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The Emergence of the Unmarked
Optimality in Prosodic Morphology[1]

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1. Introduction

The distinction between marked and unmarked structures has played a role throughout this century in the development of phonology and of linguistics generally. Optimality Theory (Prince and Smolensky 1993) offers an approach to linguistic theory that aims to combine an empirically adequate theory of markedness with a precise formal sense of what it means to be ''unmarked''.

In Optimality Theory, forms are marked with respect to some constraint $\mathbb{C}$ if they violate it — indeed, as Smolensky (1993) emphasizes, they are *literally* marked in that they incur violation-marks for constraint $\mathbb{C}$ as part of their grammatical derivation. But whether or not $\mathbb{C}$ is categorically true in some particular language is a separate matter from the statement of $\mathbb{C}$ itself; it depends instead on how $\mathbb{C}$ is **ranked** with respect to other constraints in that language. For instance, suppose that $\mathbb{C}$ is itself top–ranked and dominates some constraint that requires faithful parsing of elements relevant to $\mathbb{C}$: then no structure violating $\mathbb{C}$ can find its way into the output. Instead, parsing will be unfaithful to preserve $\mathbb{C}$. If, however, in some other grammar $\mathbb{C}$ is itself crucially dominated by another constraint, violations of $\mathbb{C}$ will indeed be found in some output forms. In cases like this, OT recovers exactly the standard notion of implicational markedness: some languages have only the $\mathbb{C}$-unmarked structure, some languages have both the $\mathbb{C}$-marked and $\mathbb{C}$-unmarked structures, and (absent a congeries of independent principles amounting to a denial of $\mathbb{C}$) no grammar can require that only the $\mathbb{C}$-marked structure be admitted. (See, e.g., Prince & Smolensky 1993: Chs. 6, 8 for demonstration of these constraint interaction patterns.)

An essential property of this conception of markedness is that within OT there is no *parametrization* in the usual sense: even in the languages where $\mathbb{C}$ is crucially dominated, it is not ''turned off'' or banished from consideration. Rather, it is fully present in the grammar, even though it is violated, under domination, in some output forms. This property of OT, fundamental to the theory, extends the traditional notion of markedness in a significant way. Even in languages where $\mathbb{C}$ is crucially dominated and therefore violated, the effects of $\mathbb{C}$ can still be observed under conditions where the dominating constraint is not relevant. Thus, in the language as a whole, $\mathbb{C}$ may be roundly violated, but in a particular domain it is obeyed exactly. In that particular domain, the structure unmarked with respect to $\mathbb{C}$ emerges, and the structure marked with respect to $\mathbb{C}$ is suppressed. This **emergence of the unmarked** is quite conspicuous in the prosodic morphology of reduplication, and here we will be focusing on that empirical domain.

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Properly speaking, the unmarked structure that emerges in obedience to ℂ is only guaranteed to be unmarked with respect to ℂ itself; it may, and often will, be marked with respect to other constraints. The constraints provided by Universal Grammar characterize many dimensions of (un)markedness, and conflict among them over the assessment of particular structures is inevitable. Optimality is computed with respect to all linguistically relevant dimensions, not just one; the contributions made by the various dimensions of markedness are mediated by constraint ranking. In the empirical material treated here, the dimensions of evaluation include at least the following:

▸Segmental Harmony	≈ ''unmarkedness'', itself consisting of various dimensions, some conflicting.
▸Syllabic Harmony	≈ having an onset, lacking a coda.
▸Faithfulness	≈ ''identity between input and output''.
▸Alignment	≈ coincidence of edges of morphological and phonological constituents.
▸Metrical Parsing	≈ satisfying constraints on exhaustivity and alignment of metrical feet.
▸Template Satisfaction	≈ meeting shape or constituency requirements imposed on the reduplicated string.
▸Exactness of Copying Relation	≈ identity between the reduplicated string and the base to which it is attached.

These various dimensions of harmonic evaluation will be discussed in detail below, as they become relevant to the analysis of particular cases.

The conflict and ranking of unmarkedness requirements along different dimensions is fundamental to Optimality Theory. It stands in sharp contrast to a common misconception about OT that could be called **The Fallacy of Perfection** (FoP). In brief, the FoP says this: ''if the output is *optimal*, then it must be *perfect*.'' In the mind of the FoP theorist, OT is assailed by questions like these:

- ·Since there is some least marked vowel and some least marked consonant, why isn't every word in every language exactly the same? Concretely, why aren't all words simply *ʔiʔi*, *tata*, or perhaps *baba*? (Chomsky 1994)
- ·Since CV is the unmarked syllable-shape, why aren't all syllables CV?
- ·Since there are constraints demanding identity between input and output, why isn't every underlying form simply realized unchanged?
- ·Since the most exact reduplicative copy is completely identical to its base, why isn't all reduplication total?
- ·Since the unmarked mode of affixation is clearly peripheral, how can you ever *infix*?

It should be clear now why the FoP is fallacious. It is arrived at by considering only a single dimension of optimality — just segmental phonology (and only one dimension there too!), or just syllabic phonology, or just faithfulness, or just exactness of copying — and ignoring all the rest.[2]

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[2] The Fallacy of Perfection can be applied with equal pertinacity to any domain where optimization ideas are put to work. At the level of grammar choice, the Evaluation Metric invites the naive question: ''How can there be a grammar at all, since the best grammar has fewest rules — none!?''; ''Under Economy of Derivation (Kiparsky 1982:18, Chomsky 1992),

The remainder of this article is laid out as follows. Section 2 introduces some of the basic theory we will call on in the course of the analyses: OT fundamentals, Alignment constraints, and a version of the reduplicative constraints which regulate the copying relation. Section 3 illustrates how, under ranking, syllabically–unmarked structure emerges in reduplication. Section 4 then turns to a descriptor of prosodic morphology, the *minimal word template*. It is shown that the minimal word is the least–marked word in terms of prosodic criteria, so that the ''minimal word template'' is an instance of emergence of the unmarked. The argument is illustrated with the reduplicative formation in the Australian language Diyari and the Austronesian language Balangao. In section 5 (continued in the Appendix), the phonology–morphology dependencies in the reduplicative pattern of the Austronesian language Makassarese are the object of investigation. Makassarese has a minimal-word reduplicative formation, along the lines of section 4, and it also imposes intricate (though not atypical) segmental, syllabic, and morphological conditions on the reduplicant which, we argue, reflect the emergence of unmarked structure. Section 6 summarizes the argument.

2. Background

Optimality Theory (Prince and Smolensky 1993) has five basic tenets:[3]

(1) **Principles of Optimality Theory**

a. **Universality**. UG provides a set *Con* of constraints that are universal and universally present in all grammars.[4]

b. **Violability.** Constraints are violable; but violation is minimal.

c. **Ranking.** The constraints of Con are ranked on a language-particular basis; the notion of minimal violation is defined in terms of this ranking. A grammar is a ranking of the constraint set.

d. **Inclusiveness.** The constraint hierarchy evaluates a set of candidate analyses that are admitted by very general considerations of structural well-formedness.

e. **Parallelism.** Best-satisfaction of the constraint hierarchy is computed over the whole hierarchy and the whole candidate set. There is no serial derivation. (Other views are consistent with a-d, as well; see Prince & Smolensky 1993:4-5 for a brief review.)

Of these, Universality will be most important in the discussion below. Universality is essential to the emergence of the unmarked — because structural constraints are universal and present in every grammar, even those that are obviously and commonly violated in a given language are predicted to be available to do their work under appropriate conditions. But of course Universality is hopeless without Violability and Ranking, in the face of the diversity of interlinguistic variation seen in linguistic systems.

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how can any rules apply?''; etc., etc. See Chomsky 1994 for recent arguments based on the FoP.

[3] Cf. other constraint-based theories such as conspiracies (Kisseberth 1970, Haiman 1972, Sommerstein 1974), Montague Phonology (Wheeler 1981, 1988; Bach & Wheeler 1981) TCRS (Paradis 1988ab, Paradis & LaCharité 1993), Declarative Phonology (Scobbie 1991, 1992), Harmonic Phonology (Goldsmith 1990, 1991, Bosch & Wiltshire 1993, Wiltshire 1992), and others (Bird 1990, Coleman 1992, Singh 1987, Lakoff 1993, Mohanan 1993, Burzio 1992ab, Kaye, Lowenstamm, and Vergnaud 1985 et seq.).

[4] In addition, Con provides schemata, such as ALIGN, which may take specific morphemes as arguments, so that statements that are the functional equivalent of ''M_{31} is a prefix'' or ''M_{42} is disyllabic'' can be made and ranked with respect to other elements of Con.

These principles must, of course, figure in a particular conception of how grammar is organized. Universal grammar must minimally provide the following:

Con. The set of constraints out of which grammars are constructed.

Gen. A function defining, for each possible input *i*, the range of candidate linguistic analyses available to *i*.

Eval. A function that comparatively evaluates sets of forms with respect to a given constraint hierarchy Γ, a ranking of Con.

The following schema sketches the way input–output pairing is accomplished using these notions. Suppose we have a grammar Γ_m , the m^{th} ranking of Con, and an input in_i — a lexical entry, if we are looking at word phonology:

(2) **Schema for An Optimality-Based Grammar**

$$\text{Gen} (in_i) = \{ cand_1, cand_2, \ldots \}$$
$$\text{Eval} (\Gamma_m , \{cand_1, cand_2, \ldots\}) \rightarrow \{cand_k\}$$

This grammar pairs input in_i with output $cand_k$.

The function Gen emits a set of candidate analyses consistent with a given input. Gen consists of very broad principles of linguistic form, essentially limited to those that define the representational primitives and their most basic modes of combination.[5] Eval deals with a system of ranked constraints Γ: a formal construction on Con that yields the grammar of an individual language. It rates the members of the candidate set in terms of their *relative harmony*, or degree of success with respect to the language's ranking Γ of the constraints. It imposes an order on the various candidates, and a maximally harmonic candidate is *optimal*. Such a candidate *best-satisfies* or *minimally violates* the grammar's constraint ranking. It is the **output** associated by the grammar with the **specific input** in_i.[6] The various non-optimal candidates have no grammatical status; no direct inferences about plausible patterns of variation or historical change can be drawn from their ordering. (For formalization of Eval and further discussion, see Prince & Smolensky 1993: Ch. 5.)

The construction of a grammar in OT is essentially a matter of determining the proper ranking of Con, and to that end the *constraint tableau* is a useful calculational device. A typical constraint tableau, showing the domination of constraint B by constraint A, is the following:

(3) **Constraint Tableau**, A >> B, $/in_k/ \mapsto k\text{-}cand_1$

Candidates	A	B
☞ $k\text{-}cand_1$		*
$k\text{-}cand_2$	* !	

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[5] It is not right to think of Gen as the depository of all ''hard'' or 100% universal constraints on language. Free ranking of Con will itself exclude many possible outcomes, thereby deriving many observed ''hard'' constraints (see Prince & Smolensky 1993:ch.6, ch.8, McCarthy & Prince 1993a: ch 7 for some examples). For example, Gen should admit all kinds of epenthetic structures, even linguistically implausible ones, because the extent and location of epenthesis are fully predicted by constraint interaction.

[6] Observe that any maximal element in the harmonic ordering of $\text{Gen}(in_i)$ is an output for in_i. Typically, there are more than enough relevant constraints to winnow the field to a unique output, but ties for optimal status are not unthinkable.

In this tableau, it is assumed that, given the input /in_k/, Gen supplies at least the candidates k-$cand_1$ and k-$cand_2$. Constraints A and B disagree on these two candidates, and since the A-obeying k-$cand_1$ is optimal, constraint A must dominate constraint B. In this and other tableaux, constraints are shown in domination order and violation-marks are indicated by *. The optimal candidate is called out by ☞, and fatal constraint violations are signalled by !. Below these fatal violations, cells are shaded to indicate their irrelevance to determining the outcome of the comparison at hand.

Another possibility that must be reckoned with is multiple violation of a single constraint, whether as violation at several loci within a single form or as a single violation whose severity is assessed gradiently. Assume that $cand_1$ and $cand_2$ tie on all constraints dominating $\mathbb{C}$ in the following tableau. (A tie occurs when competing forms perform equally on a constraint — equally well or equally poorly: mere failure is never decisive, unless there is another candidate that does better.) In such a case, when the sub–hierarchy dominating $\mathbb{C}$ is ineffective in deciding between $cand_1$ and $cand_2$, due to ties or because $\mathbb{C}$ is top-ranked, then the differences in violation of $\mathbb{C}$ are decisive, selecting $cand_1$ as optimal:

(4) **Multiple Violation**

Candidates	…	$\mathbb{C}$
☞ $cand_1$	…	*
$cand_2$	…	** ! *

No literal *counting* of violation marks is necessary or desirable. Rather, in each pairwise comparison, identical marks are cancelled out, until the marks assigned to one candidate have been exhausted. Thus, $cand_1$ is optimal because it has *fewer* marks with respect to $\mathbb{C}$ than $cand_2$ does. For full formal development of this and other aspects of Optimality Theory, see Prince and Smolensky 1993, especially chapters 5 and 8.

Constraints on the *alignment* of morphological and/or prosodic categories will have a variety of roles in the analyses below. They all conform to the following general schema (McCarthy and Prince 1993b):

(5) **Generalized Alignment** (GA)

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 (**P**rosodic and **G**rammatical categories)

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

Informally, Align(Cat1, …, Cat2, …) says that ‘‘each instance of Cat1 shares a specified edge with an instance of Cat2.’’ For various values of Cat1, Cat2, and of the specified edges, this will typically demand configurations like these:

(6) **Some Typical Aligned Structures**

a. $[_{PrWd}\ [_{Ft}$ Align(Ft, L, PrWd, L)
''Every Ft is initial in PrWd''.
Align(PrWd, L, Ft, L)
''Every PrWd is Ft-initial''. (Itô & Mester 1992)

b. $[_{Stem}[_{Af}$ Align(Af, L, Stem, L)
''Every Affix is a prefix in Stem''.

c. $]_{\sigma}]_{Stem}$ Align(Stem, R, Syll, R)
''Every Stem ends on a syllable edge''. (Prince and Smolensky 1991b, 1993)

d. $]_{PrWd}[_{Af}$ Align(Af, L, PrWd, R)
''Every Affix subcategorizes for a preceding PrWd''.

