On Defining Complex Templates

RENÉ KAGER
University of Utrecht

1. Background and motivation

This paper[1] addresses the forms of templates in prosodic morphology. The research program initiated by McCarthy and Prince (1986) has established that morphological categories in many languages are characterized by prosodic invariants, or TEMPLATES. Templates govern phenomena such as root-and-pattern morphology, truncation, canonical stem shapes, and reduplication. The central hypothesis of this research program is the Prosodic Morphology Hypothesis (McCarthy and Prince 1986):

(1) PROSODIC MORPHOLOGY HYPOTHESIS
Templates are defined in terms of the authentic units of prosody.

As this formulation suggests, templates are either authentic units themselves, or are composed of such units. This paper will focus on the latter type.

I define a SIMPLE TEMPLATE as any 'authentic unit of prosody':

(2) a. MORA (μ).
b. SYLLABLE (σ): Light syllable (L), Heavy syllable (H), Syllable (σ).
c. FOOT (F): Disyllabic foot ($F_{\sigma\sigma}$), Bimoraic foot ($F_{\mu\mu}$), Iamb ($F_{ia\,nt}$).
d. STRICT MINIMAL WORD (SMW): A Prosodic Word which is a F[illegible]

1 I wish to thank Andy Black, Chris Golston, Bruce Hayes, [illegible], Dominique Nouveau, David Perlmutter, Alan Prince, and Carl [illegible]. This research was supported by the Linguistic Research Foundation [illegible] Netherlands organization for scientific research, NWO.

In stem morphology, both μ and L are rare as a simple templates, because of the common requirement that Template = Prosodic word ≥ Foot.

I define a COMPLEX TEMPLATE as any template composed of more than one of the 'authentic units of prosody'. The two major types established by prosodic theory are:

(3) a. LOOSE MINIMAL WORD (LMW): A template consisting of a SMW plus a light syllable (anything that exceeds a foot, but is not two feet): [F+L] or [L+F].
b. PROSODIC COMPOUND (Cpd): A template consisting of precisely two SMW's: [F+F].

All templates, simple or complex, will be indicated with square brackets [...].

Complex templates should be carefully distinguished from DERIVED TEMPLATES, which, as the term suggests, are nontemplatic. Derived templates are built from a templatic base, by one or more prosodic affixes, usually moras (McCarthy and Prince 1990a,b, McCarthy 1992a,b). Borderline cases of derived and complex templates occur. As a working definition, I propose that a derived template must have its proper category or semantics, attributed to the prosodic affix. Without such motivation, the structure is complex rather than derived. This will be illustrated below.

Finally, I will introduce the notion of TEMPLATE POOL as the set of templates which together characterize a morphological category. One may think of template pools as the prosodic allomorphs associated with a category. Template pools may include simple or complex templates, or both. For example, the Arabic Broken Plural (McCarthy and Prince 1990a) defines a pool {H, LL, LH}. Template pools will be indicated with braces {...}.

The issue I wish to adress here is what principles define complex templates and pools. An unconstrained interpretation of the Prosodic Morphology Hypothesis overgenerates grossly. Many complex templates and template pools can be 'defined in terms of authentic units of prosody' which are not attested in templatic systems. E.g., Compounds such as [LH+LH], Loose Minimal Words such as [L+H+L], and template pools such as {LL, H+H}, are all composed of authentic units of prosody.

This paper aims at constraining the Prosodic Morphology Hypothesis by narrowing down the notion 'defined in terms of'. The strategy will be to define template pools as NATURAL CLASSES. This presupposes a definition of the internal structure of complex templates. I will propose a general parametric format of templates, and demonstrate that this format characterizes the better-known templatic systems from the literature. Closely connected with this is the issue of the foot typology required for templatic systems. I will argue that strictly bimoraic feet in the sense of Kager (1992a) are adequate as bases of complex templates. I will only discuss template forms, not association principles.

To form a better idea of the notion of 'template pool', let us first take a look at the prosodic invariants associated with loanword abbreviation in Japanese. The data come from Itô (1990).[2] Japanese loan abbreviations are characterized by a pool of 7 templates, 6 of which are complex:

(4) a. Strict Minimal Word: [LL], but not *[H]

LL: suto (raiki) 'strike'

b. Loose Minimal Word: [H+L], [LL+L], but not *[L+H]

H+L: dai ya (moNdo) 'diamond'
LL+L: tere bi (zyoN) 'television'

c. Prosodic Compound: [H+H], [H+LL], [LL+H], [LL+LL]

H+H: baa teN (daa) 'bartender'
H+LL: koN bini (eNsu) 'convenience store'
LL+H: ea koN (dishonaa) 'airconditioner'
LL+LL: asu para (gasu) 'asparagus'

A preliminary to the analysis of loan abbreviations is that Japanese feet are bimoraic, H and LL (Poser 1990). The following generalizations, due to Itô (1990), govern the seemingly random set of templates of (4):

(5) a. Two-foot-maximality: Templates are maximally two feet (*[HHL]).
b. Minimal stem requirement: Templates are minimally one foot (*[L]).
c. Left edge requirement: Templates begin with a foot (*[LH], *[LHL]).
d. Minimal word requirement: Templates are minimally two syllables (*[H]).

