Word in the Aru languages

A table summarizing the various properties introduced is given in (88). Beginning with the variation in reduplication patterns and the closely related syllable recycling, we saw that there were three different types: the Kalar-Kalar WT system with three patterns and no syllable recycling; the Popjetur WT system with two patterns and no syllable recycling; and the third system, covering Rebi WT, Doka Timur WT, and Kola, with two patterns plus the syllable recycling pattern. These patterns were seen to follow from the interaction of the delimiter hierarchy in (54) and the prosodic minimizer constraint AllσRight. The specific rankings discussed in (55), (70), and (75) are summarized in (89) which brings out their minimally different form.

(88) Summary of the reduplication properties of the Aru languages

<table>
<tr><th colspan="2">language</th><th>K-K</th><th>Pop</th><th>Rebi</th><th>DT</th><th>Kola</th></tr>
<tr><td>alloduples:</td><td>CVCV</td><td>√</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>CVC</td><td>√</td><td>√</td><td>√</td><td>√</td><td>VC</td></tr>
<tr><td></td><td>CV</td><td>√</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td></td><td>…C</td><td></td><td></td><td>√</td><td>√</td><td>√</td></tr>
<tr><td colspan="2">syllable recycling:</td><td></td><td></td><td>√</td><td>√</td><td>√</td></tr>
<tr><td colspan="2">segment conditions:</td><td colspan="2">*Pl/Dor
Place OCP</td><td></td><td></td><td>*2C</td></tr>
<tr><td colspan="2">default segments:</td><td></td><td></td><td></td><td>i/a</td><td>a</td></tr>
</table>

(89) Basic analysis of the reduplicant shape variation

	Kalar-Kalar	*Popjetur*	*Rebi, DT, Kola*
	....		**AllσRight**
Align-Left (Red, σ)			
	....	**AllσRight**	
Align-Left (Red, Foot)			
	............**AllσRight**		
Align-Left (Red, Prwd)			

As seen in (89) the variation between the three types can be accounted for simply by reranking the prosodic minimizer with respect to the delimiter hierarchy. These constraints will only exert the influence they do on reduplication if they are embedded in the emergence of the unmarked schema Max-LS >> … >> Max-BR. Before this point can be addressed it will be necessary to return to one aspect of Aru reduplication that has been thus far ignored: *infixation*.

All of the five Aru languages prefix the reduplicant to the main stress, which in terms of the theory developed in section 4.1 means Affix to the Optimal Word. Thus the analysis of these languages will need to consist of three parts:

1. Affixation to the prosodic word
2. A size restriction
3. Base minimization

Of these parts the second has occupied most of the attention so far, and is accounted for by the constraint ranking in (89). According to the framework developed in the first half of this chapter, part 3 results from ranking Max-BR above the constraint that makes the reduplication prefixing. The constraint that enforces prefixation is the delimiter hierarchy which forms the core of (89), most importantly the constraint Align-Left (Red, Prwd). Thus in order to make the reduplication infixing Max-BR must be ranked above that constraint. This leads to the revised ranking in (90).

(90) Basic analysis of the reduplicant shape variation (revised)

Kalar-Kalar *Popjetur* *Rebi, DT, Kola*

Max-LS

....**AllσRight**

Align-Left (Red, σ)

....................................**AllσRight**

Align-Left (Red, Foot)

.........**AllσRight**

Max-BR

Align-Left (Red, Prwd)

This ranking clearly brings out the overall emergence of the unmarked structure with the constraints responsible for the reduplicant size interleaved between the two Max constraints. The only additions to this will be the segmental restrictions, particularly the dorsal place and place OCP restrictions discussed in the analysis of Kalar-Kalar WT. These restrictions, accounted for by the ranking in (66), will need to be ranked above Align-Left (Red, Foot) in the schema in (90).

The only part of the Affix to the Optimal Word analysis that remains, is the affixation to the prosodic word. As discussed in section 4.1.2.1, this will mean the following ranking:

(91) Affix-to-Prwd >> NoRecursion, Max-BR

Together with this ranking, any of three systems summarized in (90) will lead to an Affix to the Optimal Word type infixing reduplication system. The analyses for all of the five languages are quite comparable, and I will therefore not go through all cases in detail. Instead I will pick out a few cases for illustration. A first example, that will show the account of the size restriction, is the Rebi WT form *lɔpay* ‘cold’ which reduplicates as *lɔplɔpay* (see data in 72). The tableau for this form is shown below.

(92)

Rebi WT: /RED + lɔpay/	Max_{LS}	AllσR	A-Lσ	A-LΦ	Max_{BR}
a. lɔ(lɔpay)		σ/σσ		*!	pay
b. ☞ (lɔp)(lɔpay)		σ/σσ			ay
c. (lɔpa)(lɔpay)		σ/σσ/σσσ!			y
d. lɔ(pay)(lɔpay)		σ/σσ/σσσ!		*	
e. (pay)(pay)	lɔ!	σ			

This part of the constraint ranking ensures that the reduplicant will be no larger than a heavy syllable. The minimizer constraint AllσRight will rule out any candidates that increase the number of syllables by more than the one necessary in order to be able to realize the reduplicant. For example candidates (92c) and (92d) are ruled out by this constraint, since they both have disyllabic reduplicants. The delimiter constraint Align-Left(Red, Foot) forces the reduplicant to fill out this syllable whenever possible, ruling out a light syllable reduplicant such as that in (92a). Candidate (92e) shows how the EoU nature of this account explains why this restriction is never back copied onto the base. Base truncation would lead to improvement on every score, but since Max-LS is ranked above all of these constraints, this possibility is curtailed.

The action of the next part of the account is more abstract, but nevertheless crucial: the base must always form a prosodic word.

(93)

Rebi WT: /RED + lɔpay/	AffixtoPrwd	NoRecursion	Max-BR
a. ☞ [lɔp[(lɔpay)]]		*	ay
b. [lɔp(lɔpay)]	*!		ay
c. [lɔ(papay)]	*!		y

The fact that Affix-to-Prwd dominates Max-BR makes it impossible for words with initial stress to be infixed. A form such as that seen in candidate (93c), where base minimization drives the reduplicant inside the stress foot, is ruled out because this violates the integrity of the prosodic word formed by the base. The same constraint also makes a distinction of a purely formal nature between the candidates (93a) and (93b).

A further type of candidate to worry about is [lɔ(pay)[(pay)]]. In fact in a language such as Rebi WT, which permits syllable recycling, the candidate [(lɔy)[(pay)]] would appear to be even more highly valued, since it also minimizes the number of syllables of the reduplicated form. It should be noted first of all that these candidates do not contradict the point being made here. In both of these examples [(pay)] is a prosodic word, and thus it meets the condition being imposed by this ranking. Therefore the only question is: why is [(lɔpay)] the preferred 'minimal' word? Especially since [(pay)] seems to be the more minimal of the two.

This case demonstrates a failure of terminology. Infixing reduplication of the type seen in the Aru languages is not affixation to the minimal word, but rather to the *Optimal Word*. The reason for the preference of [(lɔpay)] over [(pay)] as the best base of affixation, is the same reason the language chooses [(lɔpay)], rather than [lɔ(pay)], as the best footing for this word. Thus the same constraint ranking that is independently necessary to account for the stress system of West Tarangan, will also correctly scope out the base for infixing reduplication.[28]

Since the base of reduplication is always the same as the main stress foot of the unreduplicated form, an alternative account of this would be with the help of a constraint that requires faithful realization of prosodic structure, either surface-to-surface, or from underlying form to surface (see McCarthy 1995, Orgun 1996, also Itô, Kitagawa & Mester 1996). This approach is fraught with difficulties since it is unclear how to define 'same' prosodic constituent (see discussion in McCarthy 1995). Considering the baroque machinery necessary, it is surprising that the effects are for the most part so marginal.