Generalized Alignment, as formalized in McCarthy and Prince 1993b, unites these various types of alignment, and makes sense of alignment both within a single hierarchy (a, b) and between prosodic and morphological constituents (c, d). It expands on some notions that appear initially in Prince and Smolensky 1991b, 1993 and that are further developed in McCarthy and Prince 1993ab, connecting this with work on sentence phonology by Selkirk (1986) and Chen (1987).[7]

We will also sketch a set of constraints that govern the near-identity relation between a reduplicated string and the base it copies. These constraints, evolved from earlier proposals in McCarthy and Prince 1986, 1993a, are intended to supplant the rules of copying and association in operational theories like that of Marantz (1982).

First, some categories of analysis. The *Reduplicant* R is the actual phonological projection of some reduplicative morpheme RED_i which has a phonologically-unspecified lexical entry. (The term ''reduplicant'' is due to Spring 1990.) The *Base* B is the phonological material to which the reduplicant is attached — for reduplicative *prefixes*, the following structure, and for reduplicative *suffixes*, the preceding structure. Observe that the terms **R**eduplicant and **B**ase refer specifically to structures present in candidate output forms — and not to characteristics of the input. Each pair R, B comes equipped with a *correspondence relation* between R and B that expresses the dependency between the elements of R and those of B. It is the existence of such a correspondence relation that makes a morpheme *reduplicative*. The correspondence relation for each candidate is subject to evaluation by the set of reduplicative constraints.

Correspondence between R and B need not be perfect. Formally, it is often merely a *relation* between R and B rather than a *function* from either one to the other: there can be elements in either R or B that lie outside the correspondence. Thus — to cite examples taken up below — in Diyari *ku⌊ku–ku⌊kuŋa*, the terminal sequence *ŋa* in B corresponds to nothing in R; and in Makassarese *manaʔ–manara*, the reduplicant–final ʔ has no correspondent in B. The goal of correspondence theory is to explain why such reduplicative structures are possible, and to rule out ungrammatical but formally similar variants such as **ku⌊u–ku⌊kuŋa* and **maʔa–manara*, in which an element of the base is skipped over and, in the latter case, replaced by something else.

We will not develop the standard copying–of–the–base + re–analysis approach to describing reduplication (Marantz 1982, McCarthy & Prince 1986, McCarthy & Prince 1988, Steriade 1988), although

[7] For additional developments related to Generalized Alignment, see among others Itô & Mester 1992, Yip 1993, Selkirk 1993, Kisseberth 1993, Lamontagne & Sherer 1993, and Pierrehumbert 1993, as well as the references in McCarthy and Prince 1993b to related work in other frameworks.

this is certainly feasible technically, via a re-construction of the standard faithfulness constraints with the reduplicative domain. Rather, we will assume that Gen can offer up any phonological structure at all as a candidate Reduplicant, so that the burden of determining legitimacy falls on the principles of *correspondence* rather than on rules of templatic association or manipulation of the copied base via processes of truncation and the like.

Various approaches to formalization of the correspondence relation are plausible; here we adopt a highly analytical or atomizing strategy, emphasizing the independence of each of the formally–relevant structural properties. As the basis for the approach, we propose to think of *correspondence* as a function f **from** any *subset* of elements of R **to** B.[8] We will speak of α and β as ‘‘correspondents’’ if one is the image of the other under *correspondence* — if $\alpha = f(\beta)$ or $\beta = f(\alpha)$.

In setting out this version of the correspondence principles, we will use the following standard terminology (described informally here): the *domain* of a function f, which we write Dom(f), is the set of elements that f is defined for or ‘‘applies to’’; the *range* of a function f, which we write Range(f), is the set of elements produced by the function, i.e. the set of y’s such that y = f(x). These terms will help to delimit the substructures of R and of B that stand in correspondence with each other.

We hypothesize that the correspondence function f must always meet the following two constraints, which are therefore part of its definition in Gen.

(7) **Identity**

Correspondents are identical.[9]

$$\text{For } r \in \text{Dom}(f),\ |r| \equiv |f(r)|$$

Whenever the correspondence relation is defined for some element r of the Reduplicant, then r’s correspondent in the Base must be phonologically identical to it. We write $|\alpha|$ for ‘‘the phonological structure of α’’.

(8) **Linearity**

R reflects the precedence structure of B, and vice versa.

$$\text{For } r_i, r_j \in \text{Dom}(f),\ r_i < r_j \text{ iff } f(r_i) < f(r_j)$$

Linearity, as stated, entails that correspondence preserves distinctness of elements — two elements of R cannot correspond to a single element of B, nor can two elements of B correspond to a single element of R. Any two elements of a string will stand in an order relation which is necessarily preserved under linearity. If the statement is generalized to refer to ‘‘≤’’ instead of ‘‘<’’, as is necessary in the domain of tone, then a separate uniqueness condition will be required.

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[8] We will simplify the discussion in two respects. First, we will deal with R and B as strings, rather than full autosegmental/metrical/feature-structure entities. For formal development relevant to the full complexity of phonological structures, see Pierrehumbert and Beckman 1988, Kornai 1991, van Oostendorp 1993. Second, we will speak of f mapping from string to string, while a function properly runs from *set* to *set*. To remedy this imprecision, observe that a string can be regarded as a function from some alphabet ALPH into (say) an initial segment of Z^+ with the usual ordering < on it. So, a string Σ is isomorphic to a set $S = \{(c,i): c \in \text{ALPH}, i \in Z^+\}$, where $a_j \frown a_k$ in Σ iff $(a_j, m), (a_k, m+1) \in S$. We can define f over such sets.

[9] Correspondence turns out to hold between elements that miss perfect identity for principled reasons. In Makassarese *bulam*–*búlaŋ*, for example, *m* surely corresponds to ŋ, even though it is labial because of the following *b*. Similarly, in Sanskrit *pu*–*sp^{h}uṭ*–, *p* and *p^h* must correspond. Such phenomena can be understood as violations of feature-specific constraints akin to MAX, rather than **Identity**, if correspondence is thought of as holding between features rather than entire segments, a refinement whose pursuit will be deferred.

Apart from these two constraints, there will be no *a priori* restrictions on what the reduplicant can be. Since an underlying reduplicative morpheme RED_i is unspecified for intrinsic phonetic content, any linguistic expression whatsoever is a legitimate candidate reduplicant, suitable for evaluation by the system of constraints. (To clarify what is being evaluated, we follow the typographical practice of underlining the reduplicant in any candidate under consideration). This means that Gen supplies an infinite set of candidate reduplicants. For instance, from input /RED+badupi/ Gen will emit a candidate set that includes all of the following forms, where the correspondence function is shown for convenience by co-indexation with arbitrary (but distinct) integers:

(9)	$\underline{b_1a_2d_3}$–$b_1a_2d_3$upi	(R-initial *bad* corresponds to B-initial *bad*)
	$\underline{ba_4d_3}$–ba_4d_3upi	(*b* in R has no correspondent in B)[10]
	$\underline{ʔa_2d_3}$–ba_2d_3upi	(ʔ in R has no correspondent in B)
	<u>toʔ</u>–badupi	(no element of R has a correspondent in B)

Obviously, many candidates meeting Identity and Linearity will be of limited linguistic interest. The last of those in (9), for example, has an unusually unsuitable reduplicant. It will fall to the further reduplication-relevant constraints to sort this diversity of candidates.

These further constraints on the reduplicant/base relation are in principle and in fact violable; hence, they are in Con, and rankable with respect to the other constraints of UG. They fall into two related pairs: those that deal with the structural integrity or *quality* of the reduplicant as a string, and those that deal with the extent of correspondence between base and reduplicant, the *quantity* of copying. First, the structural integrity or qualitative pair, ANCHORING and CONTIGUITY:

(10) ANCHORING

Correspondence preserves alignment in the following sense: the left (right) peripheral element of R corresponds to the left (right) peripheral element of B, if R is to the left (right) of B.

Just as R, qua prefix or suffix, is initial/final in the domain of R+B or B+R (i.e. prefixally/suffixally aligned), so must f(R) be correspondingly initial/final within its own domain. We defer exact formalization, but

$$\exists E\ [\text{Align}(\text{Cat1}, E, R, E)\ \&\ \text{Align}\ (\text{Cat2}, E, f(R), E)]$$

comes close to what we want to say. Cat1 and Cat2 need to be specified, of course, perhaps as the minimal stem-like categories dominating R and B respectively.

Anchoring is by no means inviolable. One kind of example arises from phonological conditioning of exactly the sort to be discussed below, as in Sanskrit $\underline{p_2u_3}$–$sp^h{}_2u_3ṭ$–, where the required simple onset is chosen to maximize the steepness of the sonority cline. The other type involves alignment at the wrong edge, as when a suffixed reduplicant corresponds to the beginning of its base, as in Zuni $č_1o_2ɨ$–$\underline{č_1o_2}$ (Newman 1965:54).

(11) CONTIGUITY

The portion of the base standing in correspondence forms a contiguous string, as does the correspondent portion of the reduplicant.

Range(f) is a single contiguous string, as is Dom(f).

CONTIGUITY is stated in terms of the character of the whole correspondence function, rather than in terms of the elements that the function is based on. Crucially, it does **not** demand that *pairwise adjacency* be preserved in correspondence. It will allow non-correspondence at the edge of the Reduplicant, so long as

[10] The fact that it **could** have a correspondent without struggle is a matter for the constraints to deal with, not for Gen.

the interior material is fully correspondent, so that string relates to string. In line with the strategy of analytical independence, CONTIGUITY leaves all precedence issues to **Linearity**: metathesis in the reduplicant, for example, runs afoul of **Linearity**, which forbids hypothetical *blo-boltu* from having a correspondence function that relates all of *blo* to all of *bol*. If **Linearity** were relaxed, then a correspondence $\underline{b_1l_3o_2}$-$b_1o_2l_3$tu would be admitted; and since it has a string (blo) corresponding to a string (bol), it would violate only **Linearity**, not CONTIGUITY as framed here.

On the one hand, CONTIGUITY forbids *skipping* of elements in B, as in hypothetical *$\underline{p_1a_2t_3u_4}$–$p_1a_2\mathbf{n}t_3u_4$di, where the Range(f) in B is {pa, tu}, two noncontiguous substrings of the base. On the other, it forbids *intrusion* of foreign elements inside R, as in hypothetical $\underline{p_1a_2\mathbf{nt}_3u_4}$–$p_1a_2t_3u_4$di, where Dom($f$) in R is split as {pa, tu}. Observe that the exclusion of the base-ending sequence *–di* from correspondence is perfectly harmless, as it in no way interrupts the contiguity of the corresponding sections. Finer discrimination is possible, and it is conceivable that the two aspects of the constraint should be separated, along these lines:

a. **No Skipping in B**. Any element of B lying *between* elements of B with correspondents in R must itself have a correspondent in R.
Range(f) is a contiguous substring of B.

b. **No Intrusion into R**. Any element of R lying *between* elements of R with correspondents in B must itself have a correspondent in B.
Dom(f) is a contiguous substring of R.

Familiar examples of CONTIGUITY violation include the much-discussed Sanskrit pattern exemplified by $\underline{p_1a_3}$–$p_1ra_3$ch–, $\underline{s_1a_2}$-$s_1n\bar{a}_2$– (Whitney 1889: §590) and Tagalog $\underline{t_1a_3}$-$t_1ra_3$baho, $\underline{b_1o_3}$-$b_1lo_3$aut (Bowen 1969: 358).

We turn now to the constraints governing the extent of correspondence, MAX and BASE-DEPENDENCE.

(12) MAX
Every element of B has a correspondent in R.
Range(f) = B.

Complete satisfaction of MAX is attained in total reduplication. Sub-total reduplication, forced by superordinate templatic or phonological requirements, will necessarily violate MAX. The theory of Eval predicts that violation will be minimal, and therefore that 'copying' will be maximal, limited only by dominating constraints. Such forced violations of MAX will prove to be common.

(13) BASE–DEPENDENCE
Every element of R has a correspondent in B.
Dom(f) = R

Recall that Dom(f) can be a proper substructure of R. Complete satisfaction of BASE-DEPENDENCE is observed, however, when the reduplicant exactly copies a substring of the base. The constraint is violated when non-base-correspondent material shows up in R, as for example in Makassarese *manaʔ–manara*.

Each constraint is responsible for a particular aspect of reduplicant/base identity. All are connected with earlier proposals about reduplication (Marantz 1982, McCarthy & Prince 1986) and with principles of autosegmental phonology generally (Goldsmith 1976, Clements and Ford 1979, McCarthy 1979).

We conclude with a couple of notes on formal properties of the proposed constraints.

First, with reference to ranking–permutations of the constraints: observe that there are logical factors that limit the availability of direct ranking arguments. Because of the intrinisic structure of the entities referred to, free contrasts in violability are not always available. In particular, when either ANCHORING or CONTIGUITY is violated, it follows that there must also be violation of MAX. Further, violation of the no–intrusion subclause of CONTIGUITY entails violation of BASE-DEPENDENCE. Thus, in many cases, crucial ranking will be possible only through transitivity. For cases of this type, see the discussion below of Balangao (§3) and Makassarese (§5 and Appendix).

