Template Form in Prosodic Morphology

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> "I took to drinking in the middle of the day with Mussa… He found me in the bar one afternoon poring over the Wehr Dictionary, digging for new roots." Jonathan Raban, *Arabia* p. 179

1. Introduction

The study of reduplicative and root-and-pattern morphology has emerged in recent years as a touchstone for the relation between the theory of phonology and the theory of word formation. In reduplicative and root-and-pattern morphology, grammatical distinctions are expressed by imposing a fixed phonological shape on varying segmental material. For example, the Ilokano reduplicative plural in (1) specifies a prefix whose canonical shape is constant—a heavy syllable—but whose segmental content varies in an obvious way depending on the base to which it is attached:

(1) Ilokano Reduplication (McCarthy & Prince 1986, 1991b, Hayes & Abad 1989)

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

In the root-and-pattern morphological system of Arabic, the productive plural and diminutive are expressed by imposing a fixed light-heavy syllable sequence (an iambic foot) on the singular noun base. As shown in (2), this canonical shape holds only of the initial boldface sequence by virtue of prosodic circumscription (McCarthy and Prince 1990a):

(2) Arabic Productive Plural & Diminutive

Sg.	Pl.	Dim.	
ħukm	/**ħakaa**m/	**ħukay**m	'judgment'
ʕinab	/**ʕanaa**b/	**ʕunay**b	'grape'
jaziir+at	**jazaa**ʔir	**juzay**yir	'island'
šaagil	**šawaa**gil	**šuway**gil	'engrossing'
jaamuus	**jawaa**miis	**juway**miis	'buffalo'
jundub	**janaa**dib	**junay**dib	'locust'
sulTaan	**salaa**Tiin	**sulay**Tiin	'sultan'

As in Ilokano, the Arabic categories 'plural' and 'diminutive' are expressed by an invariant shape or canonical form, rather than by invariant segmental material.

The morphemes or formatives that express these fixed shapes are called **templates**. The theory of Prosodic Morphology (McCarthy and Prince 1986 et seq.) has established as its central claim that there is a very close relation between the structure of templates and the theory of phonology, embodied in the Prosodic Morphology Hypothesis:[1]

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[1]Earlier proposals for a specific role for prosody in templatic morphology include McCarthy (1979), Marantz (1982), Levin (1983), McCarthy (1984), and Lowenstamm and Kaye (1986).

(3) Prosodic Morphology Hypothesis

Templates are defined in terms of the authentic units of prosody.

That is, templates must have a direct prosodic interpretation, like the heavy syllable template of the Ilokano plural or the iambic foot template of the Arabic productive plural and diminutive. This claim is quite surprising and also quite easily falsified, since it establishes a very close relation between a purely morphological notion, the template, and a purely phonological one, prosody.

This article, which emerges from my collaboration with Alan Prince on Prosodic Morphology, will explore the consequences of the Prosodic Morphology Hypothesis for a fairly complete account of the central regularities of canonical form in two Semitic root-and-pattern morphological systems, those of Arabic and Akkadian. We will see that the core of the Arabic nominal system is templatic in character, with templates that conform to (3). But two more specialized nominal constructions depart from (3) and are provably non-templatic. They are analyzed instead in terms of two other notions from Prosodic Morphology theory, prosodic circumscription and a-templatic prosodic morphology. The Arabic and Akkadian verb system is even more radically non-templatic; just a single template underlies all verb forms, and other morphological regularities are derived by rules of affixation, sometimes via prosodic circumscription.

The remainder of the article consists first of an overview of the essential elements of the theory of Prosodic Morphology, followed by an analysis of the Arabic noun. The discussion then turns to the Arabic verb and for crucial confirmation to the verb in Akkadian, a language which has not figured previously in the literature on templatic morphology.

2. Theoretical Background

Our goal in this section is to review those elements of the theory of Prosodic Morphology that are essential to subsequent discussion. The treatment is necessarily incomplete, touching only briefly on matters that are dealt with at much greater length elsewhere (see McCarthy and Prince (1986, 1990a, 1990b, 1991a, 1991b) and other references in the bibliography).

The Prosodic Morphology Hypothesis in (3) is complemented by two other essential aspects of the theory, the Template Satisfaction Condition in (4), which says how templates are actually matched in words, and the Prosodic Hierarchy in (5), which defines the actual units of prosody out of which templates must be constructed.

(4) Template Satisfaction Condition (McCarthy and Prince 1986)

Satisfaction of templatic constraints is obligatory and is determined by the principles of prosody, both universal and language-specific.

(5) Prosodic Hierarchy (cf. Selkirk 1980)

PrWd

F

σ

μ

According to the Template Satisfaction Condition, the result of filling a template must exactly match the universal and language-particular conditions on the prosodic units making up that template. For instance, the template of the Ilokano plural in (1) is a heavy syllable ($\sigma_{\mu\mu}$), matched by CvC *kal* or Cvv *ro:* but not Cv. But universally the heavy syllable is indifferent to the size of the onset, which may be simple (*kal*, *ro:*) or complex (*jyan*, *tra:*).