There is however a further problem. McCarthy (1995) justifies the appeal to faithfulness constraints on prosodic structure by pointing out that, in contrast to certain derivational theories which require that redundant information be *un*specified, OT is perfectly compatible with having such redundant information specified underlyingly. In fact certain conceptions of *Lexicon Optimization* (see section 1.3.5., also P&S; Itô, Mester & Padgett 1995) predict that it must be underlying.

It is however an entirely different matter to move from this to introducing faithfulness constraints which regulate such structure. Prosodic structure is predictable precisely because there are no constraints requiring its faithful realization. Introducing such constraints predicts that prosodic structure should be distinctive in the same manner that segmental material is. Clearly the wrong road to take.

Finally in order to illustrate the 'minimize the base' component of the analysis, it is necessary to look at an infixing example. Here I've chosen the Doka Timur WT from

[28] An account of WT stress in OT is provided by Spaelti (1995). See also Nivens (1992) for a complete description of the facts of WT stress.

ε-*la*ˈ*jir* ‘3s-white’ which reduplicates as ε*lar*ˈ*jir*.

(94)

Doka Timur WT: /RED + ε-lajir/	Max-BR	Aln-L(R, Pwd)
a. ☞ ε.lar.jir	ji	εla
b. εj.la.jir.	la ir!	ε
c. ε.lε.la.jir	ajir!	

As tableau (94) demonstrates, by moving the reduplicant as close to the right as possible the base is shortened, and this improves the candidate’s score relative to Max-BR. This tendency is counteracted by Align-Left (Red, Prwd) which requires the reduplicant to be a prefix. The limit as to how far this infixation can push the reduplicant inside the Redform is set by the constraint Affix-to-Prwd discussed above.

With the three parts to the analysis in place we can again observe their interaction. As an example consider the case of Rebi WT *tapuran* ‘middle’.

(95)

Rebi /RED+tapuran/	AffPw	AllσR	Alσ	AlΦ	MxBR	Alω
a. ☞ (tar)[pu.ran]		σσσ	*	*	pu an	ta
b. ta(pun)(ran)	*!	σσσ	*	*	ra	tapu
c. ta(pur)[pu.ran]		σσσσ!			an	ta
d. (tapu)[pu.ran]		σσσσ!		*	ran	ta
e. ta(pu.ra)[pu.ran]		σσσσσ!			n	ta
f. (tap)[ta(pu.ran)]		σσσσ!			uran	

In the syllable recycling languages, of which Rebi WT is one, AllσRight outranks the delimiter constraints, and as a result the reduplicant will form a coda to an existing light syllable whenever possible. This means that candidate (95a) is preferred over any of the other logical possibilities (candidates 95c-f) which all require the introduction of an extra syllable. Candidate (95b) fails as well since the base does not form a prosodic word.

Contrasting minimally with Rebi WT, we have Popjetur WT. As argued earlier the only difference between the two languages lies in the ranking of AllσRight.

(96)

Popjetur /RED+taporan/	AffPw	Alσ	AllσR	AlΦ	MxBR	Alω
a. (tar)[po.ran]		*!	σσσ	*	po an	ta
b. ta(pon)(ran)	*!	*	σσσ	*	ra	tapo
c. ☞ ta(por)[po.ran]			σσσσ		an	ta
d. (tapo)[po.ran]			σσσσ	*!	ran	ta
e. ta(po.ra)[po.ran]			σσσσσ!		n	ta
f. (tap)[ta(po.ran)]			σσσσ		oran!	

Since Popjetur WT does not permit syllable recycling AllσRight must be ranked below the delimiter Align-Left (Red, σ). From this simple difference a very different picture emerges. Now the syllable recycling candidate (96a) will fail, and the decision will fall to the candidates (96c-f). Since syllable minimization is still important, candidate (96e) which has a disyllabic reduplicant is also ruled out as contender. Candidate (96d), where the reduplicant is only a light syllable, and thus not a foot, is the next to be eliminated. This leaves the decision to Max-BR, which must decide between the two candidates (96c) and (96f). At this point we see again the minimize the base action of Max-BR which favors the infixing candidate (c) over (f), even though in the latter case the reduplicant forms a properly left-aligned prefix.

This concludes the analysis of infixation in the Aru languages. The next section addresses one more open question:

4.2.4. Where do the codas come from?

In the analysis developed in the previous section, I have attempted to show that syllable recycling is simply part of the expected variation that results when a reduplication system is both infixing and has CVC reduplication as one of its patterns. Neither of these two properties have been the focus of much attention in previous analyses of this type of reduplication. In all previous accounts the fact that the reduplication is infixing as well as its location, were simply stipulated, while the shape of the pattern was either stipulated as well, or was derived from the property to which we now turn.

The main question which has occupied previous analyses of what I have been calling syllable recycling has been how to predict which of the base consonants will be reduplicated. To illustrate the problem consider again the Rebi WT form *taˈpuran* ‘middle’ which reduplicates as *tar̲ˈpuran*. According to the exposition of this pattern given in section 4.2.2.3, I argued that since the pattern is derivative from CVC reduplication, we expect the relevant consonant to be [r] since this consonant would be the coda of a CVC reduplicant [pur] formed from the base [puran]. There is however a problem with this. Generally in prefixing reduplication the first segment in the reduplicant is a copy of the first segment in the base. Since in this case the reduplicant consists only of a single consonant, we would expect it to copy the first consonant of the base. In this case the base is [puran]. Thus we expect the reduplicant to copy the [p] resulting in the reduplicated form *[tapˈpuran]. I will now briefly review some past approaches to this problem.

4.2.4.1. Broselow & McCarthy (1983)

Broselow & McCarthy (1983) was the first work to deal specifically with this type of reduplication. They discuss several cases of this kind, but their main example is Temiar (see data set 45). Due to the particular structure of Temiar the base to which the reduplicant attaches is always a CVC syllable. This has as a consequence that the reduplicated consonant always corresponds to the final consonant in the word.

(97) səˈlɔg sɛg̩ˈlɔg ‘to lie down’

This leads Broselow & McCarthy to propose that the unusual fact about Temiar is that it copies from the opposite side. In OT terms this can be accounted for by reversing the normal ranking of the Anchoring constraints. M&P (1994ab, 1995) propose that the way to account for the common pattern, whereby a prefixing reduplicant always starts copying from the leftmost segment of the base, is to rank Anchor-Left over Anchor-Right (see discussion in chapter 5). In order to implement the Broselow & McCarthy proposal, we would need to adopt the inverse constraint ranking:

(98) Anchor-Right >> Anchor-Left

This very proposal is made by Alderete et al. (1996) to account for a similar case from Nancowry, another Austro-asiatic language distantly related to Temiar. The important difference between Nancowry and Temiar is that while Temiar reduplication recycles a base syllable Nancowry inserts default segments. Just like Temiar however, Nancowry bases are always monosyllabic. In fact this type of reduplication is apparently expressly limited to monosyllabic bases. Some examples were given earlier in (74).

However the proposal in (98) will not work for the Aru languages. Whenever these languages reduplicate a full constituent they always copy according to the normal association convention from the leftmost segment in the base, never from the rightmost. Even more problematic is the fact that whenever the syllable recycling pattern occurs with bases that are longer than a single syllable, the copied consonant is never the final consonant, but always the consonant immediately following the initial vowel of the base.

(99)	Rebi WT	tar̠ˈpuran	‘middle’	*tan̠ˈpuran
	Doka Timur WT	dal̠ˈtalar	‘3p-sit’	*dar̠ˈtalar
	Kola	say̠ˈmayah	‘good’	*sah̠ˈmayah

Both of these facts suggest that this pattern is not the result of the ranking in (98).