Second, it is to be observed that there are significant analogies between the constraints governing the base-reduplicant relation (the ‘‘copying’’ constraints) and those governing the input-output relation (the ‘‘faithfulness’’ and alignment constraints). Already noted above is the relation between alignment and ANCHORING. Constraints on *contiguity* appear in the theory of faithfulness, governing epenthesis and deletion (McCarthy & Prince 1993ab, Kenstowicz 1994, Spencer 1993). MAX has effects on the reduplicant similar to those of PARSE-SEG in the input/output domain. BASE-DEPENDENCE parallels FILL in its effects. (See the Appendix for further discussion of this point.) Something like LINEARITY functions in general to forbid metathesis. However, the parallel constraints cannot simply be identified: we show repeatedly below that they function independently in constraint hierarchies. Thus, MAX violation is entirely distinct from violation of PARSE-SEG. It rather appears that the functional parallelism indicates that the cognate constraints are distinct members of the same formal family, in a way that further study of the abstract notion of *correspondence* should make clear.

3. Syllable Unmarkedness

For our first example, we turn to a reduplicative pattern in the Wakashan language Nootka, coming from work by Stonham (1990) and Shaw (1992), based on Swadesh 1937 and Sapir & Swadesh 1939, 1955:

(14) **Nootka CV(:) Reduplication** (Stonham 1990:19, 131; Shaw 1992)

a. Root [CV, *Reduplicant CV-*

ʔu– ʔu– ’i:ħ ‘hunting it’
či– čims– ’i:ħ ‘hunting bear’

b. Root [CV: , *Reduplicant CV:-*

wa:– wa:s– čiɬ ‘naming where...’
ta:– ta:k^{w}a– ’i:ħ ‘hunting only that’

According to Stonham and Shaw, vowel length is transferred from base to reduplicant, but the reduplicant never ends in a consonant. As Shaw argues, a templatic weight restriction cannot explain the absence of a coda, since the reduplicant is sometimes heavy and sometimes light.[11]

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[11] The transfer phenomenon is incorporated directly into an approach to Nootka suggested to us by Andre Isaak. The idea is that a constraint requiring transfer of vowel-length crucially dominates a templatic constraint R=σ_μ (‘‘the reduplicant is a light syllable’’). This forces violation of the template when the base has a long vowel. Though template violation isn’t permitted in standard Prosodic Morphology, it is an option within Optimality Theory (see McCarthy & Prince 1993a: Chapt. 7).

There are difficulties with this approach. For one thing, it does not generalize to other languages, such as Balangao (discussed in detail below) or Tagalog CV: reduplication. For another, the requisite constraint demanding transfer of length is awkward to formulate; something like ‘‘any mora linked to a segment in Range(f) must have a correspondent in Domain(f)’’ seems to be required.

The structure of the reduplicant in Nootka is unmarked relative to the language as a whole. Nootka syllables can have codas, as is apparent from most of the examples cited, but the reduplicant can not. Not having a coda is one aspect of universal syllable unmarkedness (Jakobson 1962, Clements & Keyser 1983, Steriade 1982): there exist languages where **no** syllables have codas and there exist languages where **some** syllables have codas, but no language obliges syllables to have codas.

Prince and Smolensky (1991ab, 1992, 1993) provide a formal account of this and other aspects of syllable unmarkedness within Optimality Theory. The key idea is that constraints like the following are part of universal grammar:

(15) NO-CODA[12]

$*C]_\sigma$

''Syllables may not have codas''

The constraint NO-CODA demands the structure that is unmarked in this respect; when undominated in the grammar of some particular language, it will ensure that **only** the unmarked structure is observed in output forms of that language. If, however, NO-CODA is crucially dominated, then it will be violated in some output forms, and both the marked CVC and the unmarked CV syllable structures will be found.

Since Nootka has some syllables with codas, NO-CODA is crucially dominated. The dominating constraints are those that require faithful parsing of input representations in the output. For present purposes, we will state them entirely informally as follows:

(16) PARSE-SEG[13]

Unsyllabified segments are prohibited.

(17) FILL

Epenthetic structure is prohibited.

(See Prince and Smolensky 1991ab, 1993, McCarthy and Prince 1993a, and McCarthy 1993b for proposals about the formulation of these constraints.[14]) To show that PARSE-SEG and FILL dominate NO-CODA, we need to exhibit a case where faithful parsing of the input leads to a coda in the output, where unfaithful parsing would avoid a coda. Any of the examples in (14) would do:

(18) PARSE-SEG, FILL >> NO-CODA, in Nootka

Candidates	PARSE-SEG	FILL	NO-CODA
a. ☞ .ʔu.ʔu.'iːħ.			*
b. .ʔu.ʔu.'iː.ħ𝕍.		* !	
c. .ʔu.ʔu.'iː.⟨ħ⟩	* !		

Syllable-edges are shown by a period; an epenthetic vowel is written as the hollow 𝕍; an unparsed segment is bracketed. The faithful parse in (a) is optimal, though one of its syllables has a coda. The alternatives in (b) and (c) are less harmonic because they posit unfaithful parses, either epenthetic or incomplete.

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[12] See Sherer 1994 and Itô & Mester 1994 for elaboration of this constraint.

[13] Segments which are not parsed in the output are assigned no phonetic interpretation — effectively, they are deleted.

[14] For present purposes, we do not need to distinguish FILL-NUC, barring epenthetic syllable nuclei, from FILL-MARG, barring epenthetic syllable-margin elements (Prince and Smolensky 1993: 93.)

This much is a straightforward application of familiar aspects of Prince and Smolensky's theory of syllable structure. But, as we noted just above, Nootka has a particular class of syllables that cannot have a coda: syllables in the reduplicative formation exemplified in (14). Significantly, faithfulness — obedience to PARSE-SEG and FILL — is not an issue in the reduplicant, because the content of the reduplicant is freely chosen. Rather, the issue is exactness of correspondence between a freely–chosen reduplicant and its base: ''copying''. The constraint of greatest relevance here is MAX, which requires that every element of the base be echoed in the reduplicant. When MAX is dominated, copying is less than complete. Max is obviously dominated by the templatic constraint R=σ, which limits the reduplicant to a single syllable. In addition, MAX is crucially dominated by NO-CODA, which leads directly to non-copying of a potential syllable coda:

(19) NO-CODA >> MAX, in Nootka, from /RED+čims/

Candidates	NO-CODA	MAX
a. .<u>čim</u>. – čim.s~	** !	*
b. ☞ .<u>či</u>. – čim.s~	*	**

We emphasize that there is no question of a PARSE-SEG violation in (b) — only MAX is violated by incomplete copying in the reduplicant. Unlike accounts of reduplication in which a complete copy of the base is made and then shortened to fit the template (e.g., Marantz 1982, Steriade 1988), the theory laid out in Section 2 above evaluates each candidate reduplicant in its *actual output form*, asking only how successfully it duplicates the base to which it is attached. In this respect, the approach developed here is perhaps closest to the suprafixational models of reduplication in Clements 1985 and Mester 1986.

Nootka is a typical case of emergence of the unmarked. It has codas generally, but not in the reduplicant. This follows from a ranking in which the general faithfulness constraints PARSE-SEG and FILL stand at the top of the hierarchy, dominating the syllable-structure constraint NO-CODA, which itself dominates the parochial reduplicative constraint MAX. Indeed, the analysis of Nootka provides a general model for emergence of the unmarked in the reduplicant: a structural constraint ℂ is ranked *below* the relevant faithfulness constraints but *above* some copying constraint, normally MAX. In just that case, ℂ will be obeyed in the reduplicant, but violated in the language as a whole.

Nootka reduplicative morphology and phonology cannot, of course, be completely rendered in a vignette. Of particular interest is the fact, brought to our attention by Barry Carlson, that codas are included in another reduplicative pattern, one involving total root reduplication. We provisionally interpret this to mean that the constraint R=ROOT (discussed in Section 5) crucially dominates NO-CODA; another view would be that MAX and the other reduplicative constraints can be indexed to specific morphemes or classes of morphemes, rather than to reduplication as whole. We must leave resolution of this issue to further research. Finally, we note that the analysis should be extended to other cases discussed by Shaw (Nitinaht and Ojibwe) as well as to Nahuatl and Tagalog. In the latter, the templatic constraint $R{=}\sigma_{\mu\mu}$ demands heaviness in the reduplicant despite the absence of a coda.

We have shown how syllabic unmarkedness is responsible for the coda-less reduplicant in Nootka. It has been recognized previously that the unmarked structure of syllables plays a role in reduplication. In McCarthy and Prince 1986, we hypothesized a template-type consisting of the unmarked ''core syllable'' structure CV, with simple onset and rhyme, to account for the reduplicative pattern of Sanskrit (*<u>du</u>-druv-*) and other languages. Steriade (1988) proposes to generalize Prosodic Morphology to include reference to a full range of syllabic markedness parameters which, in her account, govern truncation operations that apply to a full copy of the base. For example, Sanskrit *<u>du</u>-druv* is derived by first making a full copy of the base (*<u>druv</u>-druv*) and then subjecting it to truncation operations that correspond to the syllabic markedness parameters that militate against a filled coda (yielding *dru-druv*) and a complex onset (yielding *du-druv*).

But in Steriade's operational approach, syllabification itself is **not** done with reference to syllabic markedness parameters, and the truncation operations, which are peculiar to reduplication, play no role in ordinary syllabification either. As a consequence, the theory does not formally relate the markedness structure of syllables in general to the markedness structure of syllables in the reduplicant. The underlying insight is important, but a new approach is needed to capture it.

Optimality Theory provides the desired coherence. Exactly the same constraint, NO-CODA, is implicated in the theory of syllable markedness, in the actual syllabification of words, and in the emergence of the syllabically unmarked structure of the Nootka reduplicant. Through this single constraint, these various threads are all joined into a unified conception of syllable markedness and syllabification, within and without reduplication.

Under constraint domination, NO-CODA needn't even be true of the whole reduplicant. An interesting twist along these lines is provided by the Austronesian language Balangao, with a σCV reduplicative pattern:

(20) **Balangao Disyllabic Reduplication** (Shetler 1976)

ka +RED + ʔuma	ka– ʔuma– ʔuma	'always making fields'
ka +RED + ʔabulot	ka– ʔabu– ʔabulot	'believers of everything'
ma +RED + taynan	ma– tayna– taynan	'repeatedly be left behind'
maŋ+RED^2+ tagtag	ma– nagta– tagta– tagtag	'running everywhere/repeatedly'

The reduplicant is disyllabic; on this, see the account of Diyari in Section 4 below. The reduplicant mirrors the first two syllables of the base, minus the second syllable's coda, if any. Yet codas are obviously possible in Balangao — even the first syllable of the reduplicant can have one.

The core of the analysis is identical to Nootka. High–ranking faithfulness constraints compel violation of NO-CODA, so the language as a whole permits syllables with codas. But NO-CODA itself crucially dominates MAX, as the following tableau certifies:

(21) NO-CODA >> MAX, in Balangao, from /RED+tagtag/

Candidates	NO-CODA	MAX
a. ☞ .tag.ta.– tag.tag.	***	*
b. .tag.tag.– tag.tag.	****!	

This, then, is a typical case of emergence of the unmarked. The structural constraint NO-CODA stands between faithfulness and MAX in the ranking, so the unmarked coda-less syllable emerges in the reduplicant.

The particular interest of the Balangao example lies in the fact that the reduplicant itself **can** contain a coda, but medially rather than finally. This follows from the articulation of the copying constraints proposed in section 2. Of these, only MAX is crucially dominated, just as in Nootka; the others are unviolated. Every reduplicant begins with the same segment that the base begins with (✓ANCHORING); every reduplicant corresponds to a contiguous substring of the base (✓CONTIGUITY); and every reduplicant consists only of material with correspondents in the base (✓BASE-DEPENDENCE).

The contrast between CONTIGUITY and MAX is crucial. Unlike MAX, CONTIGUITY dominates NO-CODA:

(22) CONTIGUITY >> NO-CODA, in Balangao, from /RED+tagtag/

Candidates	CONTIGUITY	NO-CODA
a. ☞ $\underline{t_1a_2g_3t_4a_5}$ – $t_1a_2g_3t_4a_5g$		***
b. $\underline{t_6a_7t_4a_2}$ – $t_6a_7\mathbf{g}t_4a_2g$	* !	**

The correspondence relation is displayed by means of indices. In form (b), the elements labeled a_7 and t_4 of R have non-adjacent correspondents in the base yet are adjacent in the reduplicant, a violation of CONTIGUITY. The range of f, in short, is not a single contiguous substring of B. This violation, though it spares a NO-CODA mark, is fatal, since CONTIGUITY dominates NO-CODA. Together with the previous tableau, this result shows that CONTIGUITY >> NO-CODA >> MAX. This separation in ranking between the two copying constraints is a freely available option, given the theory laid out in section 2. We will see below, in the discussion of Makassarese, that other reduplicative systems require similar differentiation of the reduplicative constraints.

A less obvious approach to satisfying the templatic constraint is conceivable: full contiguity can be obtained by curtailing the extent to which the reduplicant *corresponds* to the base. Instead of $\underline{t_6a_7t_4a_2}$–, it is possible to posit $\underline{t_6a_7ta}$, or $\underline{t_6a_7bu}$, or $\underline{t_6a_7g_8i}$. Such forms start with a string that corresponds to a contiguous initial section of the base; they go on to fill the templatic requirement with freely chosen material. Such candidates must all violate MAX more severely than *tagta*–; but MAX is irrelevant to the judgment against them, since it is dominated by NO-CODA, on which they all succeed completely and therefore better than coda-ful *tagta*–. The resolution of this issue lies not with MAX, but with its notional converse BASE-DEPENDENCE, which demands that all elements in the *reduplicant* correspond to elements in the base. In Balangao, as noted above, BASE-DEPENDENCE is undominated: every reduplicant consists only of base-correspondents. Thus are all coda-free candidates dismissed.