The units of prosody are the elements of the Prosodic Hierarchy in (5): the mora μ, the syllable σ, the metrical foot F, and the prosodic word PrWd. The mora is the unit of syllable weight (Prince 1980, van der Hulst 1984, Hyman 1985, McCarthy and Prince 1986, Hayes 1989, Itô 1989, etc.); the most common syllable weight typology is given in (6), where CV syllables like *pa* are light and CVV or CVC syllables like *paa* or *pat* are heavy.

(6) Syllable Types in Moraic Theory

L(ight)	H(eavy)	
σ	σ	σ
μ	μ μ	μ μ
p a	p a t	p a

This equivalence between two types of heavy or bimoraic syllables can be seen in morphological phenomena like the Ilokano plural (1) and in phonological ones like stress, closed syllable shortening, compensatory lengthening, and versification.

The theory of metrical feet in (7) is proposed by McCarthy and Prince (1986) and Hayes (1987) to account for Hayes's (1985) typological findings. (Subsequent work along the same lines includes Hayes (1991), Kager (1989, 1992a, 1992b), Prince (1992), Mester (to appear), and others.) This theory is justified on the basis of the cross-linguistic analysis of systems of lexical stress assignment but, as we will see, its properties also have important consequences for template form.

(7) Foot Theory

Iambic	Trochaic	Syllabic
LH	H, LL	σσ
LL, H		

The iamb consists maximally of a Light-Heavy sequence, with smaller Light-Light and simply Heavy expansions available. The trochee is Heavy or Light-Light, and the quantity-insensitive foot is just disyllabic. Two logically possible foot types are notably absent from this theory. First, the foot inventory in (7) is asymmetric; there is no anti-iambic HL foot, though this is countenanced in other approaches (Hayes 1980, Halle and Vergnaud 1987, Halle and Kenstowicz 1991, Prince 1992). Second, degenerate feet, consisting of just a single light syllable, are not part of the basic typology, though they may play a marked role in stress assignment (Kager 1989, Hayes 1991). It is useful to extract this prohibition from the foot typology and state it as a general condition on foot form (McCarthy and Prince 1991a):

(8) Foot Binarity

Feet must be binary under syllabic or moraic analysis.

From the Prosodic Hierarchy and Foot Binarity, McCarthy and Prince (1986, 1990a, 1991a, 1991b) derive the notion "Minimal Word". In the Prosodic Hierarchy, the category Prosodic Word dominates the category Foot, which entails that any Prosodic Word must contain at least one Foot. But since feet are binary, any instance of the category Foot must contain a heavy syllable or two light ones (in quantity-sensitive, iambic or trochaic systems) or simply two syllables (in quantity-insensitive, syllabic systems). By transitivity, then, a Prosodic Word must contain two moras (or syllables). Hence the minimal Prosodic Word in a quantity-sensitive system is a bimoraic monopod. This notion of word minimality turns out to have broad cross-linguistic applicability; see among others Itô (1992), Mester (to appear), Spring (1990a, 1990b), and Hayes (1991).

That covers the core of Prosodic Morphology; we now turn to two other ideas that support the overall program. The first is **a-templatic prosodic morphology**, proposed independently by Archangeli (1991), Bat-El (1989: 40f.), and McCarthy and Prince (1990b: 31f.). A template specifies the canonical form of its output, like the heavy syllable in Ilokano or the iamb in the Arabic plural and diminutive. But

suppose in some particular morphological formation there is no template; then the segmental melodemes will simply organize themselves according to whatever principles of phonological well-formedness, such as epenthesis or Stray Erasure, obtain in that language.

The most obvious, almost trivial case of a-templatic prosodic morphology is total reduplication (McCarthy and Prince 1986, 1990a, 1991b), like the Indonesian plural: *harian-harian* 'newspapers', *kerusahan-kerusahan* 'riots'. In total reduplication, unlike partial reduplication (1), there is copying of segments but no templatic limitation on the canonical form of the result. The result of copying is simply syllabified according to the rules of Indonesian, rather than by mapping to a template. Hence, the result can have any canonical form that is possible in Indonesian prosody, rather than the fixed canonical form of a templatic formation like the Ilokano plural in (1).

More striking, though, are cases of a-templatic prosodic morphology in systems that are otherwise templatic, like the root-and-pattern morphology of Semitic or Yawelmani. In the Ethiopian Semitic language Chaha (9), a morphological category called the jussive is formed by imposing a CC*ə*C or C*ə*CC structure on the verbal root:

(9) Chaha Jussive (Leslau 1964) (Ethiopian Semitic)

	Root	Jussive Verb	
a.	gfr	yägfər	'release'
	k'βr	yäk'βər	'plant'
	ft'm	yäft'əm	'block'
	nks	yänkəs	'bite'
b.	srt	yäsərt	'cauterize'
	trx	yätərx	'make incision'
	gmt'	yägəmt'	'chew off'

The choice between the two surface shapes of the Chaha jussive—*yägfər* vs. *yäsərt*—depends on the relative sonority of the last two root consonants.[2] That is to say, the schwa is inserted by a phonological rule of epenthesis, sensitive to local sonority relations in a familiar way. Because the location of the schwa in the jussive is straightforwardly predictable on purely phonological grounds, it should not be encoded in the template. This observation led McCarthy (1982) and Hayward (1988) to conclude that the actual template of the Chaha jussive is a vowelless CCC skeleton (with the agreement prefix *yä*). From the existence of this vowelless template McCarthy and Hayward draw the general conclusion that templates cannot be characterized in prosodic terms, contrary to the Prosodic Morphology Hypothesis (3).

