Part III Theoretical Issues

14 Prosodic Morphology

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1 Introduction

Prosodic Morphology is a theory of how morphological and phonological determinants of linguistic form interact with one another in grammatical systems. A core area of investigation is the way in which prosodic structure impinges on templatic and circumscriptional morphology, such as reduplication and infixation. In McCarthy and Prince 1986 and 1990a, three essential claims are advanced about Prosodic Morphology:

(1) Principles of Prosodic Morphology
- (a) Prosodic Morphology Hypothesis
  Templates are defined in terms of the authentic units of prosody: mora (μ), syllable (σ), foot (Ft), prosodic word (PrWd).
- (b) Template Satisfaction Condition
  Satisfaction of templatic constraints is obligatory and is determined by the principles of prosody, both universal and language-specific.
- (c) Prosodic Circumscription
  The domain to which morphological operations apply may be circumscribed by prosodic criteria as well as by the more familiar morphological ones.

In short, this approach to Prosodic Morphology hypothesizes that templates and circumscription must be formulated in terms of the vocabulary of prosody, and must respect the well-formedness requirements of prosody.[1] The commitment to prosody is based neither on simple inductive empirical observations, nor on some kind of hegemonic impulse to extend a favored subdiscipline at the expense of others. Rather, it answers to a fundamental explanatory goal: to reduce or eliminate the descriptive apparatus that is specific to particular empirical domains like reduplication, and instead derive the properties of those domains from general and independently motivated principles. Claims

(1a), (1b), and (1c) assert that prosodic theory is where these independent principles are to be found; but the pursuit of more embracing explanations has led researchers to modify and generalize these initial hypotheses in ways we will discuss.

On the morphological side, the assumptions made within Prosodic Morphology are relatively uncomplicated. The morphological constituents Root, Stem, and Affix form a labeled bracketing, essentially along the lines of Selkirk 1982. Most work in Prosodic Morphology adopts a view of morphology that is morpheme-based, under the broad rubric of item-and-arrangement models, though the (morpheme-based) model of prosodic circumscription in McCarthy and Prince (1990a) is a processual one.

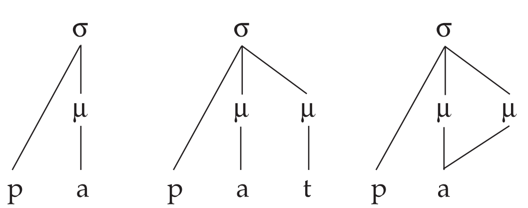
On the phonological side, Prosodic Morphology is based on the Prosodic Hierarchy in (2), evolved from that of Selkirk (1980a, b):

(2) Prosodic Hierarchy

Prosodic Word	PrWd
	|
Foot	Ft
	|
Syllable	σ
	|
Mora	μ

The mora is the unit of syllable weight (Prince 1980, van der Hulst 1984, Hyman 1985, McCarthy and Prince 1986, Zec 1988, Hayes 1989a, Itô 1989, etc.). The most common syllable weight typology is given in (3), where short open syllables like *pa* are light, and long-voweled or closed syllables like *paa* or *pat* are heavy.

(3) Syllables in Moraic Theory – Modal Weight Typology
Light (L) Heavy (H)



Syllables and syllable weight are fundamental to defining metrical feet. Feet are constrained both syllabically and moraically. The foot inventory laid out in (4) below is proposed in McCarthy and Prince 1986 and Hayes 1987 to account for Hayes's (1985) typological findings. We write L for light syllable, H for heavy syllable:

(4)	Foot types	Iambic	Trochaic	Syllabic
		LH LL, H	H, LL	σσ

Conspicuously absent from the typology are degenerate feet, consisting of just a single light syllable, though they may play a marked role in stress assignment (Kager 1989, Hayes 1995; but see Kiparsky 1992). The following general condition on foot form is responsible for the nonexistence (or markedness) of degenerate feet (Prince 1980; McCarthy and Prince 1986, 1991b, 1993b: ch. 4; Hayes 1995):

(5) Foot Binarity: Feet are binary under syllabic or moraic analysis.

The Prosodic Hierarchy and Foot Binarity, taken together, derive the key notion "Minimal Word" (Prince 1980; Broselow 1982; McCarthy and Prince 1986, 1990a, 1991a, b). According to the Prosodic Hierarchy, any instance of the category prosodic word must contain at least one foot. By Foot Binarity, every foot must be bimoraic or disyllabic. By transitivity, then, a prosodic word must contain at least two moras (or syllables, if all syllables are monomoraic). As we shall see, the Minimal Word is of singular importance in characterizing certain Prosodic-Morphological phenomena, and its role is a matter of continuing study.

2 Exemplification

Reduplicative and root-and-pattern morphology are typical cases where the principles of Prosodic Morphology emerge with full vigor.[2] In reduplicative and root-and-pattern morphology, grammatical distinctions are expressed by imposing a fixed prosodic requirement on varying segmental material. In reduplication, the prosodically fixed material stands as a kind of affix, copying segments of the base to which it is adjoined. In root-and-pattern morphology, broadly construed, the prosodically fixed material is a free-standing stem, to which segments of a root or related word are mapped.

The Ilokano reduplicative plural exemplified in (6) specifies a prefix whose canonical shape is constant – a heavy syllable – but whose segmental content is a (partial) copy of the base to which it is attached:

(6) Ilokano plural reduplication (McCarthy and Prince 1986, 1991a, 1993b; Hayes and Abad 1989)

kaldíŋ	'goat'	*kal*-kaldíŋ	'goats'
púsa	'cat'	*pus*-púsa	'cats'
kláse	'class'	*klas*-kláse	'classes'
jyánitor	'janitor'	*jyan*-jyánitor	'janitors'
róʔot	'litter'	*ro:*-róʔot	'litter (pl.)'
trák	'truck'	*tra:*-trák	'trucks'

We follow the practice of highlighting the copy, called the *reduplicant* (after Spring 1990). The template of the Ilokano plural is a heavy syllable, $\sigma_{\mu\mu}$. Given the independently motivated prosody of the language, a heavy syllable can consist of a diverse set of segmental strings, with simple or complex initial clusters (*kal* vs *klas*) and with a closing consonant or a long vowel (*pus* vs *ro:*, *klas* vs *tra:*). The heavy-syllable template $\sigma_{\mu\mu}$ is the invariant that unites the various forms of the plural in Ilokano. The Prosodic Morphology Hypothesis demands that templates be characterized in just such abstract, prosodic terms; in this way they partake, as the Ilokano template does, of the independently motivated conditions on prosody generally and in the particular language under study.