Balangao, then, displays a subtle refinement of emergence of the unmarked, one whose existence is predicted by the free ranking of constraints that is essential to Optimality Theory, combined with the particular conception of reduplicative constraints in section 2. The unmarked structure is an emergent property of the reduplicant, but not even of the whole reduplicant. Only the second syllable, in which only low-ranking MAX is at stake, is positioned so as to reveal the unmarked coda-less syllable structure.

In the cases discussed, the schematic ranking is Faitfhfulness >> NO-CODA >> MAX, leading to emergence of unmarked syllable structure through incomplete copying. Other syllabic constraints can lead to the emergence of unmarked structure in the reduplicant, as can domination of constraints other than MAX. For our final example of this effect, we will consider what happens when ONSET rather than NO-CODA is the relevant constraint on syllable structure:

(23) ONSET (Itô 1989: 223)

$*[_\sigma V$

''Syllables have onsets''

In conjunction with this, we will consider domination of a constraint on affix–stem alignment, leading to infixation:

(24) ALIGN-R-LEFT

Align(R, Left, Stem, Left)

''The left edge of the reduplicant R coincides with the left edge of the stem.''

''R is a prefix.''

This conceives of the locus of affixation as a *violable* constraint. Crucial domination of ALIGN-R-LEFT by phonological well-formedness constraints can lead to *infixation* of R — violation of the placement constraint — in support of phonologically unmarked structure (Prince and Smolensky 1991b, 1993).

The reduplicative affix of Timugon Murut, an Austronesian language of Malaysia, has precisely this character (McCarthy and Prince 1993ab):

(25) **Timugon Murut Reduplication** (Prentice 1971)

a. ***C-initial Stems: simple prefixation***

bulud	<u>bu</u>– bulud	'hill/ridge'
limo	<u>li</u>– limo	'five/about five'

b. ***V-initial Stems: infixation***

ompodon	om–<u>po</u>– podon	'flatter/always flatter'
abalan	a– <u>ba</u>– balan	'bathes/often bathes'
ulampoy	u– <u>la</u>– lampoy	no gloss

The reduplicant is identical to the first CV sequence of the word, skipping over an initial onsetless syllable, if any. As is shown below (28), the syllabic structure of the reduplicant is less marked than that of the language as a whole (because onsetful). Yet it is not exactness of copying (MAX, BASE-DEPENDENCE) that suffers, but placement of the affix within the stem.

For C-inital roots, both ONSET and ALIGN-R-LEFT can be satisfied fully, and are:

(26) **Timugon Murut Reduplication**. C-initial Words

Candidates	ONSET	ALIGN-R-LEFT
☞ [<u>bu</u>.– bu.lud.		
[bu.- <u>lu</u>.– lud.		** !

Here infixation is nothing more than gratuitous violation of prefixal alignment. But for V-initial roots, ONSET and ALIGN-R-LEFT are in conflict. ONSET is dominant, leading to emergence of unmarked structure in the reduplicant:

(27) **Timugon Murut Reduplication**. V-initial Words

Candidates	ONSET	ALIGN-R-LEFT
[<u>u</u>.– u.lam.poy.	** !	
☞ [u.- <u>la</u>.– lam.poy.	*	*

Ill-alignment spares an ONSET violation, and here must, since ONSET >> ALIGN. But ill-alignment is minimal, as required by Optimality Theory, ruling out **ulam-<u>po</u>-poy*.

To complete the argument, we must reckon with the candidate **<u>u.l</u>-u.lam.poy*, which is in serious contention for optimal status, since it contains no more ONSET violations than *u–<u>la</u>–lampoy* and is fully prefixing. But this form violates the (undominated) templatic constraint R=σ_μ, because the reduplicant *<u>u.l</u>* is more than just a syllable. (See McCarthy and Prince 1993ab for discussion.)

Obedience to ONSET is an emergent property of the Timugon Murut reduplicative morpheme. This is proven by the fact that onsetless syllables are possible in the language as a whole, even word-medially, as the following examples demonstrate:

(28) **Internal Hiatus in Timugon Murut** (page references to Prentice 1971)

ambilú.o	'soul'	''two distinct phonetic syllables'	p. 24
nansú.i	'slanting from vertical'	''both vowels are syllabic''	p. 25
lógo.i	'the price'	''two phonetic syllables''	p. 25

This shows that the faithfulness constraints PARSE-SEG and FILL must dominate ONSET in Timugon Murut. Potential hiatus is not circumvented by either epenthesis or deletion; it is simply accepted as a faithful parse of the input. The full hierarchy is therefore PARSE-SEG, FILL >> ONSET >> ALIGN-R-LEFT.

In summary, we have seen domination of ALIGN or MAX by the syllable-structure constraints ONSET or NO-CODA, leading to a syllabically unmarked reduplicant at the expense of infixation or incomplete copying. Yet, in the cases considered, ONSET or NO-CODA were violated in the language as a whole, under domination by the faithfulness constraints. The unmarked structure emerges in the reduplicant, a possibility afforded by Optimality Theory, because even dominated constraints may be visibly active when the conditions leading to violation are not present.

4. The Unmarked Prosodic Word

Consider the pattern of reduplication observed in Diyari, a language spoken in Australia:

(29) **Diyari** (Austin 1981, Poser 1982, 1989, McCarthy and Prince 1986, 1991ab)

wil̪a	wil̪a– wil̪a	'woman'
kanku	kanku– kanku	'boy'
kuɭkuŋa	kuɭku– kuɭkuŋa	'to jump'
tʲilparku	tʲilpa– tʲilparku	'bird sp.'
ŋankan̪t̪i	ŋanka– ŋankan̪t̪i	'catfish'

Descriptively, the reduplicant is identical to the first syllable of the base plus the initial CV of the second syllable. This description raises a couple of questions: Why must the reduplicant end in a vowel? Why must it be disyllabic, and not shorter or longer?

The answer to the first question is that the reduplicant is a free–standing Prosodic Word (PrWd), and all PrWd's of Diyari are vowel–final. According to Austin, both the reduplicant and the base bear their own primary word–stresses: *kánku–kánku*, *tʲílpa–tʲílparku*. This is determined impressionistically and confirmed by the fact that they each have vowel and consonant allophones that are diagnostic of primary stress. Therefore, the structure of a typical Diyari reduplicated word is as follows:

(30) $[\ \underline{\text{t}^{j}\text{ilpa}}]_{\text{PrWd}}\ [\text{t}^{j}\text{ilparku}]_{\text{PrWd}}$

The reduplicant is vowel–final because it is a PrWd, and must therefore conform to any unviolated requirement on PrWd's of Diyari.[15]

Several different answers have been given to the second question, about the disyllabic target. According to Poser, the templatic target in Diyari reduplication is a foot. The stress pattern of simplex words locates main stress on the initial syllable and secondary stress on every odd non–final syllable

[15] This requirement is itself an interesting one. One possible analysis involves the following constraint-ranking for Diyari:

OUTPUT-CONTIGUITY >> NO-CODA >> PARSE-SEG

By Output-Contiguity, we mean *x⟨y⟩z (cf. Kenstowicz 1993, Rosenthall 1994). This is the converse of the anti-medial-epenthesis sense of contiguity in McCarthy and Prince 1993a: 50 and Kenstowicz 1994. It is cognate, in input/output terms, to the ''No-Skipping'' clause of reduplicative CONTIGUITY.

thereafter. This pattern is typical of a trochaic, disyllabic foot, as in the following examples:

(31) (káɳa) 'man'
(pína)du 'old man'
(ŋánda)(wàlka) 'to close'

With a syllabic trochee foot in the language as a whole, a foot template correctly entails disyllabicity of the reduplicant.

A somewhat more abstract account of the Diyari template is given in our earlier work, which proposes that the template is a *minimal word* of the language. This subsumes the requirement that it be a free–standing PrWd together with the requirement that it be disyllabic. Every PrWd must contain a foot — this is demanded by the Prosodic Hierarchy (Selkirk 1980ab, McCarthy and Prince 1986, 1991ab, Itô and Mester 1992). Every foot is minimally binary, as the following constraint ensures:

(32) FT-BIN (Prince 1980, McCarthy and Prince 1986, Hayes 1991)
Feet are binary under syllabic or moraic analysis.

With no distinctions of weight, feet are **syllabically** binary. That is the case in Diyari.

This still leaves unanswered the question of *why* the minimal word should be a possible reduplicative template. Linguistic theory ought to provide more than a heterogenous list of the reduplicative templates that happen to be observed in various languages. We propose here to explain why the Diyari reduplicant is identical to the minimal word of the language, without invoking the notion of minimality at all.

To do this, we require some background about a particular aspect of prosodic theory as developed within OT (Kirchner 1993, McCarthy and Prince 1993b). Recall the stress pattern of Diyari, as illustrated in (31): pairs of syllables are parsed into feet from left to right (σσ)(σσ)σ. The following constraints are responsible for this effect:

(33) ALL-FT-LEFT
Align(Ft, L, PrWd, L)
''Every foot stands in initial position in the PrWd.''

(34) PARSE-SYLL[16]
Every syllable belongs to a foot.

With the ranking PARSE-SYLL >> ALL-FT-LEFT, the pattern of directional footing observed in Diyari is obtained. According to ALL-FT-LEFT, all feet should be **at** the left edge. But dominance of PARSE-SYLL requires that the form be fully footed (subject only to FT-BIN). Under minimal violation of ALL-FT-LEFT, a multi-foot form must have its feet **as close to** the left edge as possible. In right-to-left footing, ALL-FT-RIGHT — the symmetric counterpart of ALL-FT-LEFT — is the active constraint. (See McCarthy and Prince 1993b, elaborating on the proposal of Kirchner 1993, for further development.)

In a form like (σσ)(σσ)σ, both PARSE-SYLL and ALL-FT-LEFT are violated. PARSE-SYLL is violated because there is always an unparsed syllable in odd-parity words, to preserve FT-BIN, which is undominated in this language. ALL-FT-LEFT is violated because the non-initial foot is misaligned. Both constraints can, however, be obeyed fully. In that case,

- every syllable is footed, and (PARSE-SYLL is obeyed)
- every foot is initial. (ALL-FT-LEFT is obeyed)

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[16] Cf. the account of exhaustivity requirements in Liberman and Prince (1977:266, 294), Prince 1980:535, Halle and Vergnaud 1987, and Hayes 1987.

Only one configuration meets both of these requirements, the minimal word, since it has a single foot that parses all syllables and is itself properly left-aligned:

$[\ \text{Ft}\ ]_{\text{PrWd}}$ *i.e.* $[\ (\sigma\ \sigma)_{\text{Ft}}\ ]_{\text{PrWd}}$ or $[\ (\mu\mu)_{\text{Ft}}\ ]_{\text{PrWd}}$

Thus, the minimal word is the most harmonic PrWd possible, with respect to PARSE-SYLL and ALL-FT-LEFT — indeed, with respect to every form of Ft/PrWd alignment.[17] Of course, the single foot contained within the minimal word is optimally binary, because of FT-BIN. Hence, the most harmonic PrWd (with respect to these metrical constraints) is a disyllable in any language that does not make quantitative distinctions.

We return now to Diyari. Recall that the reduplicant is a free-standing PrWd, as evidenced by its stress behavior and vowel-final status. This is, in fact, **all** that needs to be said about the Diyari reduplicant:

(35) **Templatic Constraint**
R=PRWD
‘‘The reduplicant is a prosodic word.’’

There is no mention of the ‘‘minimal word’’ in this *or in any other* templatic requirement.[18] Rather, minimalization follows from the high rank of PARSE-SYLL and ALL-FT-LEFT/RIGHT. If the base of reduplication is greater than a minimal word, the reduplicant will contain a less-than-complete copy, violating MAX but obeying high-ranking PARSE-SYLL and ALIGN-FT.

Consider first MAX-violation under domination by PARSE-SYLL:

(36) PARSE-SYLL >> MAX, from /RED+t^jilparku/

	PARSE-SYLL	MAX
a. ☞ $[\ (\underline{t^j\text{ilpa}})_{\text{Ft}}\ ]_{\text{PrWd}} - [\ (t^j\text{ilpar})_{\text{Ft}}\ \text{ku}\ ]_{\text{PrWd}}$	*	***
b. $[\ (\underline{t^j\text{ilpar}})_{\text{Ft}}\ \underline{\text{ku}}]_{\text{PrWd}} - [\ (t^j\text{ilpar})_{\text{Ft}}\ \text{ku}\ ]_{\text{PrWd}}$	** !	

Form (b) is a perfect copy, but it also involves an extra PARSE-SYLL violation. Less-than-full copying is available that avoids this unparsed syllable, and, as (a) shows, this is more harmonic.

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[17] Some additional refinements are possible, leading to further results. First, under Align(Stem, E, PrWd, E), the *stem* must match the PrWd. Hence, the most harmonic *stem* with respect to alignment is MinWd-sized. This effect is commonly seen in phenomena analyzed as prosodic circumscription, prosodic delimitation, and root-and-pattern morphology (McCarthy and Prince 1990ab, 1993ac). It can also be compared to Itô and Mester’s (1993b) analysis of Sino-Japanese stems: Align-Left(Stem,Ft) & Align-Right(Stem, Ft) & Align-Left(σ, Stem) ≈ stem consists of whole number of feet and is monosyllabic.

Another refinement: Suppose ALIGN-FT is obeyed fully, and PARSE-SYLL is violated minimally. The resulting configuration is $[\ \text{Ft}\ \sigma\ ]_{\text{PrWd}}$ or $[\ \sigma\ \text{Ft}\ ]_{\text{PrWd}}$, depending on whether ALIGN-FT-LEFT or ALIGN-FT-RIGHT is active. This is the *loose minimal word* of McCarthy and Prince (1991ab, 1993c) (cf. also Itô, Kitagawa, and Mester 1992).

