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Prosodic Morphology

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Chapter 7
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7.1 Introduction

The phrase ‘prosodic morphology’ refers to a class of linguistic phenomena in which prosodic structure affects morphological form. In the Nicaraguan language Ulwa, for example, possessive morphemes are observed to occur after the main stress of the word, which always falls on one of the first two syllables in an iambic pattern, shown in (1) (Hale and Lacayo Blanco 1989; McCarthy and Prince 1990a).

(1) Ulwa possessives

'su:lu	'dog'	'su:-ki-lu	'my dog'
		'su:-ma-lu	'your (sg.) dog'
		'su:-ka-lu	'his/her dog'
'bas	'hair'	'bas-ka	'his/her hair'
'asna	'clothes'	'as-ka-na	'his/her clothes'
sa'na	'deer'	sa'na-ka	'his/her deer'
si'wanak	'root'	si'wa-ka-nak	'his/her root'
a'rakbus	'gun'	a'rak-ka-bus	'his/her gun'

In prosodic-morphological terms, the possessive is suffixed to the main-stress metrical foot of the word: (*si'wa*)-ka-nak. The possessive suffix subcategorizes for a prosodic constituent, the main-stress foot, rather than a morphological one, the stem.

Ulwa is an example of infixation (section 7.6), because the possessive suffix is internal to words with non-final stress. Other prosodic-morphological phenomena to be discussed include reduplication (section 7.3), root-and-pattern morphology (section 7.4), and truncation (section 7.5). First, though, a brief summary of the relevant assumptions about prosodic structure is necessary.

7.2 Prosodic structure

Word prosody is an area of lively research and consequent disagreement, but there are certain fairly standard assumptions that underlie much work on prosodic morphology (though see Downing 2006: 35ff., Inkelas 1989, 2014: 84ff. for other views). The constituents of word prosody are the prosodic or phonological word (ω), the metrical or stress foot (Ft), the syllable (σ), and the mora (μ). The parsing of words into metrical feet is fundamental to most theories of word stress, with binary feet accounting for the typical rhythmic patterns of stress assignment: (*ipe*)(*cacu*)(*'ana*) (i.e., the English word *ipecacuana*). The mora is the unit of syllable weight. Generally, syllables ending in a short vowel (often referred to as CV syllables) are monomoraic and therefore light, while syllables ending in a long vowel, a diphthong, or a consonant (CV:, CVV, and CVC syllables) are bimoraic and therefore heavy. Some languages,

called quantity-insensitive, do not make distinctions of syllable weight; in these languages, all syllables (or perhaps all CV and CVC syllables) are monomoraic (see chapter 5).

These constituents are arranged into a prosodic hierarchy (Selkirk 1978), in which every constituent of level n is obligatorily headed by a constituent of level $n-1$:

(2) Prosodic hierarchy



The head of a prosodic word is its main-stress foot; the head of a foot is the syllable that bears the stress; and the head of a syllable is the mora that contains the syllable nucleus.

In addition to the headedness requirement, there are various principles of form that govern each level of the prosodic hierarchy. Of these, the one that is most important in studying prosodic morphology is foot binarity, the requirement that feet contain at least two syllables or moras. Many languages respect foot binarity absolutely; all languages, it would appear, avoid unary feet whenever it is possible to form a binarity foot. Combining the headedness requirement of the prosodic hierarchy with foot binarity leads to the notion of a minimal word (Broselow 1982; McCarthy and Prince 1986/1996). If every word must contain some foot to serve as its head, and if every foot must contain at least two syllables or two moras, then the smallest or minimal word in a language that respects foot binarity will be a disyllable (if distinctions of syllable weight are not made) or a single heavy syllable (if distinctions of syllable weight are made). Thus, in the Australian language Diyari (Austin 1981, Poser 1989), which is quantity-insensitive, monosyllabic words are prohibited, while in Latin, which is quantity-sensitive, the smallest word is the smallest foot, a heavy monosyllable CVC, CV:, or CVV, as in (*'sol*) 'sun', (*'me:*) 'me', or (*'kui*) 'to whom'. (Though see Garrett 1999, Gordon 1999: 255ff., Hayes 1995: 86ff. for other views of the minimal word = minimal foot equivalence.)