But really a vowelless CCC template is the same as no template at all, since it says only that the underlying representation of the jussive consists of bare root consonants (with the agreement prefix). This is precisely what is meant by a-templatic prosodic morphology—without a template, the root consonants are organized prosodically by phonological rules of syllabification and epenthesis. An actual template is appropriate for morphological formations with a fixed, unpredictable canonical shape; where the shape is variable and phonologically predictable, as in the Chaha jussive, then no template is necessary or even possible.

Archangeli (1991) shows that the system of stem formation in Yawelmani is partially templatic, partially a-templatic. The examples in (10) are given in their phonologically justified underlying representations, abstracting away from the results of epenthesis, closed syllable shortening, and other rules.

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[2]Unexpectedly, the jussives of biliteral roots are like *yäskək* 'place a peg in the ground'. This is perhaps related to the fact that Chaha nouns never have final geminates (v. Leslau (1950: 15) on *qurər* for *qurr* 'basket').

(10) Yawelmani Stems

Root Size	Light σ	Heavy σ	Iamb
Biliteral 'devour'	CvC *c'um*	CvvC *c'uum*	CvCvv *c'umuu*
Triliteral 'walk'	CvCC *hiwt*	CvvCC *hiiwt*	CvCvvC *hiwiit*
Longer (nouns only)	CvCCC *t'on'ɬm* 'transvestites'		CvCvvCCC *yaw'eelmn* 'Yawelmani'

The constant shapes of stems are expressed by the templates: a light syllable, a heavy syllable, and an iambic foot. Roots are associated to these templates from left to right, and remaining consonants are a-templatic, so they are organized prosodically by the well-studied rules of syllabification and epenthesis in this language rather than by association to the template. Only the initial substring of a Yawelmani stem has a fixed canonical shape specified by the template, and the rest is a-templatic.[3]

One remaining aspect of Prosodic Morphology theory will be of central importance in the following discussion: prosodic circumscription. Typically, a morphological operation like affixation is applied to a morphological category like root, stem, or word to give a prefix or suffix of the usual sort. Under prosodic circumscription, though, a morphological operation is applied to a prosodically-delimited substring within the morphological category, often yielding some sort of infix. The theory of prosodic circumscription is introduced and justified in McCarthy and Prince (1990a); only the barest bones will be recapitulated here.

Central to prosodic circumscription is a parsing function Φ which locates a prosodically defined substring in a base form. Prosodic circumscription can be either positive or negative, depending on how the prosodically-delimited substring is targeted. In negative prosodic circumscription, some prosodic constituent at the edge of a form is disregarded and the morphological operation applies to the remainder. If O stands for the morphological operation (e.g., prefixation), C for the specified prosodic constituent (e.g., a syllable), and E for the edge (left or right), then we write O/Φ(C, E) to denote the application of O to some form minus the constituent C parsed out at edge E by Φ. In positive prosodic circumscription, the specified prosodic constituent at the edge serves itself as the base for the morphological operation. Using similar notation, we write O:Φ(C, E) to denote the application of O to the constituent C parsed out at edge E by Φ.

Negative prosodic circumscription, which is analogous to extrametricality, is characteristic of infixes that are located just inside the edge of a stem or word. One simple case is exemplified by the Choctaw passive infix *l* in (11).

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[3]Prince (1992) suggests that the light syllable template of Yawelmani can be dispensed with in favor of a completely a-templatic formation.

(11) Choctaw Passive (Nicklas 1974: 32)[4]

Active	Passive	
abani	albani	'to barbeque'
apisa	/alpisa/ → a pisa	'to set a date'
hokči	/holkči/ → holokči	'to plant'
takči	/talkči/ → talakči	'to tie'

This infix appears after the initial Cv sequence of the base, where it accommodates to the phonotactic requirements of the language via an independently motivated rule of epenthesis. Formally, *l* infixation is actually prefixation under negative prosodic circumscription of an initial mora (or light syllable σ_μ). The morphological rule, restricted in this way, is expressed by O/Φ(μ, Left), where O = "Prefix *l*".

A similar but slightly more complex example comes from the Philippine Austronesian language Balangao, which is analyzed in these terms by Lombardi and McCarthy (1991). In Balangao, various morphological categories are marked by gemination of the medial consonant (combined with prefixing reduplication).

(12) Balangao Reduplicative (Shetler 1976) (examples normalized)

a. Continuous Aspect

Root	Continuous	
dakal	da-dakkal	'make bigger'
matey	ma-mattey	'die'
ʔayat	ʔa-ʔayyat	'climb'

b. Diminutive/Pejorative

Root	Diminutive	
taba	tab-tabba	'fat'
ʔayat-en	ʔay-ʔayyat	'climb'
ladaw-en	lad-laddaw	'make late'
bontok	bon-bontok	'Bontoc'

c. Noun of Place

Root	Noun of Place	
basol	ba-bassol	'sin'
gadaŋ	ga-gaddaŋ	'cross'
soblak	so-soblak	'wash clothes'
hablot	ha-hablot	'hang up'

The locus of the infix in Balangao is identical to Choctaw, so it can be characterized as negative circumscription O/Φ(μ, Left). In Balangao, the morphological operation O is "Prefix μ", addition of a mora which is filled by spreading of the following consonant. Schematically, the derivation proceeds as in (13), where <> delimits the material that is negatively circumscribed.