[18] This proposal was originally made in McCarthy and Prince (1991ab), where it was argued that (the equivalent of) R = PrWd **always** calls the minimal expression of PrWd. The proposal laid out in the text can be seen as providing a rationale for **why** this is so. Observe too the abstract formal connection with Itô and Mester’s (1992:16) analysis of Japanese word clippings: all are just PrWd, with various special structural properties following from other requirements (Word Binarity, Edge Alignment).

The ''minimalization'' of the reduplicant follows from this ranking. Other seemingly plausible candidates fare no better against (a). Consider these, for example, which violate undominated constraints:

▸[(**t^jil**)]-[(t^jilpar)ku]	▹violates FT-BIN.
▸[(**t^jilpar**)]-[(t^jilpar)(ku)]	▹violates the requirement, unviolated in Diyari, that all PrWd's are V-final.
▸[(**t^jil**-t^jil)(parku)]	▹violates the templatic constraint R=PRWD.
▸[(**t^jilpar**) (**ku**-t^jil) (parku)]	▹violates the templatic constraint R=PRWD.
▸[**t^jil**]-[(t^jilpar)ku]	▹contains a foot-less (hence head-less) PrWd, contrary to the requirements of the Prosodic Hierarchy.

The failure of such candidates ensures the validity of the ranking argument just given.

A parallel ranking argument can be constructed for ALL-FT-LEFT and MAX, using a quadrisyllabic root as input. (Unfortunately, no reduplicated quadrisyllables are cited by Austin, so this example is hypothetical.)

(37) ALL-FT-LEFT >> MAX, from (hypothetical) /RED+ŋandawalka/

	ALL-FT-LEFT	MAX
a. ☞ [(<u>ŋanda</u>)$_{Ft}$]$_{PrWd}$ –[(ŋanda)$_{Ft}$ (walka)$_{Ft}$]$_{PrWd}$	*	*****
b. [(<u>ŋanda</u>)$_{Ft}$ (<u>walka</u>)$_{Ft}$]$_{PrWd}$ –[(ŋanda)$_{Ft}$ (walka)$_{Ft}$]$_{PrWd}$	** !	

In (b), the reduplicant fatally violates ALL-FT-LEFT, since it contains an unaligned foot, while form (a) spares that violation by less-than-full copying. Another failed candidate, **(<u>ŋanda</u>)<u>wa</u>-(ŋanda)(walka)*, incurs a fatal violation of PARSE-SYLL, which also dominates MAX, as was just demonstrated.

Both ALL-FT-LEFT and PARSE-SYLL are fully obeyed by the reduplicant, and this explains why it is minimal-word-sized. There is no need for a minimal-word template; rather, the templatic requirement is simply the Prosodic Word, with ''minimalization'' obtained from constraint interaction, via the ranking PARSE-SYLL, ALL-FT-LEFT >> MAX.

In contrast to the reduplicant, ordinary stems of Diyari (including the base of reduplication), may violate PARSE-SYLL and/or ALL-FT-LEFT. Ordinary stems must honor the commitment to their underlying segmentism — that is, they must obey the constraint PARSE-SEG, which requires faithful parsing of the input segments, even at the expense of metrical imperfection. This is a far more weighty matter than incomplete copying, which is only a violation of low-ranking MAX. Schematically, the ranking is as follows;

(38) Schematic Ranking and Illustration

a. Ranking

PARSE-SEG >> PARSE-SYLL, ALL-FT-LEFT >> MAX

b. Illustration[19]

	Parse-Seg	Parse-Syll	Max
a. ☞ [($\underline{\text{t}^{j}\text{ilpa}}$)$_{Ft}$]$_{PrWd}$ – [(t^{j}ilpar)$_{Ft}$ ku]$_{PrWd}$		*	***
b. [($\underline{\text{t}^{j}\text{ilpa}}$)$_{Ft}$]$_{PrWd}$ – [(t^{j}ilpar)$_{Ft}$]$_{PrWd}$ ⟨ku⟩	** !		*

Non-parsing of the segmental string *ku* in (b) spares a Parse-Syll violation, but is nonetheless fatal, since it violates dominant Parse-Seg. As usual, low-ranking Max is irrelevant. A parallel argument can be constructed involving All-Ft-Left, which could also be obeyed, in principle, by failing to parse strings of segments that would amount to an entire non-initial foot.

This, then, is a paradigm case of the emergence of the unmarked. In the Diyari language as a whole, the constraints Parse-Syll and All-Ft-Left are violated freely, under compulsion of higher-ranking constraints. In particular, violation of Parse-Syll and All-Ft-Left is inevitable in the face of the higher-ranking faithfulness constraint Parse-Seg. Yet in the reduplicant, Parse-Syll and All-Ft-Left are obeyed strictly, forcing disyllabicity. That is, in the reduplicant, where only low-ranking Max is at stake, the structure that is unmarked with respect to Parse-Syll and All-Ft-Left emerges, revealing itself under just these conditions.

These observations further reflect on two other main points of the discussion. First, there is no ‘‘parametrization’’ in the usual sense, where constraints can be shut off, all or nothing in particular grammars. Though Parse-Syll and All-Ft-Left are false as statements about Diyari as a whole, they are true in the limited domain of the reduplicant, precisely where they can be true, given the interaction with Parse-Seg and Max. Second, the optimal candidate is in no sense literally perfect — to achieve the most harmonic PrWd with respect to syllabic parsing and foot alignment, it is necessary to accept an untrue copy of the base. The practitioner of the Fallacy of Perfection can only be puzzled: if the reduplicant is unmarked, then reduplication must surely be total; and if grammar demands the optimal PrWd whenever a PrWd is needed, then surely the perfect disyllabic PrWd must be everywhere required in the language. But, as we have emphasized, markedness is reckoned along many dimensions and, with ranking, one dimension is favored over another when conflict develops. The fallacious claims proceed from focusing exclusively, and unsupportably, on a single dimension of evaluation and forgetting all the rest. In the case at hand, the Fallacy-of-Perfectionist would want to ignore the structural constraints on the reduplicant, seeing only Max; and, in complementary fashion, overlook the faithfulness constraints on the general parse, seeing only the structural constraints assessing prosody.

There are also significant typological conclusions that can be drawn from these observations. One involves the distinction between minimal word reduplication and full PrWd reduplication. Given the templatic constraint R=PrWd and the ranking Parse-Syll, All-Ft-Left >> Max, the result is partial reduplication of supraminimal bases, as in Diyari. But the opposite ranking of these constraints is also possible, and will lead to total reduplication, even at the expense of including unparsed syllables or unaligned feet in the reduplicant. An example of this permuted ranking is Indonesian, substituting All-Ft-Right for All-Ft-Left (since Indonesian stress has the opposite directional sense from Diyari):

[19] Form (b) incurs one Max violation under the assumption that only parsed segments of the base must be copied. This assumption is obviously not essential to the argument, since Max plays no crucial role in determining the outcome in this case.

(39) **Total Reduplication in Indonesian** (Cohn 1989, Cohn and McCarthy in prep.)[20]

Reduplicative Pattern	*Reduplicant Violates*	*Gloss*
[(búku)] [(búku)]	Nothing	'books'
[wa(níta)] [wa(níta)]	PARSE-SYLL	'women'
[(màša)(rákat)] [(màša)(rákat)]	ALL-FT-RIGHT	'societies'

See the references cited for evidence of the foot and PrWd bracketing. In Indonesian and similar cases, MAX is obeyed fully, though the reduplicant is clearly not the most harmonic PrWd with respect to syllable-parsing and foot-alignment. In general, total reduplication is found when MAX dominates any constraint that could compel incomplete copying.

Another typological conclusion emerging from this work involves the overall structure of the constraint ranking proposed for Diyari: PARSE-SYLL, ALL-FT-LEFT >> MAX. In this ranking, constraints on prosodic well-formedness, dealing with parsing and alignment, dominate a constraint on morphological well-formedness, MAX. This is a particular instance of the general ranking schema **P** >> **M** (McCarthy and Prince 1993a: Ch. 7), which characterizes *all* of prosodic morphology. In Diyari specifically and in prosodic morphology generally, one or more prosodic constraints **P** dominate some morphological constraint **M**, leading to prosodic conditioning of the morphological construction to which **M** pertains. In the case of Diyari, the dominant **P** constraints include PARSE-SYLL and ALL-FT-LEFT. The crucially dominated **M** constraint is MAX.

A final typological result concerns the theory of reduplicative templates. Through the contrast between Diyari and Indonesian, we have shown that a single templatic constraint, R=PRWD, is responsible for both minimal–word reduplication and total PrWd reduplication, the differences following from the ranking of other constraints. This simplifies the theory of templates, by eliminating the distinction between the minimal PrWd and the greater than minimal one (after McCarthy and Prince 1991ab). This will have broad consequences for the general theory of possible templates. As with the NO-CODA and ONSET effects discussed in section 3, this result points in the direction of a highly simplified templatic vocabulary, with further particularities understood as the result of interaction between the reduplicative constraints and the constraints of structural well-formedness that independently define the grammar of phonological form.

5. The Optimal Reduplicant in Makassarese

From Diyari we turn northward to Makassarese, an Austronesian language of South Sulawesi province, Indonesia. All of the information we have about Makassarese and our basic understanding of the system come from the fundamental contributions of Aronoff, Arsyad, Basri, and Broselow (1987). We will sketch the main elements of the analysis here, returning in the Appendix to fill in the remaining details.

First, some background. Makassarese has no long vowels or diphthongs, so each vowel is the nucleus of a separate syllable. The only licit word-final codas are ŋ and ʔ. Medially, codas are limited to a nasal, to the first half of a geminate sonorant, and to glottal stop. Coda nasals are homorganic to a following consonant, and coda ʔ is realized as gemination of a following voiceless stop. We abstract away from these assimilations in the reduplicative examples. Stress falls on the penultimate syllable, except that epenthetic vowels are ignored. The foot, therefore, is a disyllabic trochee, and the minimal word is disyllabic too, as predicted by metrical theory.

We begin with an analysis of epenthesis in Makassarese, since this will greatly illuminate the reduplicative system. The basic fact is that word-final consonants other than the permissible codas ŋ or ʔ are parsed epenthetically:

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[20] We make the arbitrary assumption that the reduplicant is prefixed in Indonesian.

(40) **Epenthesis in Makassarese**

/rantas/	rántasaʔ	'dirty'	
/teʔter/	téʔtereʔ	'quick'	[téttereʔ]
/jamal/	jámalaʔ	'naughty'	

The added vowel is sufficient to parse *s*, *r*, or *l* as an onset, not a coda. So why the final epenthetic ʔ in addition? Vowel-final words are parsed faithfully, without epenthetic ʔ:

(41) **Faithful Parse of V-Final Root**

/lompo/	lómpo	'big'
	*lómpoʔ	

Beyond the obvious conditions on syllable structure, some additional constraint must be responsible for final glottal stop, and its scope of action must somehow be limited to words that require vowel epenthesis in any case.

One part of the analysis is a constraint, undominated in Makassarese, that expresses the limitation on possible codas:

(42) CODA-COND (Itô 1989, Yip 1991)
A syllable-final consonant is Place-less.

This constraint, stated informally, limits free-standing codas to ŋ and ʔ, assuming that both are Place-less. (On ŋ as the Place-less nasal in codas, see Trigo 1988. Other assumptions about the representation of ŋ and ʔ and about the formulation of CODA-COND would serve just as well.) Medial clusters, in which the coda consonant must share Place with a following consonant, are also assumed to satisfy CODA-COND; see Itô 1986, 1989, Goldsmith 1990, Yip 1991, and especially Itô and Mester 1993a.

CODA-COND dominates FILL,[21] to account for epenthesis in stems that end in consonants other than ʔ and ŋ:

(43) CODA-COND >> FILL, from /rantas/

Candidates	CODA-COND	FILL
a. ☞ ran.ta.saʔ.		**
b. ran.tas.	* !	

As is apparent from this tableau, epenthesis of glottal stop together with the vowel appears to incur a gratuitous violation of FILL. The explanation lies with another constraint, which must also dominate FILL:

(44) FINAL-C
Align(PrWd, Right, Consonant, Right)
''Every PrWd is consonant-final.''

The requirement that some constituent end in a consonant is attested fairly commonly — see McCarthy and Prince 1990b, Piggott 1991, and McCarthy 1993a for discussion and exemplification. Here, we formulate the constraint in terms of Generalized Alignment. Alternatively, it might be connected with an even more common property of final syllables, the neutralization of weight contrasts.[22]

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[21] Recall that we are lumping FILL-NUC and FILL-MARG together.

[22] For recent discussion, see Hung 1992, in preparation, and Itô and Mester 1992, 1993b.

By dominating FILL, FINAL-C compels epenthesis of a final consonant, as the following tableau shows:

(45) FINAL-C >> FILL, from /rantas/

Candidates	FINAL-C	FILL
a. ☞ rantasaʔ		**
b. rantasa	* !	*

But with FINAL-C visibly active, why are stems like /lompo/ faithfully parsed as *lompo*, and not *lompoʔ*? The answer lies with one remaining constraint, which governs the alignment of stem and syllable edges:

(46) ALIGN-STEM-RIGHT
Align(Stem, Right, Syllable, Right)
''The stem ends exactly at a syllable edge.''