7.3 Reduplication

Reduplicative morphology involves copying all or part of a word. From the standpoint of prosodic morphology, partial reduplication is more interesting because prosodic structure determines what is copied. The naïve expectation is that reduplication identifies a prosodic constituent in the stem and then copies it. This is not always the case, however, and is in fact atypical. Much more commonly, reduplication involves copying sufficient material to create a new prosodic constituent (Marantz 1982). The prosodic requirement is imposed on the copied material, not on the base from which it was copied.

The example in (3) will clarify this important distinction. In the Philippine language Ilokano, the plural of nouns is formed by prefixing sufficient copied material to make a heavy syllable (Hayes and Abad 1989).

(3) Heavy syllable reduplication in Ilokano

pusa	pus-pusa	'cat/pl.'
kaldiŋ	kal-kaldiŋ	'goat/pl.'
ɖʒanitor	ɖʒan-ɖʒanitor	'janitor/pl.'

A heavy syllable is the prosodic characterization of the prefixed reduplicative material – *pus-*, *kal-*, and *ɖʒan-* are all heavy syllables. It is clearly not the case, however, that a syllable, heavy or otherwise, was targeted in the stem and then copied. Although *kal* happens to be a syllable in the stem, *pus* and *ɖʒan* are not. Rather, these segmental sequences in the stem are split across two syllables: *pu.sa*, *ɖʒa.ni.tor*.

The analysis of partial reduplication posits a special type of morpheme, called a prosodic template, that characterizes the shape of the reduplicated material. In the Ilokano example, this morpheme is a heavy syllable, $[\mu\mu]_{\sigma}$, that is devoid of segments. The heavy-syllable prefix borrows segments from the stem to which it is attached via a copying operation. The details of how copying is achieved are not directly relevant to the topic of this volume, but see Inkelas and Zoll (2005: 25ff.), Marantz (1982), McCarthy, Kimper, and Mullin (2012), McCarthy and Prince (1988, 1999), Raimy (2000), and Steriade (1988) for various approaches.

Like segmental morphemes, templatic reduplicative morphemes come in various forms. In addition to its heavy-syllable reduplicative prefix, Ilokano also has a light-syllable prefix with various meanings, shown in (4). When combined with the segmental prefix *ʔagin-*, it conveys the sense of pretending to do something.

(4) Light syllable reduplication in Ilokano (Hayes and Abad 1989)

ɖʒanitor	'janitor'	ʔagin-ɖʒa-ɖʒanitor	'pretend to be a janitor'
trabaho	'to work'	ʔagin-tra-trabaho	'pretend to work'
sanjit	'to cry'	ʔagin-sa-sanjit	'pretend to cry'

Observe that both simplex and complex onsets are copied: *sa*, *tra*. The light syllable reduplicative template is satisfied by both CV and CCV, because onsets do not contribute to syllable weight. Whenever it is the case that the template does not limit copying, the segmental makeup of the base is duplicated exactly.

Another reduplicative prosodic template, particularly common in the Australian and Austronesian languages, is the foot or minimal word. Recall that the minimal word in Diyari is a disyllabic foot. So is the reduplicative prefix (which has varied morphological functions), as shown in (5).