The theoretical challenge posed by the generalizations of (5) can be phrased as follows. Do these form a completely random choice, or can they be related to universal principles governing template pools?

2. A proposal

I propose to construe the generalizations about Japanese loanword abbreviations of (5) as language-particular instantiations of four PARAMETERS of a universal template format. This format consists of a HEAD plus a NON-HEAD, both of which are 'authentic units of prosody'. Four parameters define pools:

2 Itô and Mester (1992) and Perlmutter (1992) propose analyses different in some respects from that of Itô (1990).

(6) A. RANK: [**S**trict **M**in**W**d, **L**oose **M**in**W**d, **C**ompound].
- In LMW pools, the non-head is maximally L (i.e. ∅ or L).
- In Cpd pools, the non-head is maximally F (i.e. ∅, L, or F).

B. TYPE-OF-HEAD: [**H**eavy syllable, **F**oot].

C. SIDE-OF-HEAD: [**L**eft-headed, **R**ight-headed].
(This parameter's value may be left unspecified, in which case both left-headed and right-headed templates occur in the pool.)

D. TOTAL SIZE: [Minimally (≥), Maximally (≤), Precisely (=)] disyllabic. (This parameter's value may be left unspecified.)

An overview of the templates that are generated by parametric variation in Rank, Type-of-head, and Side-of-head, is presented in (7):

(7)

	Smw	Lmw	Lmw	*Cpd*	*Cpd*	**Rank**
	-	*Left*	*Right*	*Left*	*Right*	**Side**
Head						
$\sigma_{\mu\mu}$	H	H+L	L+H	H+H	H+H	
$F_{\mu\mu}$	H	H+L	L+H	H+H, H+LL	H+H, LL+H	
	LL	LL+L	L+LL	LL+H, LL+LL	LL+H, LL+LL	
Fiamb	LH	LH+L	L+LH	LH+H, LH+LL, LH+LH	H+LH, LL+LH, LH+LH	

Template pools draw natural classes from this set, as defined by parametric specification. For example, Japanese loanword abbreviations are defined parametrically as [**Cpd; F; L;** ≥2σ]:

(8) a. *Rank*: Compound. (Hence [H+H], [H+LL], [LL+H], [LL+LL].)
b. *Type-of-head*: Foot. (Hence [LL], but *[L].)
c. *Side-of-head*: Left-headed. (Hence [H+L], but *[L+H].)
d. *Total Size*: Minimally disyllabic. (Hence *[H].)

Before we turn to actual templatic systems, a number of empirical claims should be pointed out which are implicit in the parametric format:

(9) NATURAL CLASS HYPOTHESIS: Template pools can be precisely defined by some set of parameter values, i.e. by a 'template-of-templates'.

This rules out 'crazy' pools such as {H, LL, H+L, LL+LL}.

(10) HEAD MINIMALITY HYPOTHESIS: The head is a Minimal Word.

This rules out pools with L as head, e.g. [L], and [L+H] in left-headed pools.

(11) BINARY TEMPLATE HYPOTHESIS: Templates are maximally two units.

This rules out ternary complexity, e.g. [L+H+L], [H+LL+H]. Essentially, it is the 'no counting' condition of prosodic morphology.

(12) INCLUSION HYPOTHESIS: Template pools of higher prosodic ranks include templates of all lower prosodic ranks.

This rules out Compound pools which include no Loose Minimal Word, or noStrict Minimal Word (e.g. {LL, H+H}). Also, Loose Minimal Word pools which include no Strict Minimal Word (e.g. {HL, LLL}).[3]

(13) DISYLLABIC HYPOTHESIS: The total size of the templates of a pool can only be restricted with respect to a disyllabic domain.

This rules out pools with maximally trisyllabic templates, e.g. {LLL, HLL, LLH}. Perhaps this domain can be equated with a QI foot $F_{\sigma\sigma}$, or GENERALIZED TROCHEE. (See Prince 1980, Hayes 1993, Kager 1992b,c for stress systems, McCarthy 1992b for prosodic morphology.)[4]

(14) METRICAL LOCALITY HYPOTHESIS: A pool cannot specify the internal structure of the subconstituents of its templates.

If the Head is Foot, then both [H] and [LL] are possible values of Head. This rules out pools with only LL but not H as head, e.g. {LL, LL+L, LL+H, LL+LL}. If [H] is absent from a pool, it must be due to the Size parameter.