The Ilokano case also illustrates another significant finding: the fact that the reduplicative template is itself an affix (McCarthy 1979, 1981; Marantz 1982). On the face of it, the idea that reduplication involves affixing a template may seem surprising, since a natural, naive expectation is that reduplication involves an operation like "copy the first syllable," as illustrated in (7):

(7) "Copy first syllable," hypothetically

ta.ka	→	*ta*-ta.ka
tra.pa	→	*tra*-tra.pa
tak.pa	→	*tak*-tak.pa

Moravcsik (1978c) and Marantz (1982) observe that syllable copying, in this sense, does not occur. Rather, reduplication always specifies a *templatic target* which is affixed to the base, and is satisfied by copying elements of the base.[3]

The Prosodic Morphology Hypothesis, together with the Prosodic Hierarchy, predicts the existence of a range of possible types of reduplicative templates. The heavy syllable $\sigma_{\mu\mu}$ of the Ilokano plural is one of these. Another is the light-syllable template σ_{μ}, which is also used in Ilokano, in other morphological constructions:

(8) Ilokano *si* + σ_{μ} 'covered/filled with'

buneŋ	'buneng'	si-*bu*-buneŋ	'carrying a buneng'
jyaket	'jacket'	si-*jya*-jyaket	'wearing a jacket'
pandiliŋ	'skirt'	si-*pa*-pandiliŋ	'wearing a skirt'

Both of these reduplicative patterns are common cross-linguistically. Equally common too is the minimal word (MinWd) template, which consists of a single binary foot, often matching the smallest word-size in the host language. A typical example of this is found in the Australian language Diyari:

(9) Diyari Reduplication (Austin 1981; Poser 1982, 1989; McCarthy and Prince 1986, 1991a, b, 1994a)

wil̪a	*wil̪a*-wil̪a	'woman'
kanku	*kanku*-kanku	'boy'
kulkuŋa	*kulku*-kulkuŋa	'to jump'

tʲilparku	*tʲilpa*-tʲilparku	'bird species'
ŋankan̪t̪i	*ŋanka*-ŋankan̪t̪i	'catfish'

Reduplicated words of Diyari have various meanings. The formal regularity that unites them is the presence of a prefixed MinWd template. The realization of this template, and of the smallest words in the language as a whole, is a disyllabic trochaic foot, since Diyari does not make distinctions of syllable weight. In fact, the reduplicative prefix of Diyari is a free-standing prosodic word, as shown by the facts that it is vowel-final (like all prosodic words of Diyari) and that both prefix and base bear their own primary word stresses: ***kánku***-*kánku*, ***tʲílpa***-*tʲílparku*. In effect, then, the prefix + base collocation in Diyari is a compound of a MinWd with a complete PrWd. We will revisit Diyari below, in section 3, with the goal of a better understanding of the relation of MinWd phenomena to general constraints on prosody and morphology.

In root-and-pattern morphology, the prosodic template determines the shape of the whole stem, rather than just an affix. Full-blown systems are found in several widely scattered language families, touched on below. But a particular type of quasi-grammatical root-and-pattern morphology is quite broadly attested: the process of forming a nickname or hypocoristic by mapping a name onto a minimal word template MinWd. This type of prosodic morphology was identified by McCarthy and Prince (1986, 1990a), and is comprehensively surveyed by Weeda (1992). The formation of "proximal vocatives" in Central Alaskan Yup'ik Eskimo is a typical example.

(10) Proximal vocatives in Central Alaskan Yup'ik Eskimo (A. Woodbury 1985; McCarthy and Prince 1986, 1990a)

Name		Proximal vocative
Aŋukaɣnaq		Aŋ ~ Aŋuk
Nupiɣak		Nup ~ Nupix/Nupik
Aŋivɣan		Aŋif
Kalixtuq		Kał ~ Kalik
qətunɣaq	'son'	Qət ~ Qətun
Maɣʷluq		Maχʷ
Aɣnaɣayaq		Aɣən
Nəŋqəχalɣia		Nəŋəq
Qakfalɣia		Qak ~ Qakəf ~ Qakfał
Akiuɣalɣia		Aki͡uk

As is usual in such cases, personal preferences may influence the result. But there is a clear invariant structure amid the alternatives: the shape of a licit vocative is exactly an iambic foot, a single heavy syllable or a light–heavy sequence. This is the minimal prosodic word in a language like Yup'ik, with its pervasive iambic prosody.[4] Hence, the vocative template is MinWd.

Closer to home, the force of this same template can be observed with a certain species of nicknames in English:

(11) English nicknames (McCarthy and Prince 1986)

Name	Nickname
Mortimer	Mort, Mortie
Cynthia	Cynth, Cindy
Marjorie	Marge, Margie
Angela	Ange [æñʤ], Angie,
Francis	Fran, Frank, Frannie, Frankie
Cyrus	Cy
Barbara	Bar, Barb, Barbie
Alfred	Al, Alf, Alfie
Edward	Ed, Eddie, *Edwie
Abraham	Abe, Abie, *Abrie
Jacqueline	Jackie, *Jacquie (=[ʤækwi:])
Douglas	Doug, Dougie, *Douglie
Agnes	Ag, Aggie, *Agnie

Again, personal preference is a factor in fixing choices, but the overall scheme is clear: the shape invariant in English nicknames is a bimoraic (heavy) syllable, the minimal word of the language.[5] As in Yupik, the minimal word is the prosodic word that contains a single foot; English is subject to the further restriction that not only the prosodic word but also the foot itself must be minimal, and therefore monosyllabic (McCarthy and Prince 1986, 1991b). By Foot Binarity (5), any single syllable that exhausts a foot must be heavy.

The templatic base of the nickname may be augmented by addition of the external or "Level II" suffix *[i]*, spelled *-y* or *-ie*. That this suffix is prosodically independent of the template is shown by the impossibility of **Edwie* and the other asterisked examples. These all involve a cluster that cannot be mapped to the monosyllabic template, under independently motivated English syllable canons. Because there are no monosyllables **Edw*, **Dougl*, **Abr*, **Agn*, there are no nicknames **Edwie*, **Douglie*, **Abrie*, **Agnie*, and so on, even though such forms are syllabically perfect. The monosyllable base criterion thus limits the segmentism of suffixed hypocoristics in a principled way.[6]

Perhaps the most extensively studied example of this type is found in Japanese:

(12) Hypocoristics in Japanese (Poser 1984, 1990)

Name	Hypocoristic	
ti	tii-čan	
šuusuke	šuu-čan	*šuusu-čan
yoosuke	yoo-čan	*yoosu-čan
taizoo	tai-čan	*taizo-čan
kinsuke	kin-čan	*kinsu-čan
midori	mii-čan	*mi-čan
	mit-čan	
	mido-čan	

wasaburoo	waa-čan	*wa-čan
	wasa-čan	
	sabu-čan	
	wasaburo-čan	*wasabu-čan

As usual, personal preferences are a factor; but with complete consistency, any modified hypocoristic stem consists of an even number of moras, usually two.[7] Though prominential stress is not found in Japanese, there is abundant evidence that it has a system of two-mora (probably trochaic) feet (Poser 1990) and that the minimal word is, as expected, bimoraic (Itô 1991). Thus, the template for the hypocoristic can be characterized in prosodic fashion as Ft^{+} (one or more feet) or $MinWd^{+}$, the latter perhaps to be analyzed as a kind of MinWd compound.