4.2.4.2. Gafos (1995)

Gafos (1995) provides a reanalysis of the Temiar facts in an OT framework. Although the Temiar facts are quite parallel to the situation in the Aru languages, Gafos’ analysis couldn’t be more different. The analysis of Aru reduplication presented above derives the infixing location of the reduplicant as a consequence of the size restriction. Gafos’ analysis begins by stipulating the location of the reduplicant with an alignment constraint (cf. discussion in section 4.1.1). He then derives the reduplicant shape from this alignment requirement, together with the fact that Temiar never copies vowels. Even so the analysis does not automatically predict the right consonant to be copied. In order to account for this fact Gafos takes advantage of the limited variety of bases in Temiar, in particular the fact that the base consonant which corresponds to the reduplicant is itself a coda. Thus in the example *sɛɡ̠ˈlɔɡ* ‘to lie down’ both the [ɡ] that constitutes the reduplicant, and the corresponding [ɡ] in the base are codas. Under this analysis a constraint S-ROLE ensures that only the second consonant of the base, which in Temiar is always a coda, gets copied as the single consonant reduplicant.

(100) S-ROLE (Gafos 1995, M&P 1994: 368, Steriade 1988)

Corresponding segments must have identical syllabic roles.

Again, given the limited variety of base shapes that exist in Temiar, there is no data that can be used to test the predictions made. But from other perspectives there are a number of objectionable aspects to this analysis. The first is that the constraint in (100) is another example of a prosodic structure faithfulness constraint. Such constraints were already argued to be problematic, since prosodic structure is never distinctive, and thus constraints mandating its faithful realization have no empirical support. Even if we accept the existence of such constraints however (100) is problematic, since there is no way to formalize the notion of ‘having identical syllable roles’, short of enshrining syllable positions as nodes (i.e. an 'Onset' node, 'Coda' node, etc.) or as properties of segments (e.g. a feature [±Onset] etc.).

Aside from these technical objections to the S-role analysis, there are empirical problems as well. Unlike in Temiar, reduplication in the Aru languages does not always preserve syllable roles. This is true for the syllable recycling pattern as well. For instance the data shown in (99) above illustrates cases where the coda consonant reduplicant corresponds to an onset in the base. There are even data that demonstrate explicitly that an onset is in correspondence with a coda in such cases. All forms of WT have a restriction against having fricatives in coda position. This means that whenever an [s] is in a position to be copied as a reduplicant final segment, its correspondent segment will be realized as a [t]. The following examples are from Doka Timur WT.

(101)	ˈles-ay	<u>lat</u>ˈlesay	'male-3p'
	mɔsin	<u>mit</u>ˈmɔsin	'sacred-3s'
	ɨ-bisak	jɛr<u>bit</u>ˈbisak	'3s-mash' 'NF-mash'

In all of these examples a [s] in the base is in correspondence with a [t] in the reduplicant. The explantion for this discrepancy must be the restriction against fricatives in coda position. But this will mean that the reduplicant final [t]s can only be codas, while the [s]s in the base cannot be a coda. Thus these base/reduplicant segment pairs clearly do not preserve syllable roles. The same argument can also be made with the help of the devoicing data discussed in section 2.2.3.3. From all of this we can conclude that the S-role approach is not a viable explanation for the choice of consonant which must appear in the reduplicant.

4.2.4.3. Moore (1996)

One more approach to this problem is provided by Moore (1996). Unlike the previous two analyses Moore's analysis deals with the Aru languages. Just as Gafos, she legislates the location of the reduplicant using an alignment constraint. In order to account for the patterns, she relies on the templatic constraint Affix $\leq \sigma$, appealing to the Generalized Template Hypothesis.

More interesting in the current context is her account of the choice of consonant. As was noted repeatedly throughout this thesis, geminates are strictly ruled out in WT.

Moore uses this fact to explain the choice of a form like [tarpuran] over *[tappuran].

(102)

Rebi WT: /RED + taˈpuran/	NoGeminate	Anchor-L
a. ☞ tarˈpuran		*
b. tapˈpuran	*!	

To the extent that this approach to the problem is workable it can be adopted in this account as well. Unfortunately however the predictions made are not quite correct. The problem is that this approach does not actually define which consonant will be copied, but rather which consonant will *not* be copied. Since it is driven by NoGeminate, the analysis only specifies that the single consonant alloduple never copies a base initial consonant. This leads us to expect that any non-initial consonant could be copied.

This prediction is not borne out. The Aru languages are much more specific about which consonant may be copied in this type of reduplication. The only segment that can be copied in this type of reduplication is the segment following the stressed vowel. For purely descriptive purposes we can write this as follows.

(103) C V C [C V X …

The interesting question is therefore: what do these languages do when there is no consonant in the appropriate position? The answer varies depending on the language. There are two possibilities.

(104) **Kola**

taˈkuan	takaˈkuan	'deaf'	*tanˈkuan
wanˈluan	wanaˈluan	'boy' (nl -> n)	
ˈrua	raˈrua	'two'	
ˈpui	paˈpui	'fruits'	
paˈnua	panaˈnua	'village'	

The first possibility is seen in Kola. In Kola if there is no consonant following the stressed vowel, the language reverts to the light syllable alloduple, which means it copies the base initial consonant, together with an epenthetic vowel. An example of this is the form *takakuan* 'deaf'. This is the same pattern that occurs when there is only one consonant in the base, as in the example *papui* 'fruits'. Crucially in the case of *takakuan*, the final consonant [n] is ignored.

The second possibility is seen in Doka Timur WT.

(105) **Doka Timur WT**

taˈruin	tayˈruin [taɛˈruin]	‘place’	*tanˈruin
koˈrua	koyˈruin [koɛˈruin]	‘eight -> eighth’	
ˈrua	riˈrua	‘two’	
ˈlɔir	liˈlɔir	‘clean-3s’	

In Doka Timur WT, if there is a light syllable preceding the base, but no consonant following the stressed vowel to copy, the language copies the vowel and turns it into a glide. (Glides in coda position are typically realized as a lower-mid front vowel [ɛ] in Doka Timur WT.) Thus the form *taruin* ‘place’ has a reduplicated form *tayruin*. A particularly interesting example is the form *koyruin* ‘eighth’, the reduplicated form of *korua* ‘eight’. As Rick Nivens points out (pc.), this form unexpectedly takes a plural agreement suffix -*in*. This can be understood as a way to resolve the problem of finding a segment that can be used to copy as a coda. In the baseform *korua*, the segment following the stressed vowel is a vowel [a], a segment which can not be converted to a glide. Thus the form ‘borrows’ the plural marker, which has a vowel that is more conducive to being made into a vowel.

4.2.4.4. Summary

As these cases seem to show, the only segment available to be copied in a syllable recycling pattern is the segment immediately following the stressed vowel. This is compatible with the conception that syllable recycling is derived from an Affix to the Optimal Word, heavy syllable type of reduplication. The segment found in the coda of the recycled syllable must be the segment that would appear in the coda of a heavy syllable reduplicant. For example in the case of Rebi WT *ta'puran* ‘middle’, the Affix to the Optimal Word requirement places the reduplicant before the main stress. Given this premise, the heavy syllable requirement would ideally derive a form *pur'puran*. The pre-stress syllable *ta* can therefore only be accommodated in one of two ways; either outside the reduplicant, giving *tapur'puran*; or ‘overlapping’ the reduplicated syllable, leading to the syllable recycling pattern *tar'puran.*

4.3. Summary of this chapter

In this chapter I have investigated a common form of reduplication, where the location of the reduplicant is not determined morphologically, but rather prosodically, being found immediately adjacent to the main stress. I have argued that this can best be understood as a form of Emergence of the Unmarked, with the reduplication seeking the unmarked, or optimal base. I have provided a general schema, that derives this pattern from basic principles of stress, and alignment. I analyzed a number of languages using this schema, in particular: Oykangand, Nakanai, and the Aru languages West Tarangan, and Kola.