This constraint, based upon an earlier proposal by Prince and Smolensky (1991b, 1993) and formalized in terms of Generalized Alignment (McCarthy and Prince 1993b), requires that stem and syllable end together. The stem is a morphological constituent, whose composition is determined at underlying representation, without regard to phonological developments in the output — e.g., the stem of *jamalaʔ* is *jamal*.[23] The syllable, though, is a phonological constituent, whose composition is determined in the output, taking into account all Gen-mediated phonological developments. Therefore, if ALIGN-STEM-RIGHT is to be obeyed, stem-final epenthesis must be avoided, so that the right edges of stem and syllable coincide, and the stem-final segment is also syllable-final, as in *lompo̲* but not **lompo̲ʔ*. (For applications of ALIGN-STEM-RIGHT in other languages, see Prince and Smolensky 1993: Chapt. 7 and McCarthy and Prince 1993a: Chapt. 5.)

The constraint ALIGN-STEM-RIGHT stands between CODA-COND and FINAL-C in the ranking, as tableaux (47) and (48) demonstrate:

(47) CODA-COND >> ALIGN-STEM-RIGHT

Candidates	CODA-COND	ALIGN-STEM-RIGHT
a. ☞ ja.ma.l|aʔ		*
b. ja.mal|.	* !	

In (47), the right edge of the stem is shown by |; syllable boundaries are indicated by a period. CODA-COND, undominated, is always obeyed — that is, there is always a candidate that meets it, and no constraint can compel violation of it. Obedience to CODA-COND is obtained even at the expense of ill-alignment, hence the ranking CODA-COND >> ALIGN-STEM-RIGHT.[24]

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[23] This follows from ''Consistency of Exponence'' in McCarthy and Prince 1993ab.

[24] Underparsing the final consonant would still be unaligning: **ja.ma.⟨l⟩*/. In any case, underparsing appears never to be an option in Makassarese, so PARSE-SEG is presumably undominated.

(48) ALIGN-STEM-RIGHT >> FINAL-C

Candidates	ALIGN-STEM-RIGHT	FINAL-C
a. ☞ lom.po|.		*
b. lom.po|ʔ.	* !	

Tableau (48) shows that stems are end-aligned, except when CODA-COND is at issue. This means that vowel-final stems are faithfully parsed, without epenthetic ʔ, which would de-align the stem.

In summary, the full hierarchy of constraints relevant to epenthesis in Makassarese is this:

(49) **Ranking**

CODA-COND >> ALIGN-STEM-RIGHT >> FINAL-C >> FILL

The interaction of these constraints with one another is rendered somewhat clearer when full tableaux are considered. The first is for /lompo/ → *lompo*.

(50) **Exemplificatory Tableau for /lompo/**

	CODA-COND	ALIGN-STEM-RIGHT	FINAL-C	FILL
a. ☞ lompo|.			*	
b. lompo|ʔ.		* !		*

Despite FINAL-C, vowel-final stems cannot suffer epenthesis. Both candidates derived from /lompo/ obey CODA-COND, so their fate is decided by ALIGN-STEM-RIGHT, which selects the well-aligned and faithfully-parsed (a). Hence, FINAL-C can have no effect.

The second tableau is for /jamal/ → *jamalaʔ*.

(51) **Exemplificatory Tableau for /jamal/**

	CODA-COND	ALIGN-STEM-RIGHT	FINAL-C	FILL
a. ☞ jamal|aʔ.		*		**
b. jamal|a.		*	* !	*
c. jamal|.	* !			

In accord with FINAL-C, non-codaic stem-final C's evoke appearance of *both* V and ʔ. Of the candidates derived from /jamal/, (c) violates undominated CODA-COND, immediately fatal. Forms (a) and (b) **tie** by obeying CODA-COND, and they also **tie** on ALIGN-STEM-RIGHT, since the stem-final consonant is not syllable-final.[25] Forms (a) and (b) are therefore definitively distinguished by FINAL-C, which forces the epenthetic ʔ.

This is one respect in which unmarked structure emerges in Makassarese epenthesis. Makassarese has vowel-final words, because ALIGN-STEM-RIGHT is high-ranking, forcing faithful parsing of the (underlying) stem-final segment, whether it is a vowel or a consonant. But when violation of ALIGN-STEM-RIGHT is inevitable anyway, forced by the even higher-ranking CODA-COND, the unmarked consonant-final word-shape emerges, via epenthesis. What makes consonant-final words ''unmarked'' is precisely the fact that there is a constraint demanding them, FINAL-C. What makes this an emergent property of the system is that FINAL-C is not visibly active in the language as a whole, because it is crucially dominated by ALIGN-STEM-RIGHT.[26] This ranking means that FINAL-C is visibly active only when the alignment requirement is not at issue, because it must be violated anyway.[27]

From epenthesis we turn to reduplication in Makassarese. The data we will analyze at this stage are given immediately below; further data and analysis can be found in the Appendix.

(52) **Reduplication in Makassarese**

a. ***Exact*** *Reduplication of Disyllabic Unsuffixed Roots*

/batu/	<u>batu</u>-bátu	'small stone(s)'	
/golla/	<u>golla</u>-gólla	'sweets'	
/tau/	<u>tau</u>-táu	'doll'	
/tauŋ/	<u>tauŋ</u>-táuŋ	'yearly'	[taun-tauŋ]
/ballaʔ/	<u>ballaʔ</u>-bállaʔ	'little house'	
/bulaŋ/	<u>bulaŋ</u>-búlaŋ	'monthly'	[bulam-bulaŋ]

b. **ʔ*-final*** *Disyllabic Reduplication of Longer Roots*

/manara/	<u>manaʔ</u>-manára	'sort of tower'
/balao/	<u>balaʔ</u>-baláo	'toy rat'
/baine/	<u>baiʔ</u>-baíne	'many women'

The reduplicant is always disyllabic, throughout (52). There are two different ways in which the disyllabic reduplicant is satisfied. One possibility, seen in (a), is **exact** reduplication of a disyllabic root. This occurs only with roots that are themselves disyllabic. In all other cases ((b) and others discussed in the Appendix) the reduplicant and root disagree in size — the reduplicant is still disyllabic, but the root consists of more than two syllables. In just this case, a ʔ-final reduplicant invariably appears (Aronoff, Arsyad, Basri, and Broselow 1987), violating not only MAX but also BASE-DEPENDENCE, since the reduplicant contains a segment ʔ that lacks a correspondent in the base.

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[25] Since (a) and (b) tie on ALIGN-STEM-RIGHT, violation must be reckoned categorically, or by syllables or moras, not segments. Developing a principled understanding of the conditions for gradient versus categorical enforcement of constraints (and of what units determine degree of violation) is central to the OT research program, and amassing cases like the present one is a necessary empirical prerequisite to that goal.

[26] Eric Baković has brought to our attention an interesting near mirror-image-symmetrical prediction of the theory. ALIGN-STEM-LEFT can inhibit the appearance of onset-supplying epenthesis initially (McCarthy & Prince 1993a), but this is contingent upon the success of initial alignment. There should be then cases where initial *vowel*-epenthesis is nevertheless required, say in stems /CC.../, due to domination of ALIGN-STEM-LEFT. In just such cases, initial onset-supplying epenthesis is predicted to show up.

[27] There is another respect in which epenthesis reveals emergent unmarked structure. Why is the epenthetic consonant glottal stop? This question is addressed in the Appendix.

One essential feature of the analysis is the templatic constraint R=PRWD, which entails disyllabicity of the reduplicant through constraint interaction. Like Diyari, the Makassarese reduplicant is the most harmonic PrWd with respect to the prosodic constraints ALIGN-FT and PARSE-SYLL. Therefore, as we showed in section 4, PARSE-SYLL and ALIGN-FT-RIGHT dominate MAX in the grammar of Makassarese.

Further constraints are required to segregate the root-copying reduplicants of (a) from the ʔ-final reduplicants of (b). One factor clearly involved is **identity** of the root and the reduplicant. Where identity is impossible — because the reduplicant and root must differ in size — then the reduplicant is ʔ-final. The constraint responsible for differentiating these two types of reduplication is R=ROOT (cf. McCarthy and Prince 1993a: Ch. 5):

(53) R=ROOT

'The reduplicant is identical to the root.'

f(R) *is a* Root.

This constraint, understood categorically, separates those forms with an exact match between reduplicant and root from those in which the reduplicant and root must differ. The ʔ-final reduplicant is found whenever R=ROOT is violated.

R=ROOT is violated when requirements of reduplicant size override it. It is therefore rankable with respect to the constraints responsible for reduplicant size, PARSE-SYLL, ALIGN-FT-RIGHT, and R=PRWD. We show this with polysyllabic roots like those in (52b):

(54) PARSE-SYLL >> R=ROOT

Candidates	PARSE-SYLL	R=ROOT
a. ☞ [(**<u>manaʔ</u>**)]–[ma(nara)]	*	*
b. [**<u>ma(nara)</u>**]–[ma(nara)]	** !	

(55) R=PRWD >> R=ROOT

Candidates	R=PRWD	R=ROOT
a. ☞ [(**<u>manaʔ</u>**)]–[ma(nara)]		*
b. [(**<u>mana)(ra</u>**–ma)(nara)]	* !	

Using a quadrisyllabic root, a parallel argument can be constructed for the ranking ALIGN-FT-RIGHT >> R=ROOT.[28] In summary, the constraints are ranked as follows:

(56) **Interim Ranking**

R=PRWD, PARSE-SYLL, ALIGN-FT >> R=ROOT

The first three constraints yield disyllabicity of the reduplicant, just as in Diyari. By dominating R=ROOT, they guarantee inexact copying of roots longer than two syllables.

[28] This assumes that Makassarese has ''iterative'' footing, like Diyari. But non-iterative footing is also possible, following from the ranking ALIGN-FT > PARSE-SYLL (Kirchner 1993, McCarthy and Prince 1993b). In that case, PARSE-SYLL is the constraint responsible for disyllabicity of R even when B is quadrisyllabic.

It is just when the root can't be copied exactly that the reduplicant is ʔ-final. The explanation for this is closely related to the account of final ʔ-epenthesis in words like /jamal/ or /rantas/. In epenthesis, final ʔ emerges in satisfaction of FINAL-C. But FINAL-C is violated under domination by ALIGN-STEM-RIGHT, so there is no ʔ-epenthesis with V-final stems. In parallel fashion, the final ʔ in the reduplicant satisfies FINAL-C, since the reduplicant is itself a PrWd, by virtue of the undominated constraint R=PRWD. But some reduplicants must violate FINAL-C, under domination by R=ROOT:[29]

(57) R=ROOT >> FINAL-C

Candidates	R=ROOT	FINAL-C
a. ☞ [batu]–[batu]		**
b. [batuʔ]–[batu]	* !	*

The reduplicant in form (b) obeys FINAL-C, but at the expense of non-identity between root and reduplicant, fatally violating R=ROOT.

But when R=ROOT must be violated anyway, because of domination by any of the constraints listed in (56), the preferred consonant-final reduplicant emerges. That result is shown by the following tableau, which combines the various constraints responsible for the optimality of the ʔ-final reduplicant:

(58) Trisyllabic Root with Disyllabic ʔ-final R, from /RED+manara/

	PARSE-SYLL ALIGN-FT R=PRWD	R=ROOT	FINAL-C
a. ☞ [(manaʔ)]-[ma(nara)]	*	*	*
b. [(mana)]-[ma(nara)]	*	*	** !
c. [ma(nara)]-[ma(nara)]	** !		**

With trisyllabic or longer roots, R=ROOT is mooted by the higher-ranking PrWd restrictors, which exclude the perfect root-copy (c) by forcing a disyllabic reduplicant. All of the disyllabic reduplicants **tie** on R=ROOT, so the decision falls to FINAL-C, forcing the unmarked C-final PrWd shape. Moreover, since (a) violates BASE-DEPENDENCE, but (b) obeys it, FINAL-C crucially dominates BASE-DEPENDENCE, so it can force the final ʔ of the reduplicant which has no correspondent in the base.

But when the root is disyllabic, it can be copied exactly, and must be, even at the expense of FINAL-C violation. The next two tableaux illustrate this:

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[29] ALIGN-STEM-RIGHT is irrelevant to the form of the reduplicant, since all reduplicants are equally well aligned, because the underlying reduplicative morpheme is phonologically unspecified. See McCarthy and Prince (1993a: 67).

Alternatively, if the reduplicant echoes the morphological structure of the base whenever possible, so the reduplicant is maximally identical to the root both segmentally and morphologically, then ALIGN-STEM-RIGHT will apply to any reduplicant that is phonologically *identical* to its base, because in just that case the reduplicant can be assigned the bases's morphological category. This correctly prohibits the mis-aligning ʔ without the stipulated ranking R=ROOT > FINAL-C.

(59) Disyllabic Root Exactly Reduplicated, from /RED+bulaŋ/, /RED+batu/

	PARSE-SYLL ALIGN-FT R=PRWD	R=ROOT	FINAL-C
a. ☞ [(<u>bulaŋ</u>)]-[(bulaŋ)]			
b. [(<u>bula</u>)]-[(bulaŋ)]		* !	*
c. [(<u>bulaʔ</u>)]-[(bulaŋ)]		* !	

	PARSE-SYLL ALIGN-FT R=PRWD	R=ROOT	FINAL-C
d. ☞ [(<u>batu</u>)]-[(batu)]			**
e. [(<u>batuʔ</u>)]-[(batu)]		* !	*

A further candidate, *<u>*batuʔ*</u>–*batuʔ*, still violates R=ROOT and incurs a further violation of ALIGN-STEM-RIGHT, since the stem-final segment *u* is not also syllable-final.