(13)		
	Root	dakal
	Negative Circumscription	<da> kal
	Prefix μ	<da> μ + kal
	Spread	<da> kkal
	Output	dakkal

[4]But compare Ulrich (1986:136), who suggests that initial *a* in examples like *abani* may be a prefix, in which case *l* could be analyzed as a prefix too. Examples like *a:pitta* 'to place in a container', passive *a pitta* from /a:lpitta/ require a refinement of prosodic circumscription dealt with in detail by Urbanczyk (1992).

Unlike the *l* infix of Choctaw, the μ infix of Balangao remains unrealized when prohibited by syllabic well-formedness conditions. This occurs whenever the initial syllable of the base is already heavy, as in *so-soblak*. For the same reason, gemination is impossible in stressed syllables; hence the continuous aspect of *ʔánap* 'look for' is *ʔa-ʔánap*, not **ʔa-ʔánnap*. According to Shetler (1976: 33), stress is characterized by "an added mora of vowel length on non-final CV syllables"; therefore a stressed syllable is heavy per se and cannot support the additional mora of gemination.

These observations about the resistance of heavy syllables to gemination, which follow directly from the circumscriptional account, provide strong evidence against a superficially plausible alternative analysis of Balangao medial gemination. In this alternative analysis, the geminated forms are derived not by mora affixation but by mapping to a template, along the same lines as the account of medial gemination in Arabic verbs in McCarthy (1979, 1981). This analysis would set up a CVCCVC template (or some prosodic equivalent) to which the root is then mapped. Associating the the root /dakal/ to this template yields the desired result *dakkal*, and the root /bontok/ correctly remains unchanged under template mapping. But this analysis also predicts that medial gemination will apply to examples like *ʔánap*, incorrectly yielding **ʔánnap*. The problem here is that the stress (or length) of the initial vowel is a prosodic property that should not affect mapping to a template. Because a template comprehensively specifies the prosodic characteristics of its output, it should not be affected by the prosodic characteristics of its input. Only the circumscriptional analysis of Balangao gemination, not the templatic one, can explain this sensitivity to a prosodic property of the base. This argument, based on transfer of prosody from input to output, is paralleled exactly in McCarthy and Prince's (1990a: 218-9) analysis of the Arabic plural.

Lombardi and McCarthy (1991) adduce another, even more persuasive argument against the template-substitution analysis of Balangao medial gemination. The morphology of the continuous aspect can apply to a stem that has already undergone prefixation, shifting gemination leftward from the medial to the initial consonant of the root:

(14)

Root	dakal
Prefixation	pa-dakal
μ Infixation	paddakal
Reduplication	pa-paddakal

(Compare this form with synonymous *padadakkal*, where *pa-* prefixation is applied after gemination and reduplication.) Examples like *paddakal* alongside of *dakkal* show that gemination in Balangao can apply to inputs of different canonical shapes, affecting them in similar ways. This shape-independence of Balangao gemination is fatal to a template-mapping account. The problem is that a template specifies a fixed canonical shape for its output, but there is no fixed canonical shape that subsumes both disyllabic *dakkal* and trisyllabic *paddakal*. But the circumscriptional analysis, which locates gemination with respect to the initial mora, is independent of the length of the input and so encounters no such difficulty. Again, this argument for circumscription and against template substitution is exactly paralleled in the Arabic plural (McCarthy and Prince 1990a: 218-9).

Ulwa, a language of the Atlantic coast of Nicaragua, presents a remarkably clear case of positive prosodic circumscription. According to Hale and Lacayo Blanco (1989), the possessive in Ulwa is marked by a set of infixes located after the stressed syllable of the noun:

(15) Ulwa Possessive

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

Stress is iambic, assigned from left to right (though there is optional retraction of stress from a final syllable). In accordance with the definition of the iambic foot in (7), stress falls on the initial syllable if it is heavy, otherwise the peninitial syllable. Hence, the possessive infixes follow the first syllable if heavy, otherwise the second syllable:

(16) Location of Ulwa Infixes (noun + ‘his’)

a. After Initial Syllable

bás	bás-ka	‘hair’
kí:	kí:-ka	‘stone’
sú:lu	sú:-ka-lu	‘dog’
ásna	ás-ka-na	‘clothes’

b. After Peninitial Syllable

saná	saná-ka	‘deer’
amák	amák-ka	‘bee’
sapá:	sapá:-ka	‘forehead’
siwának	siwá-ka-nak	‘root’
kulúluk	kulú-ka-luk	‘woodpecker’
aná:la:ka	aná:-ka-la:ka	‘chin’
arákbus	arák-ka-bus	‘gun’ (< harquebus?)
karásmak	karás-ka-mak	‘knee’

McCarthy and Prince (1990a) analyze the Ulwa phenomenon as positive prosodic circumscription.[5] The possessive infixes are actually suffixes on a prosodically delimited base, the initial foot. Formally, the morphology of the Ulwa possessive is analyzed as O:Φ(F, Left), where O = “Suffix *ka*, *ki*, *ma*, etc.”. A schematic derivation is given in (17), where <> delimits the residue of positive prosodic circumscription.