5. Variation in polarity of affixation: Mangap-Mbula

Reduplication is prosodic morphology. As such we expect it to be affected by other prosodic phenomena, such as stress. This is exactly what we see in Mangap-Mbula, an Austronesian language spoken on Umboi island off the coast of Papua New Guinea, where the interaction of reduplication and stress determines whether the reduplicant is a prefix or a suffix.

(1) **Mangap-Mbula reduplication** (Bugenhagen 1995)

ˈbaada	badˈbaada	‘you (sg) be carrying’	*ˈbaadada
ˈboozo	bozˈboozo	‘very many’	*ˈboozozo
ˈposop	ˈposopsop	‘you (sg) be finishing’	*posˈposop
ˈmolo	ˈmololo	‘very long’	*molˈmolo

Mangap-Mbula stress shows a preference for the syllable containing the antepenultimate mora, in other words the penultimate syllable if it is heavy, or the antepenultimate if the penult is light. If reduplication would interfere with this placement it is prefixed, such as in the form *bad'baada* ‘you (sg) be carrying’. If on the other hand the reduplication can fit in with the rhythmic pattern of the base it is placed at the end of the word. An example of this kind is the form *'posopsop* ‘you (sg) be finishing’.

This stress driven variation means that Mangap-Mbula reduplication patterns are another instance of phonologically conditioned allloduples.

5.1. Anchoring versus the Anchoring Property

One property of reduplication that we have consistently relied upon but otherwise not paid much attention to is that reduplication tends towards edges. It is a notable fact about reduplication that once the appropriate base is defined, the reduplicant generally matches material from one edge or the other of this base. For example syllable reduplication from a base *tasop* will typically yield reduplicants *ta* or *tas* from the left, and *sop* or *op* from the right. A fact known at least since Marantz (1982) is that reduplication favors the edge of the base closer to the reduplicant.

(2) a) $\underline{t}_i\ \underline{a}_j\ \underline{s}_k \quad t_i\ a_j\ s_k\ o_l\ p_m$ b) $t_i\ a_j\ s_k\ o_l\ p_m \quad \underline{s}_k\ \underline{o}_l\ \underline{p}_m$

As shown in (a) prefixing reduplication favors reduplicants where the leftmost edge matches the leftmost edge of the base, while as (b) demonstrates suffixing reduplication favors the right edge. In the framework of Marantz (1982), where reduplication is described in terms of an autosegmental model, this was formulated as an association convention, but it simply remained a stipulation. This stipulation said the 'normal' association convention for prefixing reduplication is left-to-right, while the normal association convention for suffixing reduplication is right-to-left.

The generalization is that copying always starts from the side where the affix is attached. M&P call this 'Marantz's generalization'. And this generalization is captured by means of the constraint ANCHOR(LEFT/RIGHT) [see section 1.4.2. for discussion]. The definition that M&P (1994b, 1995) give for Anchor is edge-specific. It comes in two varieties Anchor-Left and Anchor-Right. In their system, suffixing reduplication behavior is achieved by ranking Anchor-Right over Anchor-Left, while prefixing reduplication requires the opposite ranking.

(3) 'Marantz's generalization' (reformulated according to M&P)

Prefixing Reduplication: Anchor-Left >> Anchor-Right
Suffixing Reduplication: Anchor-Right >> Anchor-Left

Reduplication that obeys Marantz's generalization might be said to have the ANCHORING PROPERTY. And this is in fact the case in the overwhelming majority of reduplicative systems, including all the examples that have been seen in this thesis. It is important to distinguish between the Anchoring Property—which is almost universally *un*violated—and the constraints Anchor-Left/Right—one of which is almost always violated in common partial reduplicative systems. This point can be made clear with the help of the following tableau.

(4)

input: /RED + tasop/	Anchor-Right	Anchor-Left
a. ☞ tasop$\underline{\text{sop}}$		*
b. tasop$\underline{\text{tas}}$	*!	
c. $\underline{\text{tas}}$tasop	*!	

This tableau shows how Marantz's generalization is captured in M&P's system.

In this case Anchor-Right is ranked above Anchor-Left, as is appropriate for suffixing reduplication. Candidate (a) has a reduplicative suffix. Its rightmost segment is in correspondence with the rightmost segment of the base. Thus it obeys Anchor-Right perfectly, but it fails Anchor-Left. However, since Anchor-Left is ranked lower than Anchor-Right, this is irrelevant.

The point of interest here, is the contrast—or lack thereof—between candidates (b) and (c). Candidate (b) is ‘misanchored’, since it copies from the wrong side. Candidate (c) is copying from the edge appropriate to a prefix. However it is simply in the ‘wrong system’, since this tableau is for a suffixing system. While the constraints treat both candidates the same, (b) violates the Anchoring Property, but (c) does not.

A final important point to note about M&P’s system, is that the stipulation that a particular reduplicant is a prefix, or a suffix is independent of the ordering generalization that goes with it. Thus the fact that Marantz’s generalization is so widely obeyed is somewhat of an accident in this system.

5.2. Analysis of Mangap-Mbula reduplication

Mangap-Mbula [henceforth M-M] has at least 5 different patterns of reduplication, total reduplication (5a) and four types of partial reduplication (5b-e). All data comes from the grammar by Bugenhagen (1995) [henceforth B].

(5) **Mangap-Mbula reduplication patterns** (Bugenhagen 1995):

a.	total:		
	ˈtotomen	ˈtotomenˌtotomen	‘forever’
b.	syllable—prefixing		
	ˈbaada	badˈbaada	‘you (sg) be carrying’
	ˈboozo	bozˈboozo	‘very many’
	ˈzwooro	zworˈzwooro	‘you (sg) be stretching’ (59)
	ˈwooro	worˈwooro	‘vines’ (181)
	ti-meete	ti-metˈmeete	‘3pl-die’ (181)
c.	syllable—suffixing		
	ˈposop	ˈposopsop	‘you (sg) be finishing’
	ˈmolo	ˈmololo	‘very long’
	gaˈrau	gaˈraurau	‘you (sg) be approaching’ (46)
	aˈmbai	aˈmbaimbai	‘you (sg) be very good’ (52)

d. VC-rhyme suffix

ˈkam	ˈkamam	‘you (sg) be doing’
ˈkan	ˈkanan	‘you (sg) be eating’ (46)
kut	ˈkudut	‘many lice’ (46)
pet	wedet / pedet	‘you (sg) be appearing’ (49)

e. V-rhyme suffix

ke	ˈkewe	‘you (sg) be hiding’

functions: plurality, intensification, imperfect aspect

M-M uses reduplication for a number of different functions, including imperfect aspect, intensification, and plurality, but the choice of reduplication pattern is independent of the function. Each base takes only one of the various patterns, and the choice of pattern depends (at least in part) on the phonological shape of the base form. For example polysyllabic stems with a long vowel in the penultimate syllable always take the prefixing syllable reduplication. The five patterns are thus alloduples of a single dupleme. The first question that arises is the conditioning of the choice of alloduple.