Variations on the same theme are played out in a number of other morphological patterns (Itô 1991, Mester 1990, Itô and Mester, 1997; cf. Tateishi 1989, Perlmutter 1992). Strikingly, standard Japanese (the Tōkyō dialect) has a full complement of monomoraic words in the lexicon (cf. e.g. Itô 1991). But no morphological process that demands minimality is ever satisfied by a monomoraic structure. This shows that the notion of MinWd relevant to prosodic morphology is not a simple inductive one, based on the size of attested lexical words in a given language. Rather, the active notion is "minimal *prosodic* word," a unit whose structure is determined by the universal principles of the Prosodic Hierarchy (2) and of Foot Binarity (5).

The Japanese case is particularly notable in the diversity of ways that a bimoraic foot, and therefore a hypocoristic word, can be realized. Long-voweled *tii*, diphthongal *tai*, closed *kin*, and disyllabic *mido* are all licit hypocoristics, and they represent all the canonical types of bimoraic feet to be found in Japanese as a whole. Such diversity defeats any effort to construct a respectable theory that comprehends the template in purely segmental terms, as a sequence of C and V positions. Any such segmentalist effort must painfully recapitulate the vocabulary of foot types within the parochial hypocoristic template. Obviously, any theory with the descriptive richness to do this – say, by basing itself on a Kleene-type regular language notation – will have little or no predictive force. By contrast, the templatic restriction *MinWd* inherits from Universal Grammar a cascade of information about foot and syllable structure. The hypocoristic pattern of many languages is simply *MinWd*; and further independent specification of the foot, syllable, and mora structure in the language determines the details.

Though truncation is usually rather limited in scope, root-and-pattern morphology is an utterly pervasive feature of some morphological systems, particularly in the Afro-Asiatic family, but also in various Penutian languages such as Miwok, Yokuts, and Takelma.[8] These systems are all rather complex and difficult to summarize briefly, but it is possible to get a general feel for the mode of analysis by a brief glance at one of them.

The shapes of canonical nouns in Standard Arabic, analyzed in McCarthy and Prince 1990b, Prince 1991, and McCarthy 1993, illustrate some basic principles.[9] The data are given in (13), based on all the canonical noun stems occurring in the first half of a large dictionary ($N \approx 2400$), and classified by syllable-weight pattern (H, L) with a single example of each type:

(13) The canonical noun patterns in Standard Arabic

(a)	H	(b)	LL	(c)	LH	(d)	HL
	baħr		*badal*		*waziir*		*kaatib*
	33%		7%		21%		12%

(e)	HH	(f)	HL	(g)	HH
	jaamuus		*xanjar*		*jumhuur*
	2%		14%		11%

These are glosses for the representative examples: 'sea', 'substitute', 'minister', 'writer', 'buffalo', 'dagger', 'multitude'. All patterns are well represented except for (e), which is probably a historical innovation in Arabic.

The classification of nouns in (13) according to the syllable-weight patterns assumes final consonant extraprosodicity, which is independently motivated in Arabic. Modulo this, we observe that the shapes of canonical nouns range from a lower bound at the bimoraic MinWd (H or LL) to an upper bound at the maximal disyllable HH. These observations can be expressed in terms of prosodic conditions on canonical noun stems (Stem_N):

(14) Prosodic conditions on canonicity of Stem_N

(a) Minimally bimoraic
$\text{Stem}_N = \text{PrWd}$

(b) Maximally disyllabic
$\text{Stem}_N \leq \sigma\sigma$

Because the morphological category Stem_N is equated with the prosodic category PrWd, a Stem_N must contain a foot, under the Prosodic Hierarchy, and so it is minimally bimoraic, as required by Foot Binarity. The maximality condition is a natural one under general considerations of locality, which impose an upper limit of two on rules that count (McCarthy and Prince 1986); but it can perhaps be given an even more direct prosodic interpretation in terms of conditions on branching (Itô and Mester, 1997) or through an additional foot type, the generalized trochee of Prince (1980), Hayes (1995), and Kager (1992). Details of formulation aside, the minimality and maximality conditions define a family of templates in Arabic, with each member of that family available for particular morphological functions in the nominal system. This shows that the fundamental structural properties of root-and-pattern morphological systems can and should be characterized in prosodic terms.

In the varieties of Prosodic Morphology reviewed so far, the structural constraint falls entirely on the output, characterizing its shape without dependence on any phonological properties of the input. For example, a morphological category can be specified as "MinWd" regardless of whether an input base is itself minimal, supraminimal, or subminimal. There is, however, an important class of cases in which aspects of base shape also play a role in determining output form. These have been analyzed as involving the notion of *prosodic circumscription*.

Typically, affixation is defined on purely *grammatical* entities, adjoining an affix node to morphological categories such as root, stem, or (morphological) word, without regard to their phonological content. The result is ordinary prefixation or suffixation. Under prosodic circumscription, though, affixation or other morphology applies to a phonologically defined prosodic base situated within the grammatical base. The result is often some sort of infix, though there are many applications of prosodic circumscription extending beyond infixation.