(5) Minimal word reduplication in Diyari (McCarthy and Prince 1994a)

'wila	'wila-'wila	'woman'
'wakari	'waka-'wakari	'to break'
'nan̩kaŋti	'nan̩ka-'nan̩kaŋti	'catfish'
't̩ilparku	't̩ilpa-'t̩ilparku	'bird'

The reduplicative morpheme in Diyari is quite literally a prosodic word (Austin 1981): it has its own main stress impressionistically, its first syllable has segmental allophones that are diagnostic of main stress, and it must end in a vowel, like all other prosodic words of Diyari. Reduplicated words in Diyari are prosodically compound, consisting of a minimal prosodic word followed by one that is not necessarily minimal. Why is the reduplicative part minimal even though the stem part is not? In other words, how is Diyari's minimal word reduplication distinguished from total reduplication, like hypothetical 'nan̩kaŋti-'nan̩kaŋti?

McCarthy and Prince (1994a) argue that Diyari reduplication, and perhaps all forms of partial reduplication, are instances of what they call 'emergence of the unmarked'. In Optimality Theory (OT), markedness constraints can be active even when they are ranked too low to compel violation of faithfulness constraints (Prince and Smolensky 1993/2004). Minimal word reduplication emerges when certain markedness constraints that are important in basic stress theory are active, but dominated by faithfulness. Among these constraints is PARSE-SYLLABLE, which is violated by unfooted syllables (McCarthy and Prince 1993a). In a hierarchy of strict domination, there would be no PARSE-SYLLABLE violations, because every constituent of type *n-1* would be immediately dominated by a constituent of type *n*. In OT, however, the force of PARSE-SYLLABLE is determined by its ranking. In Diyari, PARSE-SYLLABLE is ranked below the constraints requiring faithfulness to the underlying representation, so it is not able to force deletion of stem segments in an odd-numbered (and hence unfooted) syllable. But PARSE-SYLLABLE is ranked above constraints requiring total copying of the stem into the reduplicative prefix (denoted here by the ad hoc constraint COPY). The effect of this ranking is shown somewhat informally in the following tableau:

(6) Emergence of the unmarked

	FAITH	PARSE-SYLL	COPY
a. → [('t̩ilpa) _{Ft}] _{PWd} - [('t̩ilpar) _{Ft} ku] _{PWd}		*	**
b. [('t̩ilpa) _{Ft} ku] _{PWd} - [('t̩ilpar) _{Ft} ku] _{PWd}		**	
c. [('t̩ilpa) _{Ft}] _{PWd} - [('t̩ilpa) _{Ft}] _{PWd}	**		

The losing candidate in (6b) has copied the unfooted syllable *ku*, and necessarily left it unfooted, because Diyari does not permit monosyllabic feet. This candidate fails because it has incurred two PARSE-SYLLABLE violations, while (6a) has only one. The losing candidate in (6c) has eliminated all PARSE-SYLLABLE violations by deleting *ku* from the stem, a fatal violation of faithfulness. The winning candidate in (6a) retains the stem's PARSE-SYLLABLE violation – unavoidable because of high-ranking faithfulness – but it avoids copying that violation, at the expense of only low-ranking COPY.

The extent to which other reduplicative templates, like those of Ilokano, are reducible to emergence of the unmarked, like Diyari, is a topic of discussion. See, for example, Blevins (2003), Haugen and Hicks Kennard (2011), Kennedy (2008), and Urbanczyk (2001).

7.4 Root-and-pattern morphology

In root-and-pattern morphology, a prosodic template is the determinant of the form of an entire word, rather than just an affix, as is the case with reduplication. The prosodic template specifies the word pattern onto which segmental material (the root) is mapped (McCarthy 1981). A root-and-pattern system is arguably the fundamental organizing principle in the morphology of the Semitic languages (though see Watson 2006 for a review of divergent opinions).

Some of the Classic Arabic prosodic templates are shown in (7).