B seems to consider the choice of pattern to be a matter of lexical stipulation. But this is not entirely accurate. First, the two forms of rhyme reduplication can be treated as a single pattern, as indeed B does, since the VC pattern occurs only with consonant final words, and the V pattern only with vowel final ones. Second, the prefixing syllable reduplication occurs only with bases that have a long penultimate vowel. There are a few further observations. The rhyme reduplication patterns seem to be rather rare, and limited to very few cases, virtually all of which are monosyllabic, or obviously composite. Also most of the forms have an initial [k]. Although few in number, one rhyme reduplicating form *kamam* ‘be doing’ is possibly the single most common reduplicated form in the language. I will not be dealing with rhyme reduplication, or total reduplication in this paper. And once limited to syllable reduplication, the choice of alloduple can be considered entirely predictable on prosodic grounds, as I will show. The generalizations concerning Mangap-Mbula reduplication are:

Generalizations:

- 4 of the 5 patterns are suffixal
- the partial reduplication patterns are all $\leq \sigma$
- the reduplicant includes a final consonant when available
- ☞ assume the basic pattern is suffixing CVC syllable reduplication

In the rest of this chapter I will show that the shape of the reduplicant, and in particular whether it is prefixing or suffixing can be predicted entirely on the basis of the stress system of the language. Thus before going into the specifics of the M-M reduplication system I will present an analysis of the facts of the prosodic structure and stress system of M-M.

5.2.1. Syllable structure

M-M permits only CV syllables. Onsets are for the most part required, even word initially. For example, there are no vowel initial verbs except a few beginning with the vowel [u] (e.g. *uulu* 'help'). However this gap is complemented by the fact that [wu] is not a possible sequence.

Vowels are either short, long or diphthong. Long vowels are restricted to the penultimate syllable, a fact that will be seen to follow from the stress system of the language. Diphthongs occur in all positions, but are most common word finally. All vowel sequences are possible diphthongs, and I will follow B in assuming that all such sequences are tautosyllabic. Evidence that supports such an approach is the fact that such sequences always receive main stress. This fact has a ready explanation if such sequences form a single, and thus heavy, syllable.

Codas are possible only word (actually morpheme) finally, or through compounding. The latter case includes reduplication.

Worthy of special mention here are the prenasalized segments. M-M has a three way contrast in stops: plain, voiced, and prenasalized. Morpheme initially the three types are in contrast. In accordance with the vast majority of such cases (see Padgett 1995a) M-M does not contrast prenasalized segments with NC clusters, and is therefore open to an analysis of the former in terms of latter. If an NC analysis were adopted, this would add to M-M's syllable inventory a type CVN, where N is homorganic with a following stop.

The first fact that will require an explanation is the restriction against onsetless syllables. I will simplify discussion and assume the ban is total. Onsetless syllables will be avoided as long as some faithfulness constraint is ranked below Onset. Thus we have:

(6) Onset >> Faith-LS

Here Faith-LS is an abbreviation for whatever Faith constraint will need to bend in order to avoid an offending syllable. For example it might stand for Max(V). In that case onsetless syllables would simply be deleted, and would never surface. Alternately it could stand for Dep(C), and instead we would find epenthesis of a consonant, in order to avoid the violation. Note however that unless this situation gives rise to alternations, we cannot directly identify the responsible Faith constraint. In general offending configurations never surface in M-M. The ranking in (6) constitutes an instance of *Stampean Occultation*.

A closely related fact is the consistent syllabification of VV sequences into a single syllable. If such sequences were heterosyllabic we would have a violation of Onset in the second syllable. Clearly then Onset must outrank the constraint that prefers that a V form a syllable nucleus, i.e. *Margin/V (P&S). What is more though, is that the diphthong solution is chosen rather than the solution that would be dictated by (6), thus we know that Faith-LS must outrank *M/V as well:

(7) Onset >> Faith-LS >> *M/V

The hierarchy in (7) reads: ‘avoid onsetless syllables, preferably by incorporating them into a (preceding) syllable, otherwise by deleting or epenthesizing as necessary.’ The consequences of this ranking can be demonstrated as follows.

(8)

input: /garau/	Onset	Faith-LS	*M/V
a. .ga.ra.u.	*!		
b. .ga.ra.𝕨u.		*!	
c. .ga.ra⟨u⟩.		*!	
d. ☞ .ga.rau.			*

This tableau shows the syllabification of diphthongs. The form *garau* means ‘you (sg.) approach’. Candidate (8a) syllabifies each vowel the nucleus of its own syllable. This creates an onsetless syllable in the case of the vowel [u]. Epenthesizing an onset for this syllable, as in (8b), or avoiding the syllable altogether by deleting the vowel, as in (8c) would lead to violations of Faith-LS. Thus possibility (8d) is chosen, and the [u] forms a diphthong with the preceding vowel.

5.2.2. Morpheme structure

While the syllable structure described above already restricts the possible shape of words, possible morphemes in M-M are even more restricted than this.

The most obvious restriction is a tendency for all the vowels in a single morpheme to be identical. The only common exceptions are the diphthongs.

Another restriction affects the distribution of long vowels. Long vowels occur only in the penultimate syllable of a (root) morpheme. In such cases the vowel of the following final syllable is always identical in quality to that of the long vowel. Words with a long vowel in the penultimate syllable, are always stressed on that syllable.

This restriction on long vowels is particularly of interest here, because it is exactly those forms which have a long vowel in the penultimate syllable that always take the prefixing form of reduplication. It will thus be an important part of the analysis to explain this distribution. Since these vowels are stressed, it seems reasonable to assume that stress is the factor that licenses the length. We can then immediately explain the restriction of long vowels to stressed position with the ranking in (9).

(9) WSP >> Max(μ)

WSP, the Weight-to-Stress Principle (Prince 1990, P&S) says that heavy syllables are restricted to a prominent position. Max(μ) is a faithfulness constraint that requires the proper realization of weight. Since the WSP outranks Max(μ) any long vowel not in a prominent position will be shortened (cf. also Latin 'Iambic-' and 'Cretic shortening' Mester 1994, P&S). This ranking thus explains the restriction of long vowels to stressed position. However in order for this account to properly explain the long vowel distribution facts, we still need to ensure that the stress is in the right place whenever the word contains such a vowel. This task is taken up in the next section, when we discuss the stress system of M-M. But assuming for the moment that we have an account of the proper stress placement, we can still see how the ranking in (9) restricts the occurrence of long vowels.

(10)

input: /badaa/	WSP	Max(μ)
a. bádaa	*!	
b. ☞ báda⟨a⟩		*

This tableau is for a hypothetical underlying form **badaa* with a final long vowel. There are no surface forms with a long vowel in final position, thus we would not want such a form to surface. Assuming that stress is placed on the penult (to be discussed below), the tableau shows that such long vowels would not surface. Candidate (a) has the long vowel fully realized, but since it is in final position, and therefore unstressed, it will violate the WSP. Candidate (b), with the long vowel shortened does not have this problem, and is judged superior. This is another example of Stampean Occultation.

5.2.3. Stress

The analysis developed in the last section will properly account for the distribution of long vowels only if stress is correctly placed. It is thus incumbent on us to give an account of the stress placement.

In M-M words containing only light syllables, stress is found on alternating syllables. This is evidence that the foot of the language is the moraic trochee. As already mentioned, long vowels and diphthongs always receive main stress. This demonstrates weight sensitivity, further supporting the moraic trochee. Since long vowels and diphthongs always contain two moras, they will always form a moraic trochee, and thus always be stressed. The restriction of such vowels to stressed position is then explained by the WSP, as discussed above.

Also noted earlier was the fact that long vowels are restricted to the penultimate syllable of a stem. The analysis developed earlier has the effect that vowels are shortened if they do not receive main stress. This opens the door for an explanation of this restriction. If a long vowel in any position other than the penult does not get stressed, then it will automatically shorten, effectively restricting long vowels to penult position. It seems then that a heavy penult is the ideal location for main stress in M-M. Conversely, this means that the final position is not an ideal location for stress, since long vowels do not occur there. This indicates that M-M respects nonfinality. Further evidence for this comes from words with all light syllables. In words with three syllables main stress is on the antepenult, rather than the penult, and in words consisting of four light syllables, B reports that main stress is on the pre-antepenult, with a secondary stress on the penult. A third piece of evidence showing the effects of nonfinality comes from the stress behavior of subject prefixes. Normally such prefixes are never stressed. However if the stem is monosyllabic, and without a suffix, then stress exceptionally falls on the prefix.