Ulwa, a language of the Atlantic coast of Nicaragua, presents a remarkably clear case of infixation by prosodic circumscription (Hale and Lacayo Blanco 1989; Bromberger and Halle 1988; McCarthy and Prince 1990a, 1993a, b). The stress system of Ulwa is iambic, with the main stress falling on the leftmost foot. Remarkably, the possessive morphology of Ulwa is marked by a set of infixes located immediately after the main-stress foot:

(15) Ulwa possessive

(a) Forms of possessive

sú:lu	'dog'	sú:kinalu	'our (excl.) dog'
sú:kilu	'my dog'	sú:nilu	'our (incl.) dog'
sú:malu	'thy dog'	sú:manalu	'your dog'
sú:kalu	'his/her dog'	sú:kanalu	'their dog'

(b) Location of infixes (noun + 'his')

(i) After heavy initial syllable

bás-ka	'hair'
kí:-ka	'stone'
sú:-ka-lu	'dog'
ás-ka-na	'clothes'

(ii) After peninitial syllable

saná-ka	'deer'
amák-ka	'bee'
sapá:-ka	'forehead'
siwá-ka-nak	'root'
kulú-ka-luk	'woodpecker'
aná:-ka-la:ka	'chin'
arák-ka-bus	'gun'
karás-ka-mak	'knee'

The fundamental idea of prosodic circumscription is that infixes like Ulwa *-ka, -ki, -ma*, . . . are actually suffixes, but suffixes on the *prosodically circumscribed* initial foot within the Ulwa noun stem. The theory of prosodic circumscription aims to make precise and extend this basic idea. The analysis of Ulwa and the (quasi-) formal construction of circumscription theory on which it is based are presented in McCarthy and Prince 1990a; certain aspects of the approach recall earlier proposals in Broselow and McCarthy 1983 and McCarthy and Prince 1986.

Central to the formal development is a parsing function Φ(C, E, B) which returns the designated prosodic constituent C that sits at the edge E of the base B. The constituent C is thereby circumscribed; the initial foot of Ulwa is an example of exactly such a C. For notational convenience, we will write Φ(C, E, B) – the result of applying Φ – as B:Φ <C,E>, emphasizing that this is the portion of base B that falls under the description <C,E>. (In line with this usage, we will refer to the parsing function as Φ <C,E>, mentioning only its settable parameters.) In the case of Ulwa *karasmak*, for example, the circumscribed initial foot *karas* would be described as *karasmak*:Φ <Ft,L>.

The function Φ induces a factoring on the base B, dividing it into two parts: one is the *kernel* B:Φ, satisfying the constraint <C,E>; the other is the *residue* B\Φ, the complement of the kernel within B.[10] Assuming an operator "*" that gives the relation holding between the two factors (often left- or right-concatenation), the following identity holds:

(16) Factoring of B by Φ
B = B:Φ * B\Φ

Concretely, using Ulwa *karasmak*, we have the following analysis:

(17) Factoring of the Ulwa noun

karasmak	=	*karasmak*:Φ	*	*karasmak*\Φ
	=	*karas*	*	*mak*

The word is factored *initial foot + anything else*; that is, kernel + residue, in that order.

In *positive prosodic circumscription*, the specified prosodic constituent B:Φ serves as the base for the morphological operation. Let O be a morphological or phonological operation, so that O[X] is that operation applied to a base X. We can now define 'O:Φ' – the very same operation, but conditioned by positive circumscription of <C,E> – in the following way:

(18) Operation applying under positive prosodic circumscription
O:Φ [B] $=_{df}$ O[B:Φ] * B\Φ

To apply O to B under positive prosodic circumscription, is, by this definition, to apply O to B:Φ. The result stands concatenated with B\Φ in the same way ("*") that the kernel B:Φ concatenates with the residue B\Φ in the base B. In this way, the operation O:Φ inherits everything that linguistic theory tells us about O, except its domain of application.

The Ulwa possessive makes use of a parsing function that picks out the first foot of the base: Φ <Ft, Left>.[11] The morphological operations at issue are those that accomplish suffixation of the possessive markers. Suppose we write SUFFKA for the operation suffixing /ka/ 'possessed by 3psg.'. Appropriately circumscribed, the operation becomes SUFFKA:Φ <Ft, Left>. Suffixation of the possessive now unfolds as follows:

(19) Possessive suffixation under prosodic circumscription

SUFFKA:Φ [*karasmak*]	=	SUFFKA [*karasmak*:Φ]	*	*karasmak*\Φ
	=	SUFFKA [*karas*]	*	*mak*
	=	*karas-ka*	*	*mak*
	=	*karaskamak*		

The initial iambic foot, rather than the whole noun, functions as the base for suffixation of the possessive morpheme, leading to surface infixation. In the limiting case of words consisting of a single iambic foot, like *bas* or *ki:*, the infixes are actual suffixes, since B and B:Φ are identical.

In *negative prosodic circumscription*, the morphological operation is applied to the residue of circumscription, the B\Φ portion, which is what remains when the mentioned constituent C is disregarded. Symmetrically with positive circumscription, we can define an operation circumscribed to apply to the residue:

(20) Operation applying under negative prosodic circumscription

$$O\backslash\Phi\ [B] \ =_{df}\ B{:}\Phi \ * \ O\ [B\backslash\Phi]$$

This formalizes extrametricality. To apply operation O to base B *under extrametricality* is just to apply O to the residue of circumscription, B\Φ. For example, in the prototypical final-syllable extrametricality case of stress rules, a stress rule O applies to B\Φ <σ,R> – the base disregarding the final syllable. Exactly paralleling positive circumscription, the result of applying O to B\Φ stands concatenated with B:Φ in the same way as B\Φ concatenates with the kernel B:Φ in the original base B.

A common type of infixing reduplication requires negative circumscription of an *initial onsetless syllable*, one that starts with a vowel, rather than a consonant. An example of this comes from the Austronesian language Timugon Murut:

(21) Timugon Murut reduplication (Prentice 1971; McCarthy and Prince 1991a, 1993a, 1993b: ch. 7)

bulud	*bu*-bulud	'hill/ridge'
limo	*li*-limo	'five/about five'
ulampoy	u-*la*-lampoy	no gloss
abalan	a-*ba*-balan	'bathes/often bathes'
ompodon	om-*po*-podon	'flatter/always flatter'

The reduplicative template in Timugon Murut is a light syllable, σ_μ. It copies material of the base, minus an initial onsetless syllable, if any. We might therefore characterize it as $\text{PREFRED}\backslash\Phi<\sigma_v, \text{Left}>$, where σ_v is a temporary expedient for "onsetless syllable" and PREFRED stands for the operation of prefixing the reduplicative morpheme. Applied to the final example in (21), this schema yields the following result:

(22) Negative prosodic circumscription in Timugon Murut

PREFRED$\backslash\Phi$ [*ompodon*]	=	*ompodon*:Φ	*	PREFRED	[*ompodon*$\backslash\Phi$]
	=	*om*	*	PREFRED	[*podon*]
	=	*om*	*	σ_μ-*podon*	
	=	*om*	*	***po***-*podon*	
	=	*om**po**podon*			

The morphological base *ompodon*, minus its initial syllable *om*, functions as the prosodically circumscribed base to which the operation of prefixing a σ_μ template applies. Crucially, it is the residue of circumscription, rather than the kernel, that is the target of the morphological operation. When the initial syllable has an onset, as in *bulud*, the kernel of circumscription is empty, and the entire base *bulud* is the residue to which the reduplicative template is prefixed.