(7) Classical Arabic prosodic templates based on root *ktb* ‘write’

Template	Word	Gloss	Function of template
CaCaC	katab	‘wrote’	basic verb form
CaC:aC	kattab	‘caused to write’	causative verb
Ca:CaC	ka:tab	‘corresponded’	reciprocal verb
CuCuC	kutub	‘books’	plural
Ca:CaC	ka:tib	‘writer’	agent
maCCaC	maktab	‘office’	Place
maCCu:C	maktu:b	‘written’	passive participle

As usual in root-and-pattern systems, the effect of imposing a template is a fairly thorough remaking of word’s form, so it may initially seem unrecognizable. Observe, however, that the consonants of the root are constant throughout. The same can be found with other roots; the root *ḥkm*, for example, can also be found in other words that deal with the general concept of ‘judgment’: *ḥakam* ‘passed judgment’; *ḥakkam* ‘chose as arbitrator’; *ḥa:kama* ‘prosecuted’; *ḥaki:m* ‘judicious’; *ḥa:kim* ‘a judge’; *maḥkam-at* ‘a court’; etc.

For further discussion, see McCarthy (1981, 1993) and McCarthy and Prince (1990a, 1990b).

7.5 Truncation

In truncation, a portion of the stem is deleted to mark a morphological distinction (Alber and Arndt-Lappe 2012, Bat-El 2002, Benua 1995, Cohn 2005, Doak 1990, Féry 1997, Ito 1990, Ito and Mester 1997, Mester 1990, Weeda 1992). There are two ways in which prosodic structure affects truncation: by specifying what remains or by specifying what is taken away. The former is a type of templatic morphology, closely resembling reduplicative and root-and-pattern morphology (section 7.4). The latter is often referred to as subtractive morphology.

In templatic truncation, a word is typically reduced to one or two syllables. This is particularly common in nicknames and terms of address, as in (8) and (9), though it can be found in other grammatical categories as well:

(8) Japanese templatic truncation (Mester 1990, Poser 1984, 1990)

Name	Truncated	
ju:ko	o-ju:	Yuko
ranko	o-ran	Ranko
jukiko	o-juki	Yukiko
midori	o-mido	Midori
jinobu	o-jino	Shinobu

(9) Indonesian templatic truncation (Cohn 2005)

Word	Truncated	
anak	nak	'child'
bapak	pak	'father'
Agus	Gus	personal name
Lilik	Lik	personal name
Glison	Son	personal name
Mochtar	Tar	personal name

The analysis of templatic truncation is very similar to the analysis of reduplication in Diyari. The template is some version of the minimal word, a single foot. Mapping an existing word to this template shortens it to minimal size. Mapping can proceed from left to right, as in Japanese, or right-to-left, as in Indonesian. Mapping may also start with the stressed syllable, as in English *Elizabeth/Liz*, *Alexander/Sandy*, and *Vanessa/Nessa*.

In subtractive truncation, the material with constant shape consists of what is removed rather than what remains. In Koasati, for example, there are processes of plural formation that truncate the final VC or V: (10) or the final C (11) of the stem:

(10) Koasati VC subtractive truncation (Martin 1988)

Singular	Plural	
pitaf-fi-n	pit-li-n	'slice up the middle'
albiti:-li-n	albit-li-n	'to place on top of'
akocofot-li-n	akocof-li-n	'to jump down'

(11) Koasati C subtractive truncation (Martin 1988)

Singular	Plural	
bikot-li-n	biko:-li-n	'to bend between the hands'
asikop-li-n	asiko:-li-n	'to breathe'

What remains after truncation can be one, two, or three syllables long, depending on the length of the original stem. The constant, then, is that which is taken away rather than that which remains.

Subtractive truncation is not common, and often appears to be a historically secondary development in which erstwhile suffixes have been reanalysed as part of the base. As Alber and Arndt-Lappe (2012) note, there have been various efforts to analyse putative cases of subtractive truncation as something entirely different, such as phonological deletion. There have also been proposals within OT to introduce antifaithfulness constraints, constraints that require underlying and surface representations to differ from one another, and these

constraints have been applied to the analysis of subtractive truncation (Alderete 2001a, 2001b, Bat-El 2002, Horwood 1999).