All of these facts receive a direct explanation if we assume that main stress is assigned to the rightmost foot in non-final position. In OT terms this can be described by the following ranking (cf. the P&S analysis of Latin):

(11) Nonfinality >> Rightmost

Let us first consider the case, where all syllables are light. In two syllable words nonfinality is violated somewhat since the head foot is final, but there is simply no other way. Stress falls on the initial of the two syllables.

In three syllable words things are a bit more interesting. Here the constraint ranking in (11) clearly dictates antepenult stress. Assuming that foot binarity is unviolated, only one foot can be constructed. The choice is between placing this foot on the first two syllables, or the last two. The ranking (11) decides in favor of the former possibility.

(12)

input: /totomen/	NonFinality	Rightmost
a. ☞ (tó.to)men		σ σ
b. to(tó.men)	F!	σ

The tableau (12) shows the case of the word *(tó.to)men* 'forever', a trisyllabic form with stress on the ante-penult. There are only two ways to foot such a form while respecting foot binarity: foot the first two syllables leaving the final unfooted (candidate a), or leave the initial unfooted and place the foot on the final two syllables (candidate b). Nonfinality will favor (a) over (b) giving the desired result, ante-penult stress.

Returning to the case of the long vowels, we note that a penultimate syllable with a long vowel forms its own foot and, since this foot is nonfinal, it is the preferred location for stress. The footing for *baada* 'you carry' is thus *(baa)da*. In this case of course, this is pretty much the only syllabification available. The alternatives: *(baa)(da)* violates FtBin since the final foot is subminimal; *ba(ada)* violates either syllable integrity, or it creates an onsetless syllable; and *(baada)* violates 'maximal' binarity, or creates an illicit foot type. Thus all competitors are ruled out on independent grounds, but the only possible syllabification is also in perfect accordance with the stress system defined by (11).

The question is then what happens when there is a conflict. Consider again a hypothetical input **badaa*. In such a case, following the same reasoning as before, the only possible footing will be *ba(daa)*. This type of footing however has a foot head in final position, violating Nonfinality. Since such words are unattested, something must give. Presumably this something is the faithful realization of vowel length, i.e. Max(μ).

(13) NonFinality >> Max(μ)

This ranking says that rather than letting stress fall on a long vowel in final position, M-M will prefer to shorten the long vowel. The effect of this ranking is shown in tableau (14).

(14)

input: /badaa/	NonFinality	Max(μ)
a. ba(dáa)	F σ!	
b. ☞ (báda)⟨a⟩	F	*

This is again a case of Stampean occultation. If there were an underlying form in M-M of the form **badaa*, then it would have to surface as something else, e.g. *bada*. As already noted in (9), we have the ranking WSP >> Max(μ). This rules out a candidate such as **bádaa*, with stress on the initial light syllable analogous to Latin *ámo:*, no matter what the footing, since such a candidate would have an unstressed heavy syllable. But the possibility of having a stressed heavy final syllable, as in candidate (14a), is ruled out by the ranking NonFinality >> Max(μ). Thus the two rankings in (9) and (13) together explain the restriction of long vowels to the penultimate syllable.

This still leaves the question of the relative ranking between WSP and NonFinality. Alternatively we may ask whether NonFinality is ever violated in M-M. The answer is yes, since it might be recalled that diphthongs frequently occur word finally, and are always stressed, as in *gaˈrau* 'you approach'. This word is quite similar to the case just investigated, and since in that case the heavy final syllable was eliminated this raises the question of why the same does not happen here.

The difference is of course that in *gaˈrau* the heavy syllable involves a diphthong, and shortening would involve a loss of quality, not just quantity. As the constraint against loss of quality I will assume Max(V). Since NonFinality does not drive loss of quality, in this case, we have Max(V) dominating NonFinality. Also since the final heavy is stressed, NonFinality is outranked by WSP. Finally we also do not find a situation where the two vowels of the diphthong are separated, with a resultant footing as in *(gá.ra)u*. Splitting the diphthong in this fashion leads to an onsetless syllable, which M-M generally avoids as discussed above. This indicates that Onset dominates NonFinality as well. Summarizing all of this we have the following ranking:

(15) WSP, Onset, Max(V) >> NonFinality >> Max(μ)

And for *gaˈrau* we can provide the tableau in (16).

(16)

input:	/garau/	WSP	Onset	Max(V)	NonFin	Max(μ)
a. ☞	ga(ráu)				F σ	
b.	(gá.ra)⟨u⟩			*!	F	*
c.	(gá.ra)u		*!			
d.	gá(rau)	*!				

This tableau summarizes the previous discussion. Candidate (b) seeks to eliminate the final stress by removing the diphthong. This possibility violates Max(V). In candidate (c) the stress foot severs the diphthong, thereby creating an onsetless syllable. Candidate (d) avoids final stress by putting the stress on the light syllable rather than the diphthong.

This violates the WSP. Instead of any of these possibilities the preference is given to candidate (a) with stress on the final diphthong. Finally we can compare this again with the full tableau for the hypothetical underlying form**badaa*.

(17)

input: /badaa/	WSP	Onset	Max(V)	NonFin	Max(μ)
a. ba(dáa)				F s!	
b. ☞ (báda)⟨a⟩				F	*
c. (báda)a		*!			
d. bá(daa)	*!				

This tableau confirms the analysis, and shows the minimally different situation where the final heavy syllable involves a long vowel rather than a diphthong. Since shortening a long vowel does not involve a loss of quality, but only a loss of quantity, it does not violate the higher ranked Max(V), only the lower ranked Max(μ). Thus here the final heavy is eliminated in accordance with NonFinality.

So far we have dealt with the case of disyllabic words, explaining their stress pattern, and why they can have a long vowel in the penult, but not finally. We now turn to the case of trisyllabic and longer words.

Words such as *kaˈtaama* 'door', with a long stressed vowel in the penult, are unproblematic. They work just as the disyllabic CVVCV cases.

A complication arises considering four syllable words such as *ˈnakaˌbasi* 'axe'. The analysis of stress developed thus far predicts that the preferred location of stress is a heavy penult, otherwise the ante-penult if the penult is light. This predicts that the stress for this word is the unattested **na(kába)si*. Presumably the defect of this form is that it has two unparsed light syllables. However there are other forms in the language with two unparsed syllables that are perfectly acceptable, e.g. *ka(táa)ma* 'door'.

This contrast seems to indicate that problem with *nakabasi* is more specific than merely unparsed syllables. Unlike in the case of *kataama*, the two light syllables are potentially footable. We can describe a syllable as potentially footable, if (i) it is light, and (b) it immediately precedes another light syllable. We can then formulate a constraint that penalizes such potentially footable syllables if they are not footed.

(18) Foot-L

'a light syllable before another light syllable must be footed'

This constraint will need to be interleaved between NonFinality and Rightmost.

This constraint will have no effect on the footing of a form like *kataama* ‘door’, because neither of the two light syllables precedes a light syllable. In the case of *nakabasi* on the other hand, all of the first three light syllables are light and followed by light syllables, thus all of them will be required to be footed by Foot-L. Incorporating this constraint into our account of M-M stress, we can now give the tableaus for the trisyllabic and longer forms, starting with the form *kataama* ‘door’.

(19)

input: /kataama/	NonFin	Foot-L	Rightmost	Max(μ)
a. ☞ ka(táa)ma			*	
b. (káta)⟨a⟩ma			**!	*
c. ka(tá⟨a⟩ma)	F!	*	*	*

In this case Foot-L has no effect, and thus NonFinality and Rightmost drive the stress to the antepenultimate mora in the manner discussed earlier. This places the stress on the heavy penult. Moving the stress foot onto the initial syllable, as in candidate (b), or onto the final syllable, as in the case of candidate (c), would require shortening the long vowel, and neither possibility would provide any benefit to stress placement. Thus candidate (a) is optimal. The tableau for the form *nakabasi* ‘axe’ is shown next.