The second main issue of this paper, closely related to the definition of complex templates, is FOOT TYPOLOGY. Rather strikingly, none of the complex templates built on the uneven iamb LH (those below the dashed line in 7), ever occur in templatic systems. That is, the strictly bimoraic foot, together with the bimoraic syllable, exhaust the values of Head in the template format. The claim that quantitative feet are strictly bimoraic has been made for rhythmic stress systems by Kager (1992a):

(15) STRICT BINARITY HYPOTHESIS: Quantitative feet are strictly bimoraic.

An overview of well-known template pools is presented in (16). It is restricted to pools with ranks Loose Minimal Word and Compound:[5]

---

3 A possible counterexample resides in Japanese hypocoristics, which according to Poser (1990) are precisely one or two feet.

4 An alternative resides in conditions on branching (Word Binarity, Itô and Mester 1992).

5 Chugach PV: Proximal Vocative, Yawelmani V: Verbs, Arabic TV: Truncated Vocative, Sierra Miwok PV: Primary Verbs, Kikuyu DR: Diminutive Reduplication, Arabic FV: Finite Verbs, English NN: Nicknames, Akkadian V: Verbs, Axininca MR: Modal

(16)

	SMW		*LMW*			*Cpd*			
System	H	LL	LH	HL	LLL	HH	HLL	LLH	LLLL
Chugach PV	+		+						
Yawelmani V	+		+						
S. Miwok PV	+		+	+					
Arabic TV			+	+					
Kikuyu DR		+		+					
Arabic FV		+		+					
English NN	+	+		+					
Arabic BP	+	+	+						
Akkadian V		+	+	+					
Axininca MR	+	+	+	+	+				
Arabic NFV			+			+			
S. Miwok V	+		+	+		+			
Japanese LA		+		+	+	+	+	+	+
Arabic CN	+	+	+			+			

Assuming strictly bimoraic feet, these pools are characterized parametrically as in (17):

(17)

System	*Pool*	*Rank*	*Head*	*Side*	*Size*
Chugach PV	{H; LH}	LMW	H	R	
Yawelma. V	{H; LH}[6]	LMW	H	R	
S. Miwok PV	{H; LH, HL}	LMW	H		
Arabic TV	{LH, HL}[7]	LMW	H		$=2\sigma$
Kikuyu DR	{LL; HL}	LMW	F	L	$=2\sigma$
Arabic FV	{LL; HL}	LMW	F	L	$=2\sigma$
English NN	{H, LL; HL}	LMW	F	L	$\leq 2\sigma$
Arabic BP	{H, LL; LH}	LMW	F	R	$\leq 2\sigma$
Akkadian V	{LL; LH, HL}	LMW	F		$=2\sigma$
Axininca MR	{H, LL; LH, HL, LLL}	LMW	F		
Arabic NFV	{LH; HH}	Cpd	H	R	$=2\sigma$
S. Miwok V	{H; LH, HL; HH}	Cpd	H		$\leq 2\sigma$
Japanese LA	{LL; HL, LLL; HH, HLL, LLH, LLLL}	Cpd	F	L	$\geq 2\sigma$
Arabic CN	{H, LL, LH, HH}	Cpd	F	R	$\leq 2\sigma$

The remainder of the paper will be devoted to a discussion of the templatic systems summarized in (17) in the light of the parametric theory.

Reduplication, Arabic BP: Broken Plural, Sierra Miwok V: Verbs, Arabic NFV: Non-Finite Verbs, Arabic CN: Canonical Nouns, Japanese LA: Loan Abbreviations.

6 Yawelmani verb stems {L, H, LH} include atemplatic [L]. See discussion below.

7 The Arabic Truncated Vocative {LH, HL} and nonfinite verbs {LH, HH} lack [H] as well as [LL]. The violation of the Inclusion Hypothesis is apparent only. See discussion below.

3. Other templatic systems

3.1 Left-headed systems

Classical Arabic finite verb stems (McCarthy and Prince 1990b) come in two templatic shapes, [LL] or [HL]:

(18) *Arabic finite verbs* {LL, HL}: **[LMW; F; L; =2σ]**

	Biliteral /sm/ 'poison'	*Triliteral* /f9l/ 'do'	*Binyan*
a. LL:	sa.mam	fa.9al	I
	nsa.mam	nfa.9al	VII
	sta.mam	fta.9al	VIII
	sma.mam	f9a.lal	IX
b. HL:	sam.mam	fa9.9al	II
	saa.mam	faa.9al	III
	?as.mam	?af.9al	IV
	stas.mam	staf.9al	X
	smaa.mam	f9aa.lal	XI
	---	f9aw.9al	XII

The basic forms of the templates emerge when we abstract away from two factors. Firstly, final consonants are extrasyllabic in Arabic stems, while one initial consonant may be extrasyllabic. Secondly, prespecified consonants may be prefixed or infixed to basic stems. (These are underlined in 18.)