(17)	Base	siwának
	Positive Circumscription	siwá <nak>
	Suffix *ka*	siwáka <nak>
	Output	siwákanak

The initial iambic foot, rather than the whole noun, functions as the base for suffixation of the possessive morpheme. Of course, with words consisting of a single iambic foot, like *bas* or *ki:*, the infixes are authentic suffixes, but with longer words they are infixed.

Positive and negative prosodic circumscription cover roughly similar empirical ground, so we should ask whether both are truly necessary. It turns out that they are, based on arguments ranging from the narrowly parochial to the broadly universal. Consider first the logical possibility of replacing one mode of circumscription with the other simply by complementing the parsed-out prosodic constituent C

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[5]The theoretical significance of the Ulwa example was first noted by Bromberger and Halle (1988).

and the edge E. For instance, this would mean replacing the Ulwa schema O:Φ(F,Left) with O/Φ(X, Right) or the Choctaw/Balangao schema O/Φ(μ, Left) with O:Φ(Y, Right), where X and Y stand for some constituents at the right edge to which Ulwa *ka*, Choctaw *l*, or Balangao μ could be prefixed. The obvious problem is that X and Y are incoherent, ranging in the case of Ulwa from the null string (for *bas*) to one or more syllables (*karas**mak***, *ana:**la:ka***). Because words come in different sizes, it is not possible to reverse the edge at which the infix is anchored. Likewise, to account for Balangao medial gemination in terms of positive circumscription, it would be necessary to specify a prosodic constituent that delimits the boldface portions of both *da**kal*** and *pa**dakal***. But of course there is no such constituent; the location of the Balangao infix is defined with respect to the initial mora, not the rest of the word.

Consider next the simple alternative of replacing positive prosodic circumscription in Ulwa with negative circumscription: O/Φ(F, Left), O = "Prefix *ka*, *ki*, *ma*, etc.". That is, *ka* would be a prefix on the residue of negative circumscription rather than a suffix on the parsed-out foot. Ulwa-internal considerations show that this alternative is inferior: in about 10% of the nouns collected by Hale and Lacayo Blanco (1989), *ka* is an actual suffix on a word that is longer than a single iambic foot: *gobament-ka* 'government', *abana-ka* 'dance', *bassirih-ka* 'falcon', *ispiriŋ-ka* 'elbow'. (Of these, about ⅔ have doublets where *ka* is infixed as expected: *bas-ka-sirih*, *is-ka-piriŋ*.) So *ka* is a formal suffix, as the positive prosodic circumscription account requires.

Consider finally the alternative of replacing negative prosodic circumscription in Balangao with positive circumscription: O:Φ(μ, Left), O = "Suffix μ". The problem in this case is that the affixed mora is filled by spreading of the following consonant, which is outside the circumscribed domain—compare the correct derivation in (13). This phenomenon, which argues strongly for the distinction between negative and positive prosodic circumscription, arises even more acutely in cases of infixing reduplication like those of Mangarayi (18) and Samoan (19).

(18) Mangarayi Plural Reduplication (Merlan 1982)

a.	baraŋali	bararaŋali	'father-in-law'
	gabuji	gababuji	'old person'
	yirag	yirirag	'father'
	jimgan	jimgimgan	'knowledgeable person'
	gambuɽa	gambambuɽa	'classificatory MB/ZC'
	muyg-ji	muygjuygji	'having a dog'

b. Analysis (McCarthy & Prince 1986, 1991b)
O/Φ(C, Left), O = "Prefix σ".

(19) Samoan Plural Reduplication (Marsack 1962)

a.	táa	tataa	'strike'
	nófo	nonofo	'sit'
	alófa	alolofa	'love'
	ʔalága	ʔalalaga	'shout'
	fanáu	fananau	'be born, give birth'
	manáʔo	mananaʔo	'desire'

b. Analysis (Broselow & McCarthy 1983, McCarthy & Prince 1990a, 1991b)
O:Φ(F, Right), O = "Prefix σ_{μ}".

In the Australian language Mangarayi, infixing reduplication skips the initial consonant and copies the following VC^{+} sequence. In this case of negative circumscription, the copied material is taken from the remainder. Conversely, Samoan infixing reduplication copies the (initial syllable of) the stress foot, which is trochaic in this language. In this case of positive circumscription, the copied material is taken from the parsed-out constituent. Because it requires specification of both the location of the affix and the constituent to which the affix is adjoined, infixing reduplication is an unambiguous diagnostic for positive versus negative circumscription.

This completes the overview of the fundamentals of Prosodic Morphology theory: the Prosodic Morphology Hypothesis; syllables, feet, and minimality; a-templatic prosodic morphology; and prosodic circumscription. We now turn to the analysis, beginning with an examination of the Arabic noun in section 3 and continuing with the Arabic and Akkadian verbs in section 4.

3. The Arabic Noun

The goal of this section is to provide evidence for the theory of Prosodic Morphology and specifically for the Prosodic Morphology Hypothesis, refining and extending the results in McCarthy and Prince (1990b). This evidence comes in the form of an analysis of important limitations and asymmetries in the shape of Arabic noun stems which have a direct basis in prosodic theory.