There is a third type of truncation that cannot be readily classified as either templatic or subtractive. A class of vocatives in Southern Italian truncate everything after the stress:

(12) Southern Italian vocatives (Maiden 1995)

Word	Vocative	
avvo'katu	avvo'ka	'lawyer!'
mi'kele	mi'ke	'Michael!'
do'meniko	do'me	'Dominic!'

Similar phenomena can be found in other languages: Coeur d'Alene (Doak 1990, Thomason and Thomason 2004), English (Spradlin 2016), and Zuni (Newman 1965). The shape constant is that which remains after truncation – a word with final stress – but it is not a prosodic constituent such as a foot, because it is of arbitrary length. Phenomena like this suggest that the identification of templates with prosodic constituents is insufficient. Generalized template theory (McCarthy and Prince 1993b, 1994b) allows templates to be defined by phonological constraints, much as we saw in (6). For further discussion, see also Downing (2006), Flack (2007), Gouskova (2007), and Ito and Mester (1992/2003).

7.6 Infixation

Infixes are affixes that are positioned internal to the root. As the Ulwa example in (1) shows, infixes sometimes fall within the general scope of prosodic morphology because prosodic factors affect their position. In Ulwa, the possessive affixes subcategorize for the head foot of the word, to which they are suffixed. Expletive infixation in English is another example (McCarthy 1982). Expletive words, such as *fuckin'* or *bloody*, can be inserted inside of other words, provided that they do not split metrical feet: $(,abso)_{Ft}$ -*fuckin'*-(*'lutely*)_{Ft}, not $*(,ab-fuckin'-so)_{Ft}$ (*'lutely*)_{Ft} or $*(,abso)_{Ft}$ (*'lute-fuckin'-ly*)_{Ft}.

Prince and Smolensky (1993/2004) analyse Tagalog *um* infixation as prosodically conditioned. When a word begins with a single consonant, *um* is placed right after it. When a word begins with a consonant cluster, the infix variably falls within or after the cluster:

(13) Tagalog *um* infixation

sulat	s-um-ulat	'to write'
?abot	?-um-abot	'to reach for'
gradwet	g-um-radwet ~ gr-um-adwet	'to graduate'
preno	p-um-reno ~ pr-um-eno	'to brake'

Prince and Smolensky propose that infixed *um* is actually a prefix that is displaced from initial position because otherwise the word would begin with a vowel: $*um-sulat$. In optimality-theoretic terms, *um*'s prefixhood is determined by a ranked, violable constraint, ALIGN-LEFT(*um*, word). This constraint is ranked below ONSET, which requires syllables to begin with consonants. (For further details, see Klein (2002) and Zuraw (2007).)

McCarthy and Prince (1993b) discuss a case of reduplicative infixation in the Timugon Murut language of Borneo. In this language, a light-syllable reduplicative template is prefixed to words beginning with a consonant (14a), but it is infixed after the first syllable of a word beginning with a vowel (14b):

(14) Infixing reduplication in Timugon Murut (Prentice 1971)

a. Copy initial CV

[bulud]	'hill'	[bu-bulud]	'ridge'
[limo]	'five'	[li-limo]	'about five'

b. Skip initial V(C) and copy following CV

[ulampoj]	no gloss	[u-la-lampoj]	no gloss
[abalan]	'bathes'	[a-ba-balan]	'often bathes'
[ompodon]	'flatter'	[om-po-podon]	'always flatter'

If the reduplicative prefix were not infixed, as in **u-ulampoj* or **o-ompodon*, the result would be adding an ONSET violation. Abstractly, the analysis is the same as in Tagalog: ONSET dominates the constraint requiring left-edge alignment of the reduplicative prefix.

For a comprehensive review of infixation phenomena and another point of view, see Yu (2007).

7.7 Summary

This brief overview of prosodic morphology has introduced the principal phenomena – reduplication, root-and-pattern morphology, truncation, and infixation – and some of the proposals for how they should be analysed – prosodic templates and constraint interaction.

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