Under the current analysis, the 'anti-iamb' [H+L] is a complex template of the Loose Minimal Word type. Its templatic status has been challenged by McCarthy and Prince (1990a), who claim that [HL] is nontemplatic. They derive both [LL] and [HL] from a monosyllabic base [σ] by a Finite Verb Suffix consisting of a light syllable: $[\sigma_{\mu\mu}+\sigma_{\mu}]$, $[\sigma_{\mu}+\sigma_{\mu}]$. This analysis violates the Head Minimality Hypothesis, however, since the base of [L+L] is a light syllable.

McCarthy (1992b) avoids this problem by analyzing only HL as nontemplatic. He derives HL from the [LL] base template by MORA INFIXATION: $[\sigma_{\mu}\sigma_{\mu}] \rightarrow [\sigma_{\mu+\mu}\sigma_{\mu}]$. This analysis runs into other problems. If a single moraic affix is assumed for [HL], no semantics can be attributed to it, which properly characterizes all Binyanim of (18b). Alternatively, if multiple moraic affixes are assumed, the generalization is lost that all affixations conspire towards to a single prosodic invariant [HL].

I conclude that prosodic affixation is to be constrained by categorial or semantic criteria. If not, almost any template can be regularized by this device, a situation seriously undermining the empirical force of the Prosodic Morphology Hypothesis.

An template pool identical to that of Arabic finite verbs characterizes Kikuyu diminutive reduplication (Peng 1990):

(19) *Kikuyu diminutive reduplication* {LL, HL}: [**LMW; F; L; =2σ**]

		Base	*Reduplicated form*	
a.	LL:	cin	ci.na - cin	'burn a little'
		βo.cor	βo.ca - βo.cor	'be a little intended'
		ci.ɣe.rer	ci.ɣa - ci.ɣe.rer	'encircle a little'
		ha.haat	ha.ha - ha.haat	'feel about a little'
		rɛ.rɛor	rɛ.ra - rɛ.rɛor	'skim off a little'
b.	HL:	koor	koo.ra - koor	'pull out a little'
		tɛɛ.hor	tɛɛ.ha - tɛɛ.hor	'tear a little'
		tɛi.θi	tɛi.θa - tɛi.θi	'help a little'
		θaa.ɣaan	θaa.ɣa - θaa.ɣaan	'go out a little'
		tii.ɳoiɳ	tii.ɳa - tii.ɳoiɳ	'loiter a little'

The length of the first syllable of the base is transferred to the reduplicant. Peng argues that moraic length may be copied along, since it is distinctive. Furthermore, all reduplicants end in a light syllable with prespecified /a/. This may be analyzed as a prosodix suffix, but see Peng (1990).

As compared to Arabic and Kikuyu, English nicknames (McCarthy and Prince 1990a) have an additional monosyllabic [H] template. Accordingly, the Size parameter is set as maximally, rather than precisely, disyllabic:

(20) *English nicknames* {H, LL, HL}: [**LMW; F; L; ≤2σ**]

		Base	*Nickname*
a.	H:	Michael	Mike
		Thomas	Tom
		Sylvester	Sly
b.	LL:	Michael	Mickey
		Caroline	Carrie, Caro, Carol
		Benedict	Bennet
c.	HL:	Michael	Mikie
		Caroline	Lina
		Belinda	Linda

McCarthy and Prince (1990a) argue that final *-i* is a stress-neutral suffix. However, forms such as *Carol, Bennet*, and *Linda* show that the final light syllable in the disyllabic template may also be filled with melodic material from the base. The generalization is that all disyllabic forms end in a light syllable. Therefore, both [LL] and [HL] must be templates.

3.2 Right-headed systems

For bimoraic theory, the main issue in the analysis of templatic systems is whether the uneven iamb LH can be dispensed with.[8] From a descriptive point of view, [LH] need not be a primitive. It can be reanalyzed as [L+H], a right-headed Loose Minimal Word with a bimoraic head. The complex analysis of [LH] is supported by two kinds of evidence. Firstly, no language defines its word minimum as the uneven iamb, while many languages have bimoraic word minima. Secondly, no language has complex templates built on the uneven iamb (those below the dashed line in 7). That is, no Loose Minimal Words occur such as [LH+L], nor do Compounds such as [LH+H], [LH+LL], or [LH+LH].[9] Summarizing, uneven iamb theory turns out to be less restrictive than strictly bimoraic theory in defining possible templates.