Prosodic circumscription succeeds in unifying a wide range of phenomena that are sensitive to phonological subdomains, embracing under one theory operations that target a constituent, as in Ulwa, and those that exclude a constituent ("extrametricality"), as in Timugon Murut. The theory situates Prosodic Morphology within broader principles holding for all kinds of phonology and morphology, thereby addressing the fundamental explanatory goal of the enterprise. But Timugon Murut represents a kind of limiting case for prosodic circumscription theory (and, more generally, for its congener, extrametricality). Indeed, the limit appears to have been exceeded, for two reasons. First, the onsetless syllable, though granted the ad hoc symbolization σ_v, is not a legitimate prosodic constituent – on the contrary, it is a *defective* prosodic constituent. So its role in Timugon Murut circumscription contravenes principle (1c), which entails that recognized constituents be employed in circumscription criteria. Second, infixes with the same locus of placement as Timugon Murut are *always reduplicative*, to the best of our knowledge. Reduplicative infixes that go after an initial onsetless syllable are common and widespread, being found also in the Sanskrit aorist and desiderative (Kiparsky 1986, McCarthy and Prince 1986, Janda and Joseph 1986: 89), the Philippine Austronesian language Pangasinán (Benton 1971: 99, 117), and the non-Austronesian languages of Papua New Guinea Yareba (Weimer and Weimer 1970, 1975: 685), Orokaiva (Healey et al. 1969: 35–6), and Flamingo Bay Asmat (Voorhoeve 1965: 51). Ordinary, nonreduplicative infixes never show this distribution. There is an evident interaction: positioning an affix *after an initial onsetless syllable* is dependent upon the affix's being *templatic and reduplicative* rather than segmentally specified. Circumscription theory cannot explain this, because it formally divorces the placement of an affix from the structural nature of the affix. We now turn to work which aims to derive this kind of connection.

3 Recent developments

Much current work in Prosodic Morphology is set within Prince and Smolensky's (1993) Optimality Theory. Optimality Theory asserts that grammars consist of hierarchies of universal constraints that select among candidate output forms; constraint interaction is via this language-particular hierarchy, in which lower-ranking constraints are violated when violation leads to satisfaction of a higher-ranking constraint. Since the constraints are universal (up to the fixing of parameters inherent in the formulation of some constraints), the grammar of a particular language consists of a ranking of the universal constraint set.

The application of Optimality Theory to Prosodic Morphology can be illustrated with a small part of the reduplication system of Axininca Campa (Arawakan, Peru), drawn from the complete treatment in McCarthy and Prince (1993b: ch. 5). (For important earlier work on this system, see Payne 1981, Spring 1990, Black 1991.) The normal pattern in Axininca Campa is total root reduplication (23a), but, under particular phonological circumstances, more or less than the whole root may be reduplicated. In particular, when the root is vowel-initial and long (23b), its first syllable is not reduplicated.

(23) Reduplication of long unprefixed roots in Axininca Campa (Payne 1981, Spring 1990, McCarthy and Prince 1993b)

(a) Consonant-initial long roots

/kawosi/	kawosi-*kawosi*	'bathe'
/koma/	koma-*koma*	'paddle'
/tʰaaŋki/	tʰaaŋki-*tʰaaŋki*	'hurry'

(b) Vowel-initial long roots

/osampi/	osampi-*sampi*	'ask'	*osampi-*osampi*
/osaŋkina/	osaŋkina-*saŋkina*	'write'	*osaŋkina-*osaŋkina*

The constraint responsible for total reduplication of consonant-initial long roots like those cited in (23a) is MAX (McCarthy and Prince 1993b, 1994a, b):

(24) MAX
Reduplicant = Base.

In total reduplication, there is no templatic requirement to be met (McCarthy and Prince 1986, 1988), so MAX is the sole determining factor. For a form like *kawosi*, MAX imposes a ranking on candidate reduplicants in which the exact copy *kawosi* itself stands at the top, ahead of all partial copies, such as *wosi* or *si*. The optimal candidate reduplicant is therefore *kawosi*. Undominated (and therefore unviolated), MAX will always yield total reduplication – maximal identity between base and reduplicant.

But MAX is crucially dominated in Axininca Campa, as shown by the incomplete reduplication of vowel-initial *osampi* or *osaŋkina* (23b). The reason for the failure of perfect copying in these forms lies with the constraint ONSET, which prohibits onsetless syllables:

(25) ONSET (formulation from Itô 1989: 223)
$*\ [_\sigma V$

Any candidate reduplicant that exactly copied a base shaped /V . . . V/ would have hiatus at the base-reduplicant boundary, violating ONSET, as in **osampi.**osampi***. Therefore, the grammar of Axininca Campa must contain the ranking provision ONSET ≫ MAX, compelling less-than-full copying, but satisfying ONSET. The following tableau shows this:[12]

(26) ONSET ≫ MAX, from /osaŋkina + redup./

Candidates			ONSET	MAX
(a)		o.saŋkina-*.o.saŋkina*	** !	
(b)	☞	o.saŋkina- *saŋkina*	*	*

Other logical possibilities, such as epenthesis at the base-reduplicant juncture, are barred by additional constraints that are known independently to dominate MAX (see McCarthy and Prince 1993b: ch. 5). The point here is that the reduplicant need not violate ONSET, and in fact it doesn't, at the price of a MAX violation. Since MAX is lower ranking, failure on MAX – that is, partial reduplication – is irrelevant to deciding the outcome.

The same ONSET constraint can also be applied to the problem of Timugon Murut, signaled above in section 2, by recruiting an idea in Prince and Smolensky 1991, 1993. They propose that the prefixal or suffixal positioning of a morpheme can be conceived of as a violable constraint; and one possible way of violating such a constraint is infixation. For a case like Timugon Murut, where the infix is fundamentally a prefix, the constraint responsible is ALIGN-RED-L:

(27) ALIGN-RED-L
Align(RED, Left, Stem, Left)
"The left edge of the reduplicative morpheme RED aligns with the left edge of the Stem."
i.e. "The reduplicant stands initially, is a prefix."

The formalization comes from McCarthy and Prince (1993a), though details are not relevant here. The point is that obedience to ALIGN-RED-L ensures the absolute prefixal status of RED. However, disobedience can be compelled by higher-ranking constraints. Under general principles of Optimality Theory, any violation of ALIGN-RED-L must be minimal, so that RED will lie *as near as possible* to the initial word edge, given that it maximally satisfies any higher-ranking constraints.