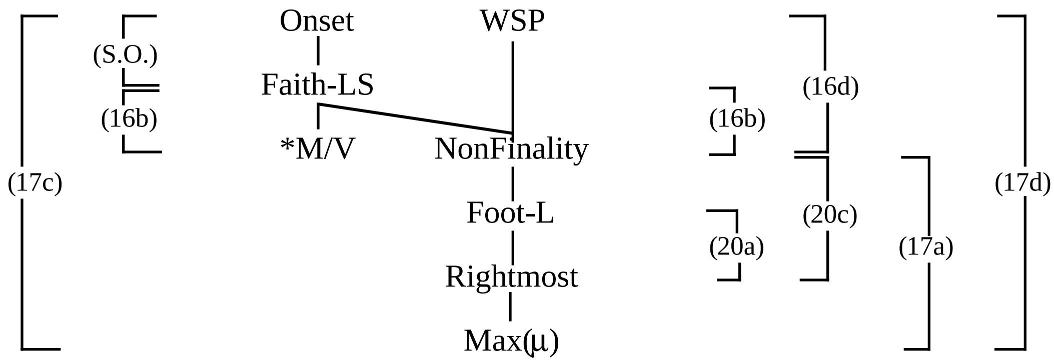
(20)

input: /nakabasi/	NonFin	Foot-L	Rightmost	Max(μ)
a. na(kába)si		*!	**	
b ☞. (náka)(basi)			***	
c. (naka)(bási)	F!		*	

In contrast to the case of *kataama* ‘door’, in this form placing the main stress foot on the antepenultimate mora leads to a violation of Foot-L, since the potentially footable initial syllable is left unfooted. This rules out candidate (a), and the choice must be made among the fully footed forms shown as candidates (b) and (c). The form with stress on the pre-antepenultimate syllable is preferred, since this form is more in accord with NonFinality.

Below I give a summary of the constraint rankings that have been established in the current analysis, and that account for the stress system and syllable structure of M-M.

(21) **Summary of the constraint rankings for Mangap-Mbula stress system**



The numbers in parenthesis indicate the candidate which provides the ranking argument. S.O. indicates that the ranking is based on Stampean Occultation. This constraint ranking was shown to account for the location of stress, which in M-M is preferably on the syllable containing the antepenultimate mora. It also accounted for the distribution of long vowels, which were seen to be limited to the penultimate syllable, where they always receive stress. I will now show how this same ranking accounts for the correct choice of alloduple in reduplication.

5.2.4. Reduplication

We now turn to the analysis of reduplication. Since M-M is a syllable reduplication system, we can account for the size restriction with the help of an emergence of the unmarked ranking as follows.

(22) Max-LS >> AllσRight >> Max-BR >> NoCoda

This ranking will favor reduplication which is maximally one syllable in size, but where this syllable is maximally filled. Taking this reduplication to be suffixing, we can show how this ranking correctly predicts a reduplicated form *posop<u>sop</u>* for the baseform *posop* ‘you (sg.) finish’.

(23)

input: /posop +RED/	AllσRight	Max-BR	NoCoda
a. poso<u>pop</u>	σ/σσ	pos!	*
b. ☞ posop<u>sop</u>	σ/σσ	po	**
c. posop<u>so</u>	σ/σσ	po p!	*
d. posop<u>osop</u>	σ/σσ/σσσ!	p	*

Candidate (d) reduplicates more than a single syllable. This causes excess violations of AllσRight, and is therefore dispreferred. Instead the choice falls to one of the three candidates that have a syllable-sized reduplicant. Here preference is given to candidate (b), which performs best with respect to Max-BR, resulting in the reduplicated form *posop<u>sop</u>* ‘you (sg) be finishing’.

While this analysis might be considered a satisfactory account of the reduplication pattern, there is an interesting ‘side-effect’ to the stress patterns of reduplicated forms. Given the earlier analysis of stress, in the case of monosyllabic and disyllabic baseforms reduplication leads to an improved foot structure.

(24)

input: /posop +RED/	NonFin	Rightmost	Max-BR
a. (póso)p<u>op</u>		**	pos!
b. ☞ (pósop)<u>sop</u>		**	po
c. (póso)(p<u>osop</u>)		***!	p
d. (pósop)	F!	*	posop

This tableau shows the status with respect to the stress constraints, of some relevant candidates for *posop<u>sop</u>* ‘you (sg) be finishing’. Since a word consisting of two light syllables has the main stress foot in word final position, any reduplicated form will lead to an improved foot structure according to the constraint system developed earlier in (21). This can be seen by contrasting candidate (d), with candidates (a-c). At the same time, candidate (c) shows that reduplicating any more than a single syllable will be penalized by Rightmost. This simply reconfirms the antepenultimate syllable as the preferred location for stress. Of course Max-BR still chooses correctly among the candidates with a mono-syllabic reduplicant.

In the case of forms with a heavy penult, however, the situation is rather different.

In this case reduplication of the final syllable would lead to one of three situations: (i) the final two syllables are unfooted, (ii) the head foot is not rightmost possible, or (iii) a syllable with a long vowel would not bear main stress. Thus in contrast to the previous case, any attempt at reduplicating such a form leads to a less optimal foot structure. This situation is illustrated with the help of the tableau in (25).

(25)

input: /baada + RED/	WSP	NonFin	Foot-L	Rmost	Affix-R
a. (baa)(dá.da)	*!	F		σ	
b. ba⟨a⟩(dá.da)		F!		σ	
c. (báa).da.da.			*!	σσ	
d. (báa)(da.da)				σσ!	
e. ☞ .bad.(báa).da.				σ	*

This tableau shows a variety of potential reduplicated candidates for the form *baada* ‘you (sg.) carry’. Candidates (a-d) all show candidates where the final syllable has been reduplicated. Candidates (a) and (b) both move the stress to the formerly final syllable, which is now the penult. Either way this will violate NonFinality, but if the long vowel is retained this will also violate the WSP. Candidate (c) has two final unfooted light syllables, a situation disfavored by Foot-L. But even if they are footed, as in candidate (d), stressing the syllable with the long vowel will place the stress unnecessarily far from the right edge of the word. Since all of these possibilities are undesirable, the language chooses to avoid them by switching the polarity of the affix. The suffix turns into a prefix, taking its place before the main stressed syllable, resulting in the reduplicated form *bad(baa)da*, as seen in candidate (e).

Clearly switching affix polarity in this way must violate something. I have chosen to represent the property that has been violated by the constraint AFFIX-R. We might well ask what this constraint represents. Typically affix polarity is a property that is captured in terms of a subcategorization frame. For example a suffixal reduplicant might be specified as in (26):

(26) RED: $_{\text{BASE}}]$ ___ $_{\text{REDFORM}}]$

The diagram in (26) includes the polarity of affixation as an immutable part of the lexical item. As this case shows, however, affix polarity is preferably treated as a violable aspect of the lexical item.[29] A constraint based approach to this problem might formulate the constraint in (26) in terms of alignment.

(27) Align-Right(RED, REDFORM)

The problem with this proposal is that the formulation in (27) combines the edgemostness and the polarity requirement in a single constraint. Affixes subject to such a constraint are typically displaced minimally from the relevant edge (e.g. the *um* infix in Tagalog, cf. discussion in M&P 1993). In this case however edgemostness is maintained, and instead polarity is switched from right to left. This suggests that edgemostness, and edge specification in alignment should be separated, a point that I will return to below.