Template parameters of uneven iamb theory slightly differ from those of bimoraic theory. On the positive side, uneven iamb theory drops the Side-of-head parameter. The only motivation for the value Right-headed of bimoraic theory, the LMW [L+H], is a primitive in uneven iamb theory. The remaining LMW's, [H+L] and [LL+L], are both left-headed. On the negative side, uneven iamb theory requires two additional values of Foot in the Type-of-head parameter, to capture natural classes of iambs. The value F_{iamb} is motivated by pools which include all three iambs. The value $F_{iamb\{H\}}$ (heavy iamb) is motivated by pools which include [H] and [LH], but not [LL].[10]

(21)	*Value*	*Range*	*Motivation*
a.	$F_{\mu\mu}$	{H, LL}	Kikuyu R, Arabic FV, English NN, Japan. LA
b.	F_{iamb}	{H, LL, LH}	Arabic BP, Akkadian V, Axininca R
c.	$F_{iamb\{H\}}$	{H, LH}	Chugach PV, Yawelmani V, S. Miwok V/PV

The Chugach Yupik Proximal Vocative (Woodbury 1985, McCarthy and Prince 1986) exemplifies a pool with only [H] and [LH], but not [LL]:

(22) *Chugach Proximal Vocative* {H, LH}: **[LMW; H; R]** or **[$F_{iamb\{H\}}$]**

		Base	*Vocative*
a.	H:	A.ɳu.kaɣ.naq	Aɳ
		Nu.pi.ɣak	Nup
b.	LH:	A.ɳu.kaɣ.naq	A.ɳuq
		Nu.pi.ɣak	Nu.pix *or* Nu.pik

8 The status of the uneven iamb in prosodic morphology has been previously questioned by Hammond (1990).

9 A genuine test would require templatic systems which are free of disyllabic maximality. Admittedly such systems are rare, but Axininca reduplication, discussed below, may bear on the issue.

10 These form a somewhat obscure natural class defined by Prince (1990) as the 'optimal monosyllabic and optimal disyllabic iamb'.

In bimoraic theory, this is analysed as a right-headed Loose Minimal Word pool based on the heavy syllable.

The same pool occurs in Yawelmani verb stems (Archangeli 1991), although here the additional template [L] seems to be required:

(23) *Yawelmani verb stems* {L, H, LH}: **[LMW; H; R]** or **[$F_{iamb\{H\}}$]**

		Stem	*Surface form*		
a.	L:	/caw/	[caw+hin]	'shouted'	
		/hogn/	[hogin+hin]	'floated'	(by epenthesis)
b.	H:	/c'uum/	[c'om+hun]	'devoured'	(by lowering, shortening)
		/cuupn/	[coopun+hun]	'consented'	(by lowering, epenthesis)
c.	LH:	/ninii/	[ninee+hin]	'became quiet'	(by lowering)
		/yawaal/	[yawal+hin]	'followed'	(by shortening)

The template [L] violates the Head Minimality Hypothesis. Prince (1990) argues that [L] is simply the minimal prosody of a biliteral or triliteral root. Therefore, it is atemplatic.

Another apparently problematic case is that of Arabic nonfinite verb stems {LH, HL} (McCarthy and Prince 1990b). As in all Arabic stems, final consonants are extrasyllabic:

(24) *Arabic nonfinite verb stems* {LH, HH}:
[Cpd; H; R; =2σ] or **[Cpd; $F_{iamb\{H\}}$; =2σ]**

		Finite verb	*Nonfinite verb*	*Binyan*
a.	LH:	fa.9al	fi.9aal	I
		nfa.9al	nfi.9aal	VII
		fta.9al	fti.9aal	VIII
		f9a.lal	f9i.laal	IX
b.	HH:	ʔaf.9al	ʔaf.9aal	IV
		staf.9al	stif.9aal	X
		f9aa.lal	f9ii.laal	XI
		f9aw.9al	f9iw.9aal	XII

Apparently the Inclusion Hypothesis is violated under the bimoraic analysis, since Strict Minimal Word [H] is not in the pool. Under the uneven iamb theory, the Inclusion Hypothesis is violated because Loose Minimal Word [H+L] is not in the pool. However, McCarthy and Prince (1990b) show that Arabic nonfinite verbs are nontemplatic.

The shape of the nonfinite verb is systematically related to that of its finite counterpart, with predictable /i-a/ vocalism. Nonfinite verbs of the shape LH correspond to finite verbs LL, while nonfinite verbs of the shape HH correspond to finite verbs HL. To capture this, McCarthy and Prince (1990b) assume a [σ] base template and a nonfinite H suffix. This runs into the problem that the base of [L+H] is light, violating Head Minimality.

However, there is an alternative analysis. Nonfinite verbs are derived from corresponding finite verbs by Nonfinite Mora Suffixation: [LL] → [LL+μ] = [LH], and [HL] → [HL+μ] = [HH]. Observe that Mora Affixation is properly constrained by an overt categorial criterion (nonfinite).