The focus of the investigation is on the **canonical** nouns of Standard Arabic—that is, the nouns that are fully integrated into the morphological system, based on their ability to form broken plurals like those in (2) and other criteria. The vast majority of nouns in the language are canonical, but many (such as recent loans like *tilifuun* 'telephone') are not. The basic data appear in (20), which provides a classification by canonical pattern of all the canonical noun stems of Arabic (disregarding the feminine suffix *-at*). The percentages given in (20) were obtained by counting all of the canonical noun stems occurring in the first half of the large Wehr (1971) dictionary (N ≈ 2400).

(20) The Canonical Noun Patterns

a. H	b. LL	c. LH	d. HL	e. HH
CvCC	CvCvC	CvCvvC	CvvCvC	CvvCvvC
baħr	*badal*	*waziir*	*kaatib*	*jaamuus*
33%	7%	21%	12%	2%

f. HL	g. HH
CvCCvC	CvCCvvC
xanjar	*jumhuur*
14%	11%

Glosses: 'sea', 'substitute', 'minister', 'writer', 'buffalo', 'dagger', 'multitude'

All patterns are well represented except perhaps for CvvCvvC (20e), which is probably an historical innovation in Arabic, since it is absent in Akkadian (von Soden 1969, Gelb 1969).

The classification of nouns in (20) according to the syllable-weight patterns (H, L) assumes final consonant extraprosodicity, which is independently motivated in Arabic. Analysis of these patterns of weight leads to two principal prosodic conditions on canonical nouns:

(21) Prosodic Conditions on Canonicity

a. Minimally bimoraic

$$N \geq \mu\mu$$

b. Maximally disyllabic

$$N \rightarrow \sigma(\sigma)$$

That is, the minimal canonical noun stem of Arabic is a single heavy syllable (20a) or a sequence of two light syllables (20b). Furthermore, no canonical noun stem is longer than two syllables (20b-g). The deeper explanation for the minimality condition, based on the Prosodic Hierarchy and Foot Binarity, was given above in section 2. The maximality condition is a natural one under considerations of locality, which impose an upper limit of two on rules that count (McCarthy and Prince 1986), but it can perhaps be made even more directly prosodic by requiring that the canonical stem of Arabic conform to the generalized trochee of Prince (1983), Hayes (1991), Kager (1992a, b). The generalized trochee combines the properties of the trochaic and syllabic feet in (7); like the canonical noun stem of Arabic, it is minimally bimoraic, maximally disyllabic.

Within the limits set by these conditions, the bimoraic lower bound and the disyllabic upper bound, every possible combination of heavy and light syllables is actually attested in (20).[6] This is a good result, since it suggests that prosody supplies the right kind of vocabulary for describing the fundamental regularities of the system. But even more structure does emerge when we look beyond the superficial properties of the system, and this further structure provides remarkable confirmation for the Prosodic Morphology Hypothesis.

The basic claim is that there are no anti-iambic or HL noun **templates** in the morphological system of Arabic. The evidence of this is that the anti-iambic noun patterns like *kaatib* and *xanjar* have a very restricted role in Arabic morphology, even though such nouns are quite common. Anti-iambic nouns are derived not by mapping to a template but by other resources of Prosodic Morphology theory, specifically affixation of a mora and a-templatic prosodic morphology. The remaining noun patterns—Heavy, Light-Light, Light-Heavy, and Heavy-Heavy—are actually templatic, and so they are broadly distributed in the lexicon of Arabic and used independently by the morphology. Evidence of this difference between anti-iambic nouns and others will emerge shortly, but first we will explore the prosodic basis for the absence of anti-iambic noun templates.

The explanation for the restricted role of these nouns is that the anti-iambic HL sequence is not a prosodic unit—that is, it cannot be analyzed within the theory of feet given in (7). The authentic templates H, LL, and LH are all single quantity-sensitive feet; in fact, they are all expansions of the iamb. The remaining authentic template HH is a sequence of two (iambic) feet; in fact, it is the only sequence of feet that meets the disyllabic upper bound on canonical nouns in (21b). In contrast, the anti-iamb HL does not have a foot-level analysis; at best it consists of a monosyllabic foot (H) plus a light syllable which cannot be footed because of Foot Binarity.

The Iamb Rule in (22) formalizes these observations about the difference between templatic and non-templatic noun patterns:

(22) Iamb Rule

N **template** → F_I^+

The Iamb Rule requires that the template of a noun stem consist of a whole number of iambic feet. The actual noun stem templates—H, LL, LH, and HH—are each analyzeable in this way, subject to the overall disyllabic upper bound in (21b).

The claim, then, is that the peculiarily restricted role of anti-iambic noun patterns in Arabic follows from the fact that the anti-iamb does not have a foot-level analysis within prosodic theory. The anti-iambic nouns are non-templatic, in accordance with the Prosodic Morphology Hypothesis, which

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[6]There are two additional conditions on canonicity of noun stems in Arabic that are not our focus here, though they are dealt with in McCarthy and Prince (1990b):

(i) Final Consonantality

All stems (noun and verb) are consonant-final.

(ii) Cluster Rule

All and only monosyllables end in consonant clusters.