The Timugon Murut reduplicative affix is prefixed to C-initial bases (***bu**-bulud*) but infixed in V-initial bases (*om-**po**-podon*). Simple prefixation runs into problems with ONSET that infixation (i.e. violation of ALIGN-RED-L) successfully avoids. Reduplicating *ompodon* as **o.ompodon* is syllabically less harmonic than reduplicating it as *om.**po**.podon* because **o.ompodon* duplicates an ONSET violation.

Formally, this means that ONSET forces violation of ALIGN-RED-L; in terms of ranking, ONSET dominates ALIGN-RED-L in the grammar of Timugon Murut:

(28) ONSET ≫ ALIGN-RED-L, from /redup. +ompodon/

		Candidates	ONSET	ALIGN-RED-L
(a)		| *o*.om.po.don	** !	
(b)		| *om*.om.po.don	** !	
(c)	☞	| om.*po*.po.don	*	*
(d)		| om.po.*do*.don	*	** !

Ill-alignment (= infixation) spares an ONSET violation. With the ranking ONSET ≫ ALIGN-RED-L, the unaligned *om-**po**-podon* is optimal. By contrast, in C-initial forms like ***bu**-bulud*, ONSET is obeyed by even the properly aligned candidate, so infixation is unnecessary – and therefore impossible, since it would involve gratuitous violation of ALIGN-RED-L.[13]

Recall that this infixal locus is observed only with *reduplicative* affixes, and never with segmentally specified (i.e. nonreduplicative) affixes. The proposal here explains why: reduplicating the initial onsetless syllable of *ompodon* would copy the ONSET violation. With segmentally specified affixes, regardless of their shape, the circumstances are different, since they cannot duplicate a violation of ONSET. (For formal analysis, see McCarthy and Prince 1993b: ch. 7.)

This result answers the two objections against a circumscriptional treatment of Timugon Murut raised at the end of section 2. There is no problem here of referring to the onsetless syllable as a type of (defective) prosodic constituent. Rather, the distribution of the infix is determined by the high rank of the constraint ONSET, an uncontroversial part of the universal theory of the syllable. Equally significantly, the fact that only reduplicative infixes are observed with this distribution is no longer mysterious, but rather follows from the constraint interaction responsible for this type of infixation.

We have just suggested how Prosodic Morphology within Optimality Theory can provide the first steps toward a real theory of infixability, predicting both what kind of morpheme shapes can be infixed at all and where they can lodge in their hosts. It also sheds further light on the theory of templates, sharpening and extending the predictions made by the Prosodic Morphology Hypothesis (1a). We will focus on the MinWd template, improving on the analysis of Diyari sketched in section 2.

The question raised by Diyari and similar cases is *why* the minimal word should be a possible reduplicative template. Linguistic theory ought to provide more than a heterogeneous list of the reduplicative templates that happen to be observed in various languages. The goal here is to explain why the Diyari reduplicant is identical to the minimal word of the language, without invoking the notion of minimality, or perhaps the notion of *template*. If the argument is successful, the minimality property will be shown to follow from the interaction of the universal constraints on prosodic form, whose status is quite independent of any phenomena of prosodic morphology.

To accomplish this goal, we require some background about a particular aspect of prosodic theory as developed within Optimality Theory (Kirchner 1993, McCarthy and Prince 1993a). The stress pattern of Diyari, illustrated in (29), pairs up syllables into feet from left to right:[14]

(29) Diyari stress (Poser 1982, 1989)

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

The following constraints are responsible for this stress pattern:

(30) All-Ft-Left
Align(Ft, L, PrWd, L)
"The left edge of every foot aligns with the left edge of some PrWd."
= "Every foot is initial in the PrWd."

(31) Parse-Syll
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 *exactly at* the left edge. This constraint is satisfied when there is just one foot in the entire word. In partial contradiction, the constraint Parse-Syll requires that every form be fully footed, demanding multiple feet in longer words.[15] Thus, All-Ft-Left will never be completely satisfied in words longer than three syllables, which will have more than one foot. But under minimal violation of All-Ft-Left, a multifoot form must have its feet *as close to* the beginning of the word as possible. This is the foot-placement effect attributed to left–right directionality.[16]

In a quinquesyllabic form (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, because Foot Binarity is undominated. All-Ft-Left is violated because the non-initial foot is misaligned. (See McCarthy and Prince 1993a, elaborating on the proposal of Kirchner 1993, for further development.)

Observe that these constraints are often violated, but are nevertheless consequential even when violated. Both constraints can, however, be obeyed fully. In that case,

Every syllable is footed (Parse-Syll is obeyed)
and
Every foot is initial (All-Ft-Left is obeyed).

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:

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

Thus, the minimal word is the most harmonic prosodic word possible, with respect to Parse-Syll and All-Ft-Left – indeed, with respect to every form of Ft/PrWd alignment. Of course, the single foot contained within the minimal word is optimally binary, because of Ft-Bin. Hence, the most harmonic prosodic word, with respect to these metrical constraints, is a disyllable in any language that does not make syllable-weight distinctions.

Diyari is such a language. 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:

(32) 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. Rather, minimalization follows from the ranking of Parse-Syll and All-Ft-Left, in particular from their domination of Max, the reduplicative constraint that demands total copy. 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:

(33) Parse-Syll ≫ Max, from /RED + t^jilparku/

			Parse-Syll	Max
(a)	☞	$[(t^j ilpa)_{\mathrm{Ft}}]_{\mathrm{PrWd}}$ – $[(\mathrm{t^j ilpar})_{\mathrm{Ft}}\ \mathrm{ku}]_{\mathrm{PrWd}}$	*	***
(b)		$[(t^j ilpar)_{\mathrm{Ft}}\ ku]_{\mathrm{PrWd}}$ – $[(\mathrm{t^j ilpar})_{\mathrm{Ft}}\ \mathrm{ku}]_{\mathrm{PrWd}}$	** !	

Form (b) is a perfect copy, as indicated by its success on Max. But success on Max is purchased at the intolerable cost of a gratuitous Parse-Syll violation. Less-than-full copying is available that avoids this unparsed syllable, and given the dominance of Parse-Syll, this is more harmonic, as (a) shows.

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:

[(*tʲil*)]-[(tʲilpar)ku]	:	violates Foot Binarity
[(*tʲilpar*)]-[(tʲilpar)(ku)]	:	violates the requirement, unviolated in Diyari, that all PrWds are V-final.
[(*tʲil*-tʲil)(parku)]	:	violates the constraint R = PrWd.
[(*tʲilpar*)(*ku*-tʲil)(parku)]	:	violates the constraint R = PrWd.
[*tʲil*]-[(tʲilpar)ku]	:	contains a footless PrWd, an impossibility under the Prosodic Hierarchy.