Arabic canonical noun stems (McCarthy and Prince 1990a) define a somewhat larger Right-headed Compound pool {H, LL, LH, HH}:

(25) *Arabic canonical noun stems* {H, LL, LH, HH}: **[Cpd; F; R; ≤2σ]**

a.	H:	ba~~h~~r	'sea'
		barr	'reverent'
		baaz	'vulture'
b.	LL:	ra.jul	'man'
c.	LH:	ja.naab	'wing'
d.	HH:	jaa.muus	'buffalo'
		sul.ṯaan	'sultan'
		nuw.waar	'white flowers'

The Inclusion Hypothesis is satisfied under bimoraic theory, but not under uneven iamb theory. On the latter analysis the pool has one Compound [H+H], three Strict Minimal Words [H], [LL], [LH], but no Loose Minimal Word [H+L]. This violates the Inclusion Hypothesis. Absence of [H+L] is even more puzzling since it occurs elsewhere in Arabic templatic morphology, in finite verbs (cf. 18). An attempt at a natural class interpretation is the IAMB RULE, due to Fleisch (1968):

(26) Canonical noun stems are all analyzeable into one or more iambic feet (subject to a disyllabic upper bound).

If such natural classes are possible, bimoraic analogues would be expected to occur, such as {LL, H+H}. The Inclusion Hypothesis rules these out.

A template pool which has a very simple characterization under uneven iamb theory is the Arabic Broken Plural (McCarthy and Prince 1990a). The templatic portions of the plurals appear as underlined in (27):

(27) *Arabic Broken Plural* {H, LL, LH}: [LMW; F; R; ≤2σ] or [F_{iamb}]

		Base	*Plural*	
a.	H:	?a~~h~~.mar	~~h~~umr	'red'
b.	LL:	rukb+at	ru.kab	'knee'
		ki.taab	ku.tub	'book'
c.	LH:	nafs	nu.fuus	'soul'
		ra.jul	ri.jaal	'man'
		jaa.muus	ja.waa.miis	'buffalo'
		jun.dab	ja.naa.dib	'locust'

Under bimoraic theory, this pool comes out as the Loose Minimal Word version of the Arabic canonical nouns pool (cf. 25).

3.3 Symmetrical systems: pools where Side-of-head is unspecified

Finally let us consider symmetrical template pools, those which have no specification for the Side-of-head parameter. An example is the Classical Arabic Truncated Vocative (McCarthy and Prince 1990b), which comes in two shapes, [LH] and [HL]:

(28) *Classical Arabic Truncated Vocative* {LH, HL}:
[LMW; H; =2σ] or [LMW; $F_{iamb\{H\}}$; =2σ]

		Base	*Vocative*
a.	LH:	ma.jiid	ma.jii
		ja9.far	ja9.fa
		mar.waan	mar.wa
b.	HL:	maa.zin	maa.zi

The Inclusion Hypothesis is apparently violated under the bimoraic analysis. It is respected under the uneven iamb analysis, since the pool contains both a Strict Minimal Word [LH] and a Loose Minimal Word [H+L].

It turns out, however, that both members of the pool are derived, hence nontemplatic. McCarthy and Prince (1990b) argue that the Vocative is a minimal stem {LL, H} plus a vowel suffix, e.g. [*maji*]+*i*, [*marw*]+*a*, [*maaz*]+*i*. This suffix corresponds to the case-marking vowel /-*u*/ of the untruncated Vocative, and may even be replaced by this vowel (cf. [*ja9f*]+*u*). If this analysis holds, the template is Strict Minimal Word {H, LL}, and the Inclusion Hypothesis is not violated.

Another symmetrical pool is that of Akkadian verb stems, the basic templates of which have been identified by McCarthy (1992a) as {LL, HL, LH}. The stems are given in (29) in these abstract forms. McCarthy demonstrates that final consonants are extrasyllabic, as in Arabic:

(29) *Akkadian verb stems* {LL, LH, HL}:
[LMW; F; =2σ] or **[LMW; F_{iamb}; =2σ]**

a.	LL:	pa.ras	*Base form*	/prs/ 'decide'
b.	LH:	pa.raas	*Infinitive*	
c.	HL:	par.ras	*Present tense*	
		paa.ris	*Participle*	

This template pool is consistent with the Inclusion Hypothesis under both theories. McCarthy argues that HL is nontemplatic, and derived from basic [LL] (*paras*) by Mora Infixation. In contrast to Mora Affixation in the Arabic finite verb, affixation is properly constrained here by category. If this derivational analysis holds, the template pool is reduced to the disyllabic right-headed {LL, LH}.