This system further shows the emergence of unmarked structure. The prerequisite to the emergence of the unmarked is failure of root/reduplicant identity — that is, violation of R=ROOT. In such cases, the reduplicant is no longer committed to root-copying; instead, it is the most harmonic PrWd possible with respect to several structural constraints. It is a disyllabic PrWd, because the **metrically** most harmonic PrWd consists of a single properly–aligned foot and no unfooted syllables. It is the most harmonic PrWd **syllabically** because it is consonant-final, in obedience to FINAL-C. As in previous discussion, these properties of the reduplicant are emergent relative to the language as a whole. In stems, rather than reduplicants, faithful parsing ensures that disyllabicity can't be forced and final vowels as well as consonants are possible.

To recall another of our themes, consider the fact that only disyllabic consonant-final roots could be said to yield a ''perfect'' reduplicant, one that is itself disyllabic, consonant-final, and an exact copy of its base. All other root-types must settle for reduplicants that are less than ''perfect'': either vowel-final (with disyllabic vowel-final roots) or inexact copies (with roots longer than two syllables). Optimality is not perfection: it is the best output possible given a hierarchy of constraints that make different, often conflicting demands along different dimensions of evaluation. The metrical constraints see perfection in disyllabicity; R=ROOT wants exactness of copying; and FINAL-C seeks a consonant-final PrWd. The Fallacy of Perfection simply doesn't reckon with the fact that different dimensions of evaluation can have competing requirements of well-formedness.

The reduplicative pattern of Makassarese is initially quite puzzling: why should a final glottal stop appear in seeming compensation for incomplete copying of the root? But the pattern of epenthesis is equally puzzling: why should final vowel epenthesis always be accompanied by insertion of glottal stop too? The analysis we have presented relates these two properties to one another and sees them in terms of a much larger scheme, in which syllabically and metrically unmarked structures prevail under appropriate conditions. Here Optimality Theory supports a significant step beyond previous conceptions.

6. Conclusion

Within Optimality Theory, even dominated constraints may be visibly active, under appropriate circumstances. This property, which we have dubbed *emergence of the unmarked*, is fundamental to OT, since it follows from the essential notions of constraint ranking and violation under domination (Prince and Smolensky 1993). It sharply differentiates OT from approaches to linguistic structure and interlinguistic variation based on parameters, rules, or other devices that see linguistic principles in globally all-or-nothing terms.

The evidence and analyses we have presented here show that the facts of reduplication, infixation, and epenthesis come down very much on the side of OT. Constraints on syllabic structure, metrical footing, and word form that are demonstrably violated in a given language are nonetheless active in determining properties of the reduplicative and epenthetic structure of that very language. We showed how this follows from appropriate constraint ranking: any structural constraint ℂ that stands in the ranking Faithfulness >> ℂ >> MAX will be violated in the language as a whole but obeyed in the reduplicant. Suitably generalized, this ranking schema applies to all cases of emergence of the unmarked, including others discussed here involving infixation (section 3) or epenthesis (section 5).

Though our primary focus has been prosodic, these remarks apply with equal force to segmental markedness constraints. In the Appendix, we briefly touched on the role of the segmental markedness constraint NO-NAS in determining the unmarked structure of the reduplicant in Makassarese. More broadly, segmental markedness constraints, situated in ranking between Faithfulness and MAX, are responsible for many phenomena that have been analyzed under the rubric of reduplicative prespecification (Marantz 1982) or melodic overwriting (McCarthy and Prince 1986, 1990a). A most dramatic instance is found in Tübatulabal, in which the consonant of a CV– prefixing reduplicant is fixed as ʔ:[30]

(60) Reduplication in Tübatulabal

pɨtɨta	ʔɨ –pɨtɨta	'to turn over'
tomot͡ska	ʔo –tomot͡ska	'to stumble'
kamiːd͡ʒ	ʔa –kamiːt͡ʃ	'to catch it'
maʃa	ʔa –maʃa	'to cover it'
ʔela	ʔe –ʔela	'to jump'

Glottal stop is the default consonant, unmarked relative to all others. This means that there is some constraint(–set) ℂ that ʔ obeys and that all other segments violate. The fixed initial ʔ of the Tübatulabal reduplicant shows that ℂ >> MAX, ANCHORING, BASE-DEPENDENCE. Yet ℂ is obviously untrue about Tübatulabal as a whole; indeed, it is an egregious falsehood, since lexical items are littered with consonants other than glottal stop. This shows that Faithfulness >> ℂ, completing the argument. Through domination of MAX, segmental unnarkedness emerges in the reduplicant.

We have compared the OT conception of emergence of the unmarked with the misconceived Fallacy of Perfection (FoP). The FoP evidently attempts a theory-free construction of what it means to be ''optimal'', and asks why all derivations don't lead to some single perfect state — for instance, why don't all derivations of all words produce the output *ba*? (Recalling the facts of Tübatulabal, one might better ask ''why isn't every word ʔ*a* ?'', or ''why doesn't /pɨtɨta/ become ʔɨʔɨʔ*a* ?''.) But theory-free construction of word-meaning is a poor basis for linguistic theorizing, and here it thoroughly disregards the fact that Optimality Theory relies intrinsically on the ranking of constraints, which express aspects of

[30] The many additional details of Tübatulabal are taken up in McCarthy & Prince *in prep*.; limitations of space prevent us from presenting them here, but a complete account is available from the authors upon request.

linguistic unmarkedness along different dimensions. It is an empirical truth, established by the evidence presented here and throughout the literature on OT, that these dimensions are in general not mutually compatible in their assessments; rather, they will sometimes, even often, make conflicting demands on well-formedness. There is no ‘‘perfect’’ form in a space where relative success along some dimensions of evaluation entails relative failure along others. Instead, there’s a variety of attainable targets, corresponding to the various rankings of the constraints that define this space: optimality, rather than perfection. The Fallacy of Perfection rests on an illusion of homogeneity; ranking, violation, and emergence of the unmarked in Optimality Theory rest on the fact of multidimensional conflict.

Appendix: Further Details of Makassarese

In this appendix, we take up several other aspects of Makassarese phonology and morphology that were not treated in the main text. With the main text, these notes form a complete account of the Makassarese system as presented by Aronoff, Arsyad, Basri, and Broselow (1987).

One detail concerns the identity of the epenthetic consonant, a glottal stop. Much work in Optimality Theory has proceeded under the assumption that epenthetic segments are structurally incomplete, consisting of **empty** syllabic constituents (Prince and Smolensky 1991ab, 1992, 1993; cf. also McCarthy and Prince 1993a). The very name of the constraint FILL presupposes this: it bans empty positions from phonological representation, and is therefore able to regulate the appearance of epenthetic segments. The actual phonetic identity of the epenthetic segment is determined outside the phonology proper, via interpretation of the output phonological structure.

There are various reasons to think that this conception of epenthetic structure and of FILL is inadequate. We won't review all of them here (see McCarthy 1993b), but one reason is evident from the facts of Makassarese. If the identity of the epenthetic consonant is determined outside the phonology proper, then it is completely accidental that the epenthetic consonant ''interpreted'' in coda position also happens to be one of just two consonant-types that are permitted in coda position by the phonology proper. With CODA-COND restricting word-final consonants to just ʔ and ŋ, we certainly wouldn't expect to find that the epenthetic word-final consonant is *t*, but that is a logical possibility if all the phonology sees is an empty coda slot holding a place for a segment whose phonetic identity is determined outside the phonology.

Therefore, it is necessary to adopt a different view of epenthetic structure, one in which the features as well as the position of epenthetic segments are supplied by Gen and are evaluated by the constraints of the phonology. Under this view, the optimal output of /jamal/ is literally *jamalaʔ*, with epenthetic ʔ fully present in the form under evaluation. (Hence, the output is not something like *jamal*□□, with the boxes referring to true empty nodes, syllabic or segmental.) CODA-COND evaluates the fully-specified *jamalaʔ*, and finds it optimal, while it rejects a form like **jamalat*, in which an epenthetic coronal consonant, violating CODA-COND, has been provided instead.

This different conception of epenthetic structure means that FILL is no longer viable (since epenthesis ≠ emptiness), and a replacement must be sought. The new constraint we adopt is MSEG, from McCarthy 1993b:

(61) MSEG

Morphologically unsponsored segments are prohibited.

This constraint militates against phonological structure in the output that is not present in the input. In the domain of the input–output relation, it is the direct counterpart of the reduplicative constraint BASE-DEPENDENCE. Epenthetic structure is identified by its lack of morphological sponsorship, just as ALIGN-STEM-RIGHT identifies the morphological constituent Stem in the phonological output form (see §5). An epenthetic segment, even one internal to a morpheme, is not sponsored by that morpheme, since ''morpheme'' describes a unit of lexical structure rather than a phonological constituent. (The lack of morphological sponsorship of epenthetic elements follows from a principle of Gen dubbed Consistency of Exponence in McCarthy and Prince 1993a: Ch. 2.)

With this much as background, we can confront the details of the optimality of *jamalaʔ*.[31] The constraint hierarchy presented in the text is sufficient to account for the **structural** properties of *jamalaʔ*, but it doesn't account for all of its **segmental** characteristics. Given the assumptions about epenthesis just presented, Gen will emit candidates with various fully specified epenthetic consonants. Among these candidates are the following two, which are of particular interest:

(62)

		CODA-COND	ALIGN-ST-R	FINAL-C	MSEG
☞	jamal|aʔ.	✓	*	✓	**
	jamal|aŋ.	✓	*	✓	**

Either ʔ or ŋ would fully satisfy undominated CODA-COND, yet ʔ is the actual epenthetic consonant. In standard parlance, ʔ is the ''default'' consonant of Makassarese; ŋ is a licit coda, but not the default. Pretheoretically, this is because ŋ is more marked than ʔ.

In Optimality Theory, this difference in segmental markedness means that there is a **constraint** that ʔ obeys and ŋ violates. Then ʔ is literally unmarked relative to ŋ (Smolensky 1993). For concreteness, we put forward the following constraint as the operative one:

(63) NO-NAS
*[nas]

NO-NAS is just part of a much bigger package of constraints on featural markedness.[32] It is justified independently by the typological facts of implicational markedness: there are languages without nasal segments (a few — 10/317 in Maddieson 1984) but there are no languages without oral segments.

Since NO-NAS settles a tie, it isn't directly rankable with respect to any of the other constraints cited. Wherever it is ranked, it will select *jamalaʔ*, with just a single nasal, over **jamalaŋ*, with two. It is, however, crucially dominated by the faithfulness constraint PARSE-SEG, since Makassarese does have nasals.[33]

This is yet another instance of emergence of the unmarked. In coda position, Makassarese has two possible consonants, ŋ and ʔ. But the **epenthetic** coda consonant is ʔ, the less marked member of the pair. This follows from NO-NAS, which is one of the family of segmental markedness constraints. Obviously, NO-NAS is not true generally in Makassarese; it isn't even true of all codas. But it **is** true of the epenthetic coda. NO-NAS is obeyed in the one condition where faithful parsing of the input is not at issue: in determining the character of the Gen-supplied epenthetic consonant. Just in that case, the unmarked consonant ʔ is emergent.[34]

There is another circumstance in Makassarese where NO-NAS is visibly active because faithfulness is irrelevant: in reduplication. The relevant fact is that trisyllabic or longer words like /barambaŋ/ 'sort of

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[31] We continue the practice of notating epenthetic segments in a hollow font. In light of the discussion above, this indicates their lack of morphological sponsorship.

[32] According to Prince and Smolensky (1993: Chs. 8, 9) and Smolensky (1993), segmental markedness is defined by a family of constraints barring *every* feature. Their ranking with respect to each other may be universally fixed.

[33] One additional fact remains: determining the quality of the epenthetic **vowel**. In Makassarese, the epenthetic vowel is identical to the vowel in the preceding syllable. Let us assume a linked structure in which a single V-Place node (Clements 1993) is shared by the two vowels. Then, a constraint militating against V-Place specifications (even if low-ranking) will prefer the shared structure to a specified epenthetic vowel. (Cf. fn. 32 and the analysis of Tübatulabal in McCarthy and Prince 1993d.)

[34] With additional constraints and appropriate ranking, this sort of analysis is straightforwardly extensible to other types of epenthetic segments. See Smolensky (1993) and McCarthy (1993b).

chest' reduplicate as *baraʔ-barámbaŋ* and not as *baram-barámbaŋ*. This shows that NO-NAS >> MAX, as may be inferred from the following tableau:

(64) Trisyllabic Root Has Disyllabic ʔ-final RED, from /RED+barambaŋ/

	PARSE-SYLL ALIGN-FT R=PRWD	R=ROOT	FINAL-C	NO-NAS	MAX
a. ☞ [(baraʔ)]-[ba(rambaŋ)]	*	*		**	****
b. [(baram)]-[ba(rambaŋ)]	*	*		*** !	***
c. [ba(rambaŋ)]-[ba(rambaŋ)]	** !			****	

The argument for ranking NO-NAS above MAX can be seen from the comparison of (a) and (b). In (a), a ʔ-final reduplicant spares a NO-NAS violation; though (b) has the more exact copy of the base, it fails in the face of the higher-ranking constraint.

On the other hand, NO-NAS is ranked below R=ROOT. That is apparent from the following tableau, in which an exact copy of a disyllabic nasal-final root is seen to be optimal:

(65) Disyllabic Nasal-Final Root Exactly Reduplicated, from /RED+bulaŋ/

	PARSE-SYLL ALIGN-FT R=PRWD	R=ROOT	FINAL-C	NO-NAS	MAX
a. ☞ [(bulaŋ)]-[(bulaŋ)]				**	
b. [(bula)]-[(bulaŋ)]		* !	*	*	*
c. [(bulaʔ)]-[(bulaŋ)]		* !		*	*

The rankable configuration is (c) versus (a); these forms differ on both R=ROOT and NO-NAS. Since (a) is optimal, by virtue of its exact root copy, R=ROOT >> NO-NAS.