The failure of these 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.)

(34) All-Ft-Left ≫ Max, from (hypothetical) /RED + ŋandawalka/

	All-Ft-Left	Max
(a) ☞ [(*ŋanda*)$_{Ft}$]$_{PrWd}$ – [(ŋanda)$_{Ft}$ (walka)$_{Ft}$]$_{PrWd}$	*	*****
(b) [(*ŋanda*)$_{Ft}$ (*walka*)$_{Ft}$]$_{PrWd}$ – [(ŋanda)$_{Ft}$ (walka)$_{Ft}$]$_{PrWd}$	** !	

In (b), the reduplicant fatally violates All-Ft-Left, since it contains an unaligned foot, while (a) avoids that violation by less-than-full copying. Another failed candidate, ****(ŋanda)wa***-(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.

The success of the accounts of both the Timugon Murut and Diyari examples is inextricably linked with the Optimality-Theoretic principles of constraint ranking and violation. In Timugon Murut, low-ranking Align-Red-L is violated under the compulsion of Onset. Nonetheless, violation is minimal, as usual in Optimality Theory. More remarkably, even Onset itself is violated in this language, not only word-initially (*ulampoy, ompodon*) but also medially:

(35) Onset violation in Timugon Murut

ambilú.o	'soul'	"two distinct phonetic syllables" (Prentice 1971: 24)
nansú.i	'slanting'	"both vowels are syllabic" (ibid.: 25).
lógo.i	'the price'	"two phonetic syllables" (ibid.)

Onset is violated when obeying it would run afoul not of RED/Stem alignment, but of *faithfulness* to the underlying segmentism. That is, satisfaction of Onset cannot be bought at the price of deleting or inserting segments, because faithfulness constraints dominate Onset. (For various approaches to formalizing these faithfulness constraints, see Prince and Smolensky 1993 and McCarthy and Prince 1994a, b.)

Faithfulness likewise plays a role in Diyari. In contrast to the reduplicant, ordinary stems of Diyari (including the base of reduplication), may violate Parse-Syll and/or All-Ft-Left. The reason for this is that ordinary stems must honor the commitment to their underlying segmentism: that is, faithfulness constraints, which require that all input segments be realized in the output, crucially dominate the responsible metrical constraints Parse-Syll and All-Ft-Left.

In Optimality Theory, a form is marked with respect to some constraint if it violates it; hence, the universal constraints embody a theory of markedness (Prince and Smolensky 1993, Smolensky 1993). In particular, the constraints Onset, Parse-Syll, and All-Ft-Left constitute part of a theory of prosodic markedness. In both Timugon Murut and Diyari, these constraints stand in the middle of a hierarchy Faithfulness $\gg$ "Prosodic Markedness" $\gg$ X. They are crucially dominated by Faithfulness, as shown by the fact that they are freely violated when respecting the input is at stake. Yet they themselves dominate X, a constraint of *morphological* markedness, like Align-Red-L or Max, that demands a particular structure under morphological conditions. Given this ranking, X must be violated whenever it is possible to achieve a phonologically less marked structure, even though that less marked structure is not consistently observed in the language as a whole. This result, dubbed "emergence of the unmarked" by McCarthy and Prince (1994a), is fundamental to Optimality Theory, since it derives from the theory's intrinsic conception of constraint ranking and its role in linguistic typology.

4 Prospects

As research in Prosodic Morphology proceeds to explore connections between its phenomena and the general principles of phonology and morphology, we expect to find a continuing diminution of dependence on parochial assumptions, and correspondingly greater reliance on independent principles of form, perhaps within the context of Optimality Theory. We will highlight two prospects here.

Under Optimality Theory, where grammars are rankings of interacting constraints, ranking must also be the proper way to characterize phenomena like those studied in Prosodic Morphology. The hypothesis is that all of Prosodic Morphology should be understood in terms of a general ranking schema: "P dominates M" (P $\gg$ M), where P stands for some prosodic constraint, and M stands for some morphological one (McCarthy and Prince 1993b). To paraphrase, in the analysis of prosodic-morphological phenomena, some phonological constraint must dominate some morphological constraint, forcing it to be violated minimally.

The ranking required in Axininca Campa and Timugon Murut conforms to this P $\gg$ M schema: the P-constraint Onset dominates the M-constraints Max and Align-Red-L (respectively), which pertain to the exactness of reduplicative copying and the positioning of the affix with respect to the Stem. Likewise in Diyari, the P-constraints Parse-Syll and All-Ft-Left crucially dominate the M-constraint Max. Interesting questions arise about the full range of P- and M-constraints that may be subsumed under this schema.

Another matter rendered ripe for rethinking is the status of templates in Prosodic Morphology. A striking feature of the analysis of Diyari in section 3 is the relatively minor role played by the template. Instead of stipulating that the template is a foot or minimal word, it is sufficient to say that the reduplicant is a prosodic word; other properties of the Diyari reduplicant follow from appropriate ranking of the (quite independent) metrical constraints that specify the character of the most harmonic prosodic word.

It is possible to go still further in reducing the role of templates in Diyari and similar cases (McCarthy and Prince 1994b). The morphological category Stem has a characteristic congeries of phonological properties; in particular, the most harmonic Stem is one that is analyzed as a prosodic word, and appropriate rankable constraints demand this.[17] We can therefore say that the Diyari reduplicant is a Stem, so the reduplicative formation is a Stem–Stem compound. This is sufficient, with no loss of descriptive accuracy, since the reduplicant's status as a prosodic word – and a minimal prosodic word to boot – will follow from appropriate ranking of the constraints that define the harmony of Stems and prosodic words.

There is, then, no template at all in Diyari or, by extension, in any other case of a minimal-word reduplicant. Rather, the only stipulation in the grammar is that the reduplicative morpheme *is a Stem*. Such a declaration must be present in the lexicon at any rate, regardless of Prosodic Morphology, since it is necessary, on most theories of morphology, to specify the morphological status or level of each morpheme.

Pressing the hypothesis to its logical conclusion, we might say that smaller reduplicative morphemes, like the Ilokano examples in (6) and (8), are of the morphological category Affix, looking to independent prosodic properties of Affixes to account for their phonology. If this is successful, then all that is left of the reduplicative "template" is an irreducible minimum of morphological specification – no more than would be required for any morpheme – with the apparatus that is specific to reduplication or Prosodic Morphology essentially eliminated.

NOTES

1 Earlier proposals for including prosody in templatic morphology in various ways include Archangeli 1983, 1984; Broselow and McCarthy 1983; J. Levin 1983; Lowenstamm and Kaye 1986; Marantz 1982; McCarthy 1979, 1981, 1984a, b; Nash 1986: 139; and Yip 1982, 1983. Prosodic Morphology extends this approach to the claim that *only* prosody may play this role, and that the role includes circumscription as well.