Central Sierra Miwok simple verb stems (Freeland 1951, Goldsmith 1990) form the clearest case for the unspecified Side-of-head parameter. Verbs belong to four types, each with its canonical primary template. Suffixes may select other templatic forms (nonprimary stems), a second stem [H] or [LH], a third stem [HH], and a fourth stem [HL]:

(30) *Central Sierra Miwok simple verb stems* {H, LH, HL, HH}:
[Cpd; H; ≤2σ] or **[Cpd; $F_{iamb\{H\}}$; ≤2σ]**

	Primary	*Second*	*Third*	*Fourth*	
Type I	CvCvvC-	CvCvC-	CvC_iC_ivC-	CvCCv-	
	ka.laaŋ-	ka.laŋ-	kal.laŋ-	kal.ŋa-	'to dance'
	te.leey-	te.ley-	tel.ley-	tel.ye-	'to hear'
Type II	CvCCv-	CvCvC-	CvC_iC_ivC-	CvCCv-	
	cel.ku-	ce.luk-	cel.luk-	cel.ku-	'to quit'
	koy.pa-	ko.yap-	koy.yap-	koy.pa-	'to suck'
Type III	CvC_iC_iv-	CvCv?-	CvC_iC_iv?-	CvC?v-	
	ham.me-	ha.me?-	ham.me?-	ham.?e-	'to bury'
	?up.pi-	?u.pi?-	?up.pi?-	?up.?i-	'to dive'
Type IV	CvvC-	CvC-	$CvC_iC_iï$?-	CvC?ï-	
	weel-	wel-	wel.lï?-	wel.?ï-	'to take'
	huup-	hup-	hup.pu?	hup.?u-	'to bake'

Second stem forms are given without final geminate consonants, which are fully predictable from the suffix (Kager in progress).[11] A motivation of the parameter settings is given in (31):

(31) a. [HH] occurs in third stem template: *Rank* = Cpd.
b. All stem templates contain a heavy syllable: *Type-of-head* = [H].
c. Both [LH] (primary, second stem) and [HL] (primary, fourth stem) occur: *Side-of-head* is unspecified.
d. Maximally disyllabic, and [H] occurs (primary, second): *Size* $\leq 2\sigma$.

Primary stems {H, LH, HL} form a subpool, characterized as Loose Minimal Word rather than Compound.

Finally, let us consider Axininca Campa Modal Reduplication (Black 1991, Spring 1990), another symmetrical pool:

(32) *Axininca Modal Reduplication* {H, LL, LH, HL, LLL}: **[LMW; F]**

a. H: naa+naa+waitaki 'has continued to chew more and more'

b. LL: koma+koma+waitaki 'has continued to paddle more and more'
noN+koma+koma+waitaki 'I will continue to paddle more and more'
no+na+nona+waiti 'I will continue to carry more and more'

c. LH: no+naa+nonaa+waiti 'I will continue to chew more and more'

d. HL: tʰaaNki+tʰaaNki+waitaki 'has continued to hurry more and more'

e. LLL: kawosi+kawosi+waitaka 'has continued to bathe more and more'[12]
noN+kawosi+kawosi+waitaka 'I will continue to bathe more and more'

Under a bimoraic theory, this pool comes out as a perfect example of the symmetrical Loose Minimal Word, without any delimitation on total size. Two remarks are in order[13]. Firstly, there is a preference for reduplication of the stem without the prefix, so that the maximal template [LLL] is not always filled. Secondly, there is a preference for a disyllabic base, so that the prefix is copied along when the stem is monosyllabic (Spring 1990). Black (1990) analyses the system as total stem reduplication, with an optimal disyllabic iamb as a delimiter. Potentially a problem arises for an uneven analysis. Since the reduplicant is not restricted by disyllabic maximality, it is predicted that the uneven iamb may form the head of a Loose Minimal Word [LH+L], in addition to [H+L] and [LL+L].

---

11 The pool is slightly different from that of Southern Sierra Miwok verbs (Broadbent 1964, Smith and Hermans 1982, Lamontagne 1989).

12 Spring (1990:116) gives this stem as *kaawosi*, with a long vowel.

13 After the presentation of this paper, I learned that Prince and Smolensky (1993) make essentially the same points in their analysis of Axininca.

4. Conclusions

The main conclusion is that the parametric format [Rank; Head; Side; Size] is highly adequate in defining complex templates and template pools. As such, it constitutes a significant step towards constraining template forms in prosodic morphology. Secondly, the results bear on the issue of 'uneven iambs' versus 'strictly bimoraic feet'.

Uneven iamb theory is supported in two ways. Firstly, it dispenses with the Side-of-head parameter, analyzing all complex templates as Left-headed. Secondly, it simply defines {H, LL, LH} pools, e.g. Arabic Broken Plurals.

These advantages are outweighed by three defects. Firstly, uneven iamb theory complicates the Type-of-head parameter. While $F_{\mu\mu}$ and F_{iamb} are natural values for Foot, an awkward third value $F_{iamb\{H\}}$ must be set up for pools which include [H] and [LH], but not [LL]. Secondly, uneven iamb theory violates the Inclusion Hypothesis w.r.t. Arabic canonical nouns. Dropping the Inclusion Hypothesis would severely weaken theory, as many unattested pools would be allowed (e.g. {H, LL, HH}). Thirdly, uneven iamb theory predicts unattested complex templates built on [LH]: Loose Minimal Word [LH+L], and Compounds [LH+H], [LH+LL], [H+LH], [LL+LH], [LH+LH]. In sum, a theory with [LH] as a primitive foot overgenerates.