The former condition applies to all stems of Arabic, nouns and verbs. The latter is the locus of a significant difference between Arabic and Akkadian, which otherwise have quite similar noun patterns. According to Gelb (1969) and von Soden (1969), Akkadian has noun patterns with final geminates like *kunukk* ‘seal’, though these are non-canonical in Arabic.

limits templates to prosodic units: the actual templates of the Arabic noun conform to the Prosodic Morphology Hypothesis by way of the even more restrictive Iamb Rule (22).[7]

Having established the theoretical basis for the absence of HL or anti-iambic noun templates, we can now turn to the arguments. The first, which is due to Fleisch (1968), involves an important asymmetry between the anti-iambic noun stems and their apparent mirror images, the true iambic ones. All the nouns occurring in the first half of the Wehr dictionary were collected and grouped according to their vowel quality, a good indicator of their inherent diversity in a language like Arabic, where vowel quality is often used to distinguish morphological categories. The results appear in (23):

(23) CvvCvC vs. CvCvvC Noun Stems

HL		LH	
CaaCiC	263	CaCiiC	265
CaaCaC	7	CiCaaC	106
CaaCuC	1	CaCaaC	37
		CaCuuC	29
		CuCaaC	25
		CiCiiC	1
Total	271	Total	463

It is immediately apparent that the anti-iambic pattern is massively skewed to one vowel pattern, but the iambic one is not. Iambic nouns are more common and occur with more vocalic patterns in a more even distribution than anti-iambic ones. Nearly all anti-iambic nouns are vocalized like *kaatib*, with *aa* in the first syllable and *i* in the second. In fact, essentially all of the small number of anti-iambs without this vocalization actually have doublets **with** it, so the correlation is nearly perfect. (There is only one exception, *maalaj* 'trowel', in a rough check of all of Wehr (1971).)

On closer inspection, the restriction of anti-iambic nouns to *aa-i* vocalization turns out to have a morphological explanation: anti-iambs have just a single morphological function in Arabic, as participles of the basic or "Measure I" form of the verb. Specifically, the participle *kaatib* 'writing, scribe' is related to the Measure I verb *katab* 'wrote', and a parallel relationship holds for nearly all other

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[7]The proposal that Arabic noun templates consist of a sequence of feet may seem an illegitimate extension of the Prosodic Morphology Hypothesis. But in reality rule (22) expresses the structural regularity that underlies **several** actual noun templates, each of which has a distinct morphological function (cf. (25)). In this respect (22) is like McCarthy's (1981: 387; cf. McCarthy and Prince 1986: 3-4) template-of-templates for the Arabic verb or, for a precedent within the theory of Prosodic Morphology, Perlmutter's (1992) master template $F_{\mu\mu}(F)$ that underlies all of the various templates in Japanese (see Poser (1990), Mester (1990), and Itô (1992)). For example, Perlmutter argues that this template-of-templates is required to account for variability in the system of Japanese hypocoristics analyzed by Poser (1990: 88), where a template of one or more bimoraic feet must be satisfied:

Name	Monopod Hypocoristic	Bipod Hypocoristic
gisaburoo	gii-tyan	gisaburo-tyan
kenzaburoo	ken-tyan	kenzabu-tyan
wasaburoo	waa-tyan	wasaburo-tyan
	wasa-tyan	
	sabu-tyan	

Furthermore, an actual bipedal template is required for the Ponapean reduplicative, where the output of reduplication with polysyllabic bases must consist of two feet, perhaps as a kind of compound of two minimal words (McCarthy and Prince 1986, 1991b). Of course, the requirement that words consist of a whole number of feet is a familiar one in phonology, where stray or unfooted syllables are often augmented (Mester to appear, Prince 1992) or deleted (Kirchner 1990).

C*aa*C*i*C nouns. Since almost all anti-iambic nouns in Arabic are participles of Measure I, anti-iambs are found only with the characteristic *aa-i* vocalism of this participle. In contrast, true iambic nouns like those on the right in (23) have a variety of morphological functions, and some are basic lexical items, with no special morphological function at all. Therefore they occur with a variety of vocalizations.

The second argument is based on a similar asymmetry, this one between HL and HH nouns with a doubled root consonant (e.g., *sukkar* 'sugar' vs. *jabbaar* 'giant'). The data are in (24):

(24) CvCCvC vs. CvCCvvC Noun Stems With Doubling

HL		HH	
CvC_iC_ivC	8	CvC_iC_ivvC	109
$CvCC_ivC_i$	0	$CvCC_ivvC_i$	14
Total	8	Total	123

It is clear that there is a very strong bias in favor of the Heavy-Heavy pattern in nouns with a doubled root consonant, either with the common medial doubling (*jabbaar*) or the rarer final doubling (*jilbaab* 'a jilbab'). The few Heavy-Light nouns of this type are fully exceptional, and in fact some form their plurals as if they were Heavy-Heavy: *sullam* 'ladder', pl. *salaaliim* ~ *salaalim*. Remarkably, this asymmetry is limited to nouns with a doubled root consonant. HL nouns like *xanjar*, without doubling, are actually slightly more common than HH nouns like *jumhuur*, though both are well represented in the lexicon.

The third argument comes from the various broken plural patterns, based on the descriptive and analytic findings in McCarthy and Prince (1990b). Classified by canonical shape, there are three types of internal or "broken" plurals in Arabic:

(i) the modal Light-Heavy iambic plural, exemplified earlier in (2) and by *quluub* 'hearts', the plural of *qalb*.