2 Treatments of reduplication within Prosodic Morphology include Aronoff et al. 1987; Bagemihl 1991; Bates and Carlson 1992; Black 1993; Chiang 1992; Cole 1991; Crowhurst 1991a, b; Finer 1985; Goodman 1994; Hewitt and Prince 1989; Hill and Zepeda 1992; Kroeger 1989a, b; C. Levelt 1990; McNally 1990; Mutaka and Hyman 1990; Nivens 1992; Noske 1991; Schlindwein 1988, 1991; Shaw 1987, 1992; Spring 1990; Steriade 1988b; Stonham 1990; Weeda 1987; J. Williams 1991; Yin 1989; Yip 1991, 1992.

3 Satisfaction of the $\sigma_{\mu\mu}$ template in Ilokano principally involves MAX and related constraints discussed below in section 3. Particular cases in which the copying is less complete than it could be show the intervention of Ilokano-specific requirements. Words like *roʔot* reduplicate as ***roː**-roʔot*, rather than *****roʔ**-roʔot*, because Ilokano bans syllable-final glottal stop. By a further peculiarity of Ilokano, word-final consonants cannot be copied, so forms like *trak* or *nars* 'nurse' also reduplicate with a long vowel.

4 The complexities of the system are extensively explored in Kager 1993; Hayes 1995; Hewitt 1992, 1994; Leer 1985a, b; Rice 1988; A. Woodbury 1987; and others.

5 The bimoraic minimum is clearly evidenced in English by the impossibility of light monosyllables, like [tə] or [ə], except as prosodically dependent function words. The monosyllable minimum is also seen in the system of irregular verbs, all uniformly monosyllabic modulo prefixes (or pseudo-prefixes, as in *believe*). If, indeed, monosyllabicity is an output constraint on the past-tense forms of irregulars, then the lack of *-əd* endings is explained (both *-d* and *-t* are used: *told, lost*). See Pinker and Prince 1988 for recent discussion. Spring 1990, McCarthy and Prince 1991a, b, Black 1993, and Hewitt 1994 deal with some of the issues surrounding subtypes of prosodic minimality.

6 The unsuffixed forms are themselves also subject to additional limitations on their final clusters: **And < Andrew*, **Christ < Christine*, **Naft < Naftali*, **Alb < Albert*, **Ald < Aldo*. Contrast *Mort, Walt, Barb*, etc. Evidently, certain consonant sequences are banned, by a restriction that must be imposed after suffixation, since *Andy*, etc., are acceptable. (The markedness of the illicit sequences is evidenced by their inclination to simplify, in English and elsewhere.) Interestingly, certain clusters can appear before *-ie* that are generally banned in the language: *Pengie < Penguin* [attested], *Ambie < Ambrose*

[constructed]. The clusters *ŋg* and *mb* must be admitted by the monosyllable restriction, which therefore refers to general sonority considerations, but they are then disallowed by other constraints of the language, which apply to e.g. [æmb] but not [æmbi]. In short, the monosyllable restriction is a necessary condition on both suffixed and unsuffixed forms, completely eliminating all postvocalic clusters of rising sonority; additional restrictions eliminate other 'marked' clusters of falling sonority from syllable-final position on the surface (Borowsky 1986). For further discussion of this interesting nexus of facts, see McCarthy and Prince 1991a.

7 It is also always possible to attach the hypocoristic suffix *-čan* to the entire original name: hence, *midori-čan*, with three moras in the base; *wasaburoo-čan*, with five. In this case, no prosodic template is at work, and no restriction falls on the base. All short forms invoke the template: contrast licit *wasaburo-* < *wasaburoo* with illicit **taizo-* < *taizoo*.

8 References include, for the Afro-Asiatic family: McCarthy 1979, 1981, McCarthy and Prince 1990b, Bat-El 1989, Dell and Elmedlaoui 1992, Hayward 1988, Lowenstamm and Kaye 1986; for Miwok: Freeland 1951, Broadbent 1964, Crowhurst 1991b, Lamontagne 1989, Sloan 1991, N. Smith 1985, 1986, Smith and Hermans 1982; for Yokuts: Newman 1944, Archangeli 1983, 1984, 1991; for Takelma: Sapir 1922, Goodman 1988, B. Lee 1991.

9 *Canonical* nouns are those that are truly integrated into the morphological system, based on their ability to form broken plurals and other criteria. The vast majority of nouns in Arabic are canonical, but many (such as recent loans like *tilifuun* 'telephone') are not.

10 Some aspects of this approach to formalizing the theory of prosodic specification are influenced by Hoeksema's (1985) notion of a "head operation." Compare also the developments in Aronoff 1988.

11 Alternatively, we might see the target of circumscription in Ulwa as the *head* foot, rather than the leftmost one, allowing the parsing function Φ to refer to the hierarchical notion *head* rather than, or in addition to, left and right edges. This idea is pursued, within an Optimality-Theoretic account, in McCarthy and Prince 1993b: ch. 7).

12 This table observes certain notational conventions: constraints are written (left to right) in their domination order, violations are marked by "*", and crucial violations are also called out by "!." Shading emphasizes the *irrelevance* of the constraint to the fate of the candidate. A loser's cells are shaded after a crucial violation, the winner's when there are no more competitors.

13 Notice that deeper infixation, as in **ompo-**do**-don*, fares no better on ONSET and even worse on ALIGN-RED-L, so it cannot be optimal. A complete account of the system requires consideration of various other candidates, in which the problem with ONSET is resolved by other means: e.g. deletion or epenthesis. A particularly interesting candidate is the purely prefixal *****o.m**-om.po.don*, where the reduplicant straddles a syllable boundary. Here the templatic requirement on the reduplicant – that it constitute a syllable – is not met, indicating the dominance of the templatic constraint. For

discussion, see McCarthy and Prince 1993b: ch. 7.

14 Complications arise in polymorphemic words – see Poser 1989.

15 In Diyari, as in many languages, PARSE-SYLL is subject to Foot Binarity (5), which forbids the construction of degenerate feet. FTBIN therefore dominates PARSE-SYLL in Diyari, preventing the complete footing of odd-syllabled words. Indeed, FTBIN is unviolated in the language (except for *ya* 'and'), and therefore undominated.

16 In right-to-left footing, ALL-FT-RIGHT, the symmetric counterpart of ALL-FT-LEFT, is the active constraint.

17 A nearby case is the phonology of Stems with "Level II" affixes in English.