Another class of reduplicative examples to be considered are disyllabic roots rendered trisyllabic in the output by epenthesis, when the root-final consonant is not a licit coda:

(66) **ʔ-final** Disyllabic Reduplication of Disyllabic Roots with Final Epenthesis

/teʔter/	teʔteʔ-téʔtereʔ	'rather quickly'	[tettettéttereʔ]
/ak+beser/	ak-beseʔ-béséreʔ	'quarrel in jest'	

With roots like these, the undominated CODA-COND is fatal to root-copying candidates like (b) in the following tableau:

(67) Epenthetic Disyllabic Root with Disyllabic ʔ-final R, from /RED+beser/

	PARSE-SYLL ALIGN-FT R=PRWD CODA-COND	R=ROOT	FINAL-C	NO-NAS	MAX
a. ☞ [(<u>beseʔ</u>)]--[(bese)reʔ]	*	*			***
b. [(<u>beser</u>)]–[(bese)reʔ]	*				**
	* !				
c. [<u>be</u>(<u>sereʔ</u>)]–[(bese)reʔ]	** !				

Since *r* is not a possible coda, an exact copy of the root is impossible (b). But if *r* is copied as the onset of an epenthetic syllable (c), then an illicit trisyllabic reduplicant results. A futher possibility like **<u>bese</u>-besereʔ* (not shown) is out for the same reason that **<u>mana</u>–manara* is (see section 5) — both violate FINAL-C.

A final class of examples involves disyllabic consonant-final roots combined with the stress-determining suffix *-i* 'transitive'. Contrary to naive expectation, these forms have ʔ-final reduplicants, even though the root could be copied exactly:

(68) **ʔ-final** Reduplication of C-Final Disyllabic Roots with Stress-determining Suffix *-i*

	/gassiŋ+i/	<u>gassiʔ</u>– gassíŋi	'make strong'
cf.	/lompo+i/	<u>lompo</u>– lompói	'make somewhat big' (V-final root)
cf.	/gassiŋ#i/	<u>gassiŋ</u>– gássiŋi	'he is strong' (homophonous stress-neutral suffix *-i* '3rd sub')

For comparison purposes, a vowel-final root and a root with the stress-neutral suffix *-i* are also shown. They have exact copying of the disyllabic root, as expected.

Obviously, the real competition for the actual output form *<u>gassiʔ</u>-gassí.ŋi* is the root-copying candidate **<u>gassiŋ</u>.–gassí.ŋi*. In the failed candidate, the root-final ŋ is copied, but with a different syllabic role than it has in the base. The constraint STROLE (McCarthy and Prince 1993a: Ch. 7) militates against this:

(69) STROLE

A segment in R and its correspondent in B must have identical syllabic roles.

For consonants, the usual syllabic roles are onset and coda.[35] STROLE entails the onset and rhyme transfer effects discussed by Steriade (1988) and analyzed by her in terms of full copying of the base with subsequent readjustments. Like MAX or R=ROOT, STROLE is nothing more than a (particularly strict) reduplicant-base identity condition.

[35] Seeing onset and coda as syllabic roles does not presume the existence of Onset and Coda constitutents. Suppose, for example (cf. Hayes 1989), that prenuclear consonants are dominated by σ and post-nuclear consonants are dominated by μ. Then the onset and coda roles can be read off of syllabic structure without recognizing labeled Onset and Coda constituents.

STROLE must be able to compel violation of R=ROOT, as the following ranking argument shows:

(70) STROLE >> R=ROOT

Candidates	STROLE	R=ROOT
a. ☞ $\underline{g_1a_2s_3s_4i_5ʔ}$–$g_1a_2s_3s_4i_5$ŋi		*
b. $\underline{g_1a_2s_3s_4i_5ŋ_6}$.–$g_1a_2s_3s_4i_5.ŋ_6i$	* !	

For explicitness, we have shown the correspondence relation between base and reduplicant by co-indexation. What this ranking means is that exact identity beween root and reduplicant fails if the copied segments are syllabified differently in R on the one hand and its image in B on the other. In (b), $ŋ_6$ is a coda in the reduplicant and an onset in the base, fatally violating STROLE.

The following tableau shows how STROLE fits into the full system of Makassarese:

(71) Suffixed Disyllabic Root with Disyllabic ʔ-final R, from /RED+gassiŋ+i/

	PARSE-SYLL ALIGN-FT R=PRWD	STROLE	R=ROOT	FINAL-C	NO-NAS	MAX
a. ☞ [(<u>gassi.ʔ</u>)]-[gas(si.ŋi)]	*		*	*	*	**
b. [(<u>gassiŋ</u>.)]-[gas(si.ŋi)]	*	* !		*	**	**
c. [(<u>gassi</u>)]-[gas(si.ŋi)]	*		*	** !	*	**
d. [<u>gas(sini</u>)]-[gas(si.ŋi)]	** !			**	**	

Form (a) is optimal; the reduplicant is ʔ-final, satisfying FINAL-C and NO-NAS, at the expense of violating R=ROOT. Form (b) achieves exact root-copying, but only by violating the undominated constraint STROLE. Form (c) loses to (a) on FINAL-C, since its reduplicant is vowel-final. The last candidate, (d), has a trisyllabic reduplicant, breaching the high-ranking PrWd-restrictors.

Recall the comparison examples in (68). The first, *<u>lompo</u>-lompo-i*, involves exact reduplication of a V-final root combined with the same stress-determining suffix *-i* 'transitive'. In this case, STROLE is obeyed by the root-reduplicating candidate, and so it is irrelevant. The second, *<u>gassi</u>*ŋ*-gássi*ŋ*#i*, combines a C-final root with the stress-neutral suffix *-i* '3rd subj.'. Under the plausible assumption that stress-neutral suffixes attach to PrWd, then ŋ is a coda in both B and R, and this form also obeys STROLE.

An important property of this overall approach is that various aspects of reduplicant/base identity — STROLE, R=ROOT, and MAX in particular — are ''dispersed'' (to use Armin Mester's term) into separate constraints. Considerations of interlinguistic variation support this dispersion. As Aronoff *et al*. (1987) observe, reduplication in Tagalog is very similar to reduplication in Makassarese, with final vowel length in the reduplicant when the root is trisyllabic or longer:

(72) Reduplication in Tagalog (Carrier-Duncan 1984: 263)

a. Exact Copy of Disyllabic Root

mag– walis– walis	‘sweep a little’
mag– li:nis– li:nis	‘clean a little’
mag– pantay– pantay	‘thoroughly level’

b. Disyllabic V:–final Copy of Longer Root

balu:– baluktot	‘variously bent’
ʔinti:– ʔintindiŋ	‘several small understandings’
tahi:– tahi:mik	‘rather quiet’
kala:– kalansiŋ	‘a jingling of coins’

The substitution of vowel length for the expected final ʔ is evidently a relatively superficial phonetic fact of Tagalog: ‘‘Word–final /ʔ/ is obligatorily omitted and replaced by vowel length when the word occurs in the middle of a phrase.’’ (Schachter and Otanes 1972: 19). Indeed, except for this and loss of *h*, all PrWd’s of Tagalog are consonant–final (Schachter and Otanes 1972: 29).

In the current context, the interesting thing about Tagalog is the fact that suffixation to a disyllabic consonant–final root does not change the pattern of reduplication:

(73) Exact Copy of Suffixed C–Final Disyllabic Roots (Schachter & Otanes 1972: 341f.)

pag– dugtuŋ– dugtuŋ– in	‘join (more than 2 objects) together’
pag– dikit– dikit– in	‘stick/paste *id*. together’
linis– linis– in	‘clean a little’

This is precisely the case where Makassarese demands a ʔ–final reduplicant in obedience to STROLE. That Makassarese and Tagalog can differ on such a subtle point shows that there must be comparable subtlety in the constraints, so they can be ranked differently in the two languages. Specifically, the ranking of R=ROOT and STROLE in Tagalog is the reverse of Makassarese. Compare (70) with the following:

(74) R=ROOT >> STROLE, in Tagalog

Candidates	R=ROOT	STROLE
a. ☞ linis–linis–in		*
b. liniʔ–linis–in	* !	

Ranked below R=ROOT, STROLE can have no effect on the outcome in Tagalog: the root is copied exactly if the copy can be syllabified as two syllables, period. This is an instance of Pāṇini’s Theorem on Constraint Ranking (Prince and Smolensky 1993: Ch. 5). The constraint R=ROOT pertains to **every** root, but in the instant case STROLE is relevant only to C–final roots before V–initial suffixes. The higher-ranking, more general constraint deprives the lower-ranking constraint of having any effect on the outcome.

This argument shows that Makassarese and Tagalog must have different rankings of the constraints R=ROOT and STROLE. But for languages to differ in this way, Con must of course supply these two separate constraints, even though both of them apply to aspects of reduplicant/base identity.

This completes the analysis of Makassarese, and we can sum up the ranking of the various constraints. One possible partial ordering is the following:

(75) Ranking

PARSE-SYLL, ALIGN-FT, R=PRWD, STROLE, CODA-COND	>>	R=ROOT, ALIGN-ST-RIGHT	>>	NO-NAS, FINAL-C	>>	BASE-DEP, MAX, MSEG

This ranking combines the hierarchies motivated by reduplicative and epenthetic phenomena, which demonstrably intersect at the constraints R=ROOT, NO-NAS, and FINAL-C.

This system shows the emergence of unmarked structure in several respects, of which many were noted previously in section 5. The prerequisite to emergence of the unmarked is failure of root/reduplicant identity, equivalent to violation of R=ROOT or, in certain circumstances, STROLE. In such cases, the reduplicant is no longer committed to root-copying; instead, it is the most harmonic PrWd possible on several criteria. It is disyllabic, because the most harmonic PrWd metrically consists of a single properly aligned foot and no unfooted syllables. It is the most harmonic PrWd syllabically because it is consonant-final, in obedience to FINAL-C. Even segmentally, it is harmonic, since its final consonant obeys the segmental marking constraint NO-NAS. Prosodic and segmental unmarkedness emerge in the reduplicant when and only when accurate root-copying is not at issue. As in previous discussion, these properties of the reduplicant are also emergent relative to the language as a whole. In stems, rather than reduplicants, faithful parsing and alignment ensure that disyllabicity can't be forced, final vowels are possible, and nasals aren't replaced by glottal stops.

We turn to a final issue. With NO-NAS dominating MAX, why don't we see reduplicated forms like **ʔaʔaʔ–manara* or **ʔaʔaʔ–barambaŋ*, in which all consonants of the reduplicant are replaced by the unmarked glottal stop? Compared to the actual output *manaʔ–manara*, something like **ʔaʔaʔ–manara* is obviously less marked, specifically by virtue of violating NO-NAS less. It would seem that *ʔaʔaʔ* is the one truly optimal reduplicant, and so should be found everywhere.

This is a typical instance of the Fallacy of Perfection. As usual in FoP situations, it promotes a **particular** kind of unmarkedness above all others. In the examples just mentioned, it ignores the contribution of the reduplicative constraints ANCHORING and CONTIGUITY, which are undominated in Makassarese, as they are in many languages. To see this, consider the following candidates for /RED+manara/, in which the correspondence relation is indicated explicitly:

(76)		ANCHORING	CONTIGUITY	BASE-DEP	MAX
a. ☞	m$_1$a$_2$n$_3$a$_4$ʔ–m$_1$a$_2$n$_3$a$_4$ra	✓	✓	*	*
b.	m$_1$a$_2$ʔa$_4$ʔ–m$_1$a$_2$na$_4$ra	✓	* !	*	*
c.	ʔa$_2$n$_3$a$_4$ʔ–ma$_2$n$_3$a$_4$ra	* !	✓	*	*
d.	ʔa$_2$ʔa$_4$ʔ–ma$_2$na$_4$ra	* !	* !	*	*

Like all ʔ-final reduplicants, these various candidates violate MAX, because the base is incompletely copied, and BASE-DEPENDENCE, because a ʔ appears in the reduplicant that is not found in the base. Though (b, c, d) have fewer nasals than (a), they aren't optimal, because ANCHORING and CONTIGUITY perform the crucial winnowing.

Since obedience to NO-NAS is not purchased at the expense of ANCHORING or CONTIGUITY violations, while it does lead to violation of BASE-DEPENDENCE and MAX, the schematic ranking must be as follows:

(77) Relative Ranking of Reduplicative Constraints:

ANCHORING, CONTIGUITY >> NO-NAS >> BASE-DEPENDENCE, MAX

This ranking effectively limits any deviations from perfect copying to the right edge of the reduplicant.

There is one other candidate of interest: the form *$\underline{m_1 a_{2i} ʔiʔ}$–$m_1 a_2$*nara*. It avoids violation of CONTIGUITY by failure to copy **any part** of the second syllable, violating only low-ranking BASE-DEPENDENCE and MAX. In this way it spares a NO-NAS violation. (Further simplifications of the reduplicant, such as *ʔiʔiʔ–manara*, are banned by undominated ANCHORING.)

To rule out this possibility, we need a way to prohibit the non-correspondence of the vowel in the second syllable of the reduplicant in **maʔ**i**ʔ–manara*, while still permitting non-correspondence of the final ʔ in the reduplicant of *manaʔ–manara* or *baraʔ–barambaŋ*. One possibility is to distinguish between two senses of BASE-DEPENDENCE, one pertaining to vowels and the other to consonants. The constraint BASE-DEPENDENCE(V) is undominated, since vowels in the reduplicant must always have correspondents, while BASE-DEPENDENCE(C) is low-ranking, since the reduplicant can contain correspondent-less consonants. This differentiation of BASE-DEPENDENCE is abstractly the same as the distinction between FILL-NUC and FILL-MARG in Prince and Smolensky 1993: 93. This similarity constitutes yet another parallel between the faithfulness constraints and the copying constraints — see sections 2 and directly above for discussion of the others. Elucidating these parallels is obviously a significant research question for the future.

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