References

Archangeli, Diana. 1991. Syllabification and prosodic templates in Yawelmani. *NLLT* 9.231-284.

Black, H. Andrew. 1991. The optimal iambic foot and reduplication in Axininca Campa. *Phonology at Santa Cruz* 2, ed. by A. Mester and S. Robbins, 1-18.

Broadbent, Sylvia M. 1964. *Southern Sierra Miwok language*. (University of California Publications in Linguistics, vol. 38.) Berkeley and Los Angeles: University of California Press.

Fleisch, H. 1968. *L'arabe classique. Esquisse d'une structure linguistique*. Beirut: Dar El-Machreq.

Freeland, L.S. 1951. *Language of the Sierra Miwok*. (IJAL Memoir, 6.) Baltimore: Waverly Press.

Goldsmith, John. 1990. *Autosegmental and metrical phonology*. Oxford: Basil Blackwell.

Hammond, Michael. 1990. *Metrical theory and learnability*. Unpublished manuscript, University of Arizona, Tucson.

Hayes, Bruce. 1993. *Metrical stress theory. Principles and case studies*. To be published by Chicago University Press.

Itô, Junko. 1990. Prosodic minimality in Japanese. *CLS 26. Papers from the 26th regional meeting of the Chicago Linguistic Society*, vol. 2, ed. by M. Ziolkowski, M. Noske, and K. Deaton, 213-239. Chicago Linguistic Society.

Itô, Junko, and R. Armin Mester. 1992. *Weak layering and word binarity.* Unpublished manuscript, University of California, Santa Cruz.

Kager, René. 1992a. Alternatives to the iambic-trochaic law. To appear in *NLLT* 11.

Kager, René. 1992b. Are there any truly quantity-insensitive systems? To appear in *Proceedings of BLS* 18.

Kager, René. 1992c. Shapes of the generalized trochee. To appear in *Proceedings of WCCFL* 11.

Kager, René. In progress. *The templatic morphology of the Central Sierra Miwok verb.* Unpublished manuscript, University of Utrecht.

Lamontagne, Greg. 1989. *Suffix triggered variation in Southern Sierra Miwok.* Unpublished manuscript, University of Massachusetts, Amherst.

McCarthy, John and Alan Prince. 1986. *Prosodic morphology.* Unpublished manuscript, University of Massachusetts, Amherst, and Brandeis University, Waltham, Massachusetts.

McCarthy, John and Alan Prince. 1990a. Foot and word in prosodic morphology: The Arabic Broken Plural. *NLLT* 8.209-283.

McCarthy, John and Alan Prince. 1990b. Prosodic morphology and templatic morphology. *Perspectives on Arabic linguistics II: Papers from the second annual symposium on Arabic linguistics*, ed. by M. Aid and J. McCarthy, 1-54. Amsterdam: John Benjamins.

McCarthy, John. 1992a. Derived 'templates'. *BLS* 18 handout.

McCarthy, John. 1992b. Template form in prosodic morphology. To appear in *Proceedings of FLSM* 3.

Peng, Long. 1990. Root and foot in Kikuyu reduplication. *Proceedings of FLSM* 1, ed. by D. Meyer, S. Tomioka, and L. Zidani-Eroglu, 222-237.

Perlmutter, David. 1992. Pervasive word formation patterns in a grammar. *BLS* 18 handout.

Poser, William. 1990. Evidence for foot structure in Japanese. *Lg* 66.78-105.

Prince, Alan. 1980. A metrical theory of Estonian quantity. *LI* 11.511-562.

Prince, Alan. 1990. Quantitative consequences of rhythmic organization. *CLS 26. Papers from the 26th regional meeting of the Chicago Linguistic Society.* vol 2., ed. by M. Ziolkowski, M. Noske, and K. Deaton, 355-398. Chicago Linguistic Society.

Prince, Alan, and Paul Smolensky. (1993). *Optimality theory: Constraint interaction in generative grammar.* Unpublished manuscript, Rutgers University and University of Colorado at Boulder.

Smith, Norval, and Ben Hermans. 1982. Nonconcatenatieve woordvorming in het Sierra Miwok. *GLOT* 5.263-284.

Spring, Cari 1990. *Implications of Axininca Campa for prosodic morphology and reduplication.* Doctoral dissertation, University of Arizona.

Woodbury, Anthony C. 1985. *Meaningful phonological processes. A consideration of Central Alaskan Yupik Eskimo prosody.* Unpublished manuscript, University of Texas, Austin.