(28) AFFIX-RIGHT

'the affix should be on the right'

The constraint in (28) contains only the edge specification. As long as the edgemostness is inviolate, any violation of (28) will force the affix to appear at the opposite edge of the affixed form.

With this constraint, the analysis provides an explanation for the location of the reduplicant as a consequence of general constraints, that are independently necessary to explain the stress behavior of the language. Crucially, the various alloduples must be viewed as a unified system, with each alloduple simply providing the realization of reduplication best suited to the base, given the constraint system of the language.

Actually there is one relevant candidate that was not mentioned in the previous tableau, the candidate with the shortened vowel. Consider the following datum.

(29) keene ti-kene<u>ne</u> '3pl-sleep' (231) *ti-<u>ken</u>keene

It seems that at least in this case, vowel shortening is an option. However this is the only case of a stem with a long vowel that undergoes shortening in reduplication in B's corpus. In all other cases such stems show prefixing reduplication. This argues for the following ranking.

(30) Max(μ) >> Affix-R

This ranking says that the reduplication will prefer to switch sides, rather than shorten the vowel. The tableau for *<u>bad</u>baada* 'you (sg.) be carrying' that shows the effect

[29] There are a number of other cases, which show similar variation with regular affixes as well. See for example Fulmer (1991) for discussion of a case from Afar, and Noyer (1994) for a case from Huave.

of this ranking is given below.

(31)

	Max(μ)	Affix-R
a. (bá⟨a⟩.da).da.	*!	
b. ☞ bad.(báa).da.		*

So far the analysis has successfully accounted for the shape and the location of the reduplicant in M-M. But there is an important problem. Throughout the analysis we have been assuming that M-M has suffixing reduplication. Since it obeys Marantz's Generalization it must have the ranking shown in (32), as argued in section 5.1.

(32) Anchor-Right >> Anchor-Left

Now while all the candidates in (25) and (31) obey the Anchoring Property only the suffixal candidates avoid violating Anchor-Right. As long as we use the ranking scheme in (32) for suffixing reduplication we predict prefixal forms as follows:

(33)

	Anchor-R	Anchor-L
a. ☞ bad.(báa).da.	*!	
b. ☹ da.(báa).da.		*

The problem is that the analysis developed here crucially depends on being able to compare suffixal and prefixal forms *in the same tableau* (as in 25 and 31). Reranking is therefore not an option for these cases, since it would involve different constraint rankings for competing candidates. Adopting such an approach would undermine the very basis of OT.

However the problem seems to be the same one that we encountered in the discussion of Affix-R, namely the linking of edgemostness, and edge specification. It will therefore be necessary to consider the basis for this linking.

M&P (1994b, 1995) define Anchor as a form of Alignment. The general schema for alignment is shown below.

(34) **Generalized Alignment/Anchoring** (M&P 1994b)

ALIGN(Cat1, Cat2, Edge)

$\forall$Cat1 $\exists$Cat2 $\forall x \exists y$ [x = Edge(Cat1) $\Rightarrow$ (y = Edge(Cat2)) & $y \sim x$)]

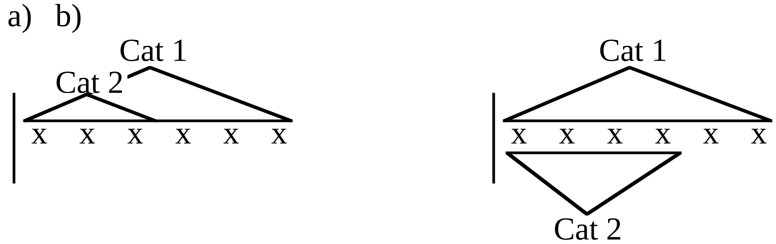
On the basis of this schema Anchoring is formulated as in (35)

(35) Anchor(Edge) $=_{def}$ Align(R, B, Edge)

In this definition R stands for the phonological exponent of the reduplicant, while B stands for the phonological exponent of the base. This instance of Alignment is rather unique, however. All other useful instances of alignment seem to involve one of two typical configurations. The first is typically represented by PCat-PCat alignment. And some examples are Align-R(Prwd, Ft), or AllσRight, etc. Such constraints always involve two constituents which are in a dominance relation where one properly includes the other.

The most common example of the second type of Alignment configuration is the MCat-PCat alignment. Since MCats and PCats refer to different types of constitutents they are not obviously in a dominance relation. However the constituents being compared are typically expressed in terms of overlapping segmental material. These two configurations can be represented schematically as follows.

(36) a) b)



Here (36a) represents the PCat-PCat configuration, while (36b) represents the PCat-MCat configuration. A proposal which suggests removing the edge specification from the definition of alignment is provided by Itô, Kitagawa & Mester (1996). They call this proposal HIERARCHICAL ALIGNMENT .

(37) **Hierarchical Alignment** (Itô, Kitagawa & Mester 1996)

HIERARCHICAL ALIGNMENT

$\forall$PCat1 $\exists$PCat2 [PCat2 $\supset$ PCat1 & Align (PCat1, PCat2)]

'Every prosodic constituent is aligned with some prosodic constituent, containing it'

This constraint expresses the idea that edge-location is the 'prime real estate' in a prosodic structure. While this definition is limited to cases where one constituent is properly contained within another, more boldly we might generalize this case. Thus all alignment *is* Hierarchical alignment, and we can revise (34) to the following.

(38) **Generalized Alignment** [revised]

ALIGN(Cat1, Cat2)

$\forall$Cat1 $\exists$Cat2 $\exists$Edge $\forall$x $\exists$y [x = Edge(Cat1) $\Rightarrow$ (y = Edge(Cat2)) & y ~ x)]

Returning to the issue of Anchoring. The important difference between Anchoring and other forms of alignment is that, according to the standard definition involving R and B, the *phonological exponents* of reduplicant and base, the constituents that are being aligned do not share any segmental material. In order to remedy this situation, I propose that the constraints being aligned with Anchoring are not Base and Red, but rather Base and *Redform.* This can be clarified with the following diagram.

(39)

Redform $\{\underline{b}_1\ \underline{a}_2\ \underline{d}_3\ b_1\ a_2\ d_3\ u_4\ p_5\ i_6\}$

Red $\{b_1\ a_2\ d_3\}$ $\{b_1\ a_2\ d_3\ u_4\ p_5\ i_6\}$ Base

Reduplication which obeys Marantz's generalization shows a 'telescope effect'. This means that the outermost edges of the baseform stay outermost, when the baseform is reduplicated. With the redefined version of alignment in (38) we can state Anchoring simply as:

(40) 'Anchoring'

Align(Base, Redform)

This concludes the analysis of Mangap-Mbula reduplication.

5.2.5. Conclusion

The analysis was seen to have important consequences for the representation of affix polarity in the lexicon, at least in the case of reduplicant affixes. Affix polarity is usually treated as a matter of subcategorization. For example a suffixal reduplicant might be specified as in (26):

(41) [[__] RED]

The diagram in (26) includes the polarity of affixation as an immutable part of the lexical item. In this analysis however affix polarity was shown to be violable. This argues for an interpretation of this property in the form of a constraint (cf. proposal in Hammond 1995). This analysis also affects the formulation of the constraint Anchoring (McCarthy & Prince 1993, 1994ab). The standard conception of Anchoring makes it impossible to compare both types of reduplication within a single ranking, as is necessary for M-M. Instead, I have proposed a non edge-specific form of Anchoring based on the concept of

Hierarchical Alignment (Itô, Kitagawa & Mester 1996).

5.3. Summary of this chapter

In this chapter I investigated the reduplication system of Mangap-Mbula, an Austronesian language from Papua-New Guinea. Reduplication in Mangap-Mbula was seen to vary between prefixing and suffixing reduplication in a predictable manner. The analysis showed that this could be explained as a consequence of the interaction between reduplication and the stress system of the language.

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