(ii) the not uncommon Light-Light or trochaic plural, exemplified by *kutub* 'books', the plural of *kitaab*.

(iii) the rather rare Heavy monosyllabic plural, like *ħumr* 'red', the plural of *ʔaħmar*.

In sum, the actual plural patterns—LH, LL, and H—consist of all the monopodal noun stems. The bipodal HH noun pattern is not used in plural formation, nor is the anti-iambic HL pattern, which is not a foot at all.[8]

Finally, the evidence in (25) shows that the various noun patterns which are claimed to be templatic actually have diverse morphological functions in the lexicon of Arabic.

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[8]HH and HL plurals with medial gemination are used only for C*aa*C*i*C participial singulars with human referents: *kaafir*, pl. *kuffaar* 'infidel'; *kaafil*, pl. *kuffal* 'breadwinner'. Neither is terribly common; according to Levy (1971: 72-6), they constitute 23% and 9%, respectively, of the 460 plurals of C*aa*C*i*C nouns in the whole of Wehr (1971). Because this limitation of a plural pattern to a particular noun class is so unusual, McCarthy (1983) and McCarthy and Prince (1990a: 214) propose that these plurals are non-templatic, derived directly from the corresponding singular by spreading the medial consonant leftwards to close the first syllable, usurping its second mora.

(25) Morphological Functions of Noun Types

a. H			
CaCC	qatl	‘killing’	gerund of Measure I verb
CiCC+at	kisr+at	‘piece’	small fragments
CuCC+at	ʔukl+at	‘morsel’	small quantities
CuCC	θulθ	‘one third’	fractions
b. LL			
CaCaC	maraD	‘sickness’	gerund of Measure I verb
CuCuC	θuluθ	‘one third’	fractions
c. LH			
CiCaaC	ħilaab	‘milk-pail’	vessels
CuCaaC	ħumaam	‘fever’	diseases
CiCaaC+at	xilaaf+at	‘caliphate’	offices, posts
CuCaaC+iyy	rubaaʕ+iyy	‘quadriliteral’	number of parts in whole
d. HH			
CaC_iC_iaaC	xayyaaT	‘tailor’	occupations
CaC_iC_iaaCat	barraad+at	‘refrigerator’	instruments

Compare these various morphological roles of the truly templatic noun patterns with the meager use of the anti-iambic noun, limited as it is to just a single deverbal function, as the active participle of the Measure I verb.

To sum up, we have seen four respects in which the anti-iambic noun pattern is different from other noun patterns in Arabic. These observations support the claim that there is an asymmetry between the anti-iamb and other noun patterns. Furthermore, they provide evidence for the more specific proposal that there are no anti-iambic noun **templates**, from which this asymmetry derives. The lack of anti-iambic noun templates devolves from the Iamb rule in (22), which itself is a special case of the claim embodied in the Prosodic Morphology Hypothesis.

This leaves just one question: if anti-iambic nouns are not templatic, what are they? The two principal types of anti-iambic nouns, *kaatib* and *xanjar*, have non-templatic sources that appropriately limit their role in the language.

According to the evidence presented in (23), anti-iambic nouns like *kaatib* are almost entirely restricted to active participles of Measure I verbs. Thus, there must be a direct morphological relation between the anti-iambic noun *kaatib* ‘writing, scribe’ and the corresponding verb form *katab* ‘wrote’. The proposal is that this morphological relationship is affixational in character: the noun *kaatib* is derived from the corresponding verb *katab* by left-adjoining a mora to the initial syllable (and supplying a new vowel melody, as is quite typical in Arabic morphology). The adjoined mora is realized as length on the vowel of the initial syllable, in conformity with the usual requirements of syllabic well-formedness in Arabic.

(26)

```
  σ   σ  →          σ   σ          →        σ   σ
  μ   μ           μ + μ   μ                  μ μ   μ
k a t a (b)       k a t a (b)              k a  t a (b)
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This analysis explains why nouns like *kaatib* are found only as active participles of Measure I—they are derived from Measure I by affixation of a mora. Hence there is no anti-iambic template underlying the noun *kaatib*, because the source of this noun is complex, involving affixation to the verb stem *katab*.

The other class of anti-iambs is the set of CVCCVC nouns like *xanjar*. The fundamental observation about this pattern, documented in (24), is that it is restricted to true quadriliterals, nouns with four (different) root consonants. Nouns of this type are essentially never found with a geminated or

doubled root consonant. The explanation is that these nouns are **a-templatic**. In other words, a noun like *xanjar* consists of just its four root consonants, without any templatic constraint on form. This does not mean that its form is free; on the contrary, the canons of Arabic syllable structure—obligatory onset and no tautosyllabic consonant clusters—limit the ways in which four consonants can be organized into a phonotactically well-formed word. The constraints on canonical nouns in (21) and note 6 limit the options still further, by imposing a disyllabic upper bound and requiring that any consonant cluster be medial. The actual surface form of CVCCVC nouns like *xanjar* is uniquely determined by these conditions. It is simply the result of organizing four consonants into a stem according to the constraints on Arabic syllable structure and noun canonicity. There is no template, nor is there any need for one. This analysis obviously provides an immediate explanation for why nouns of this type are limited to true quadriliterals: a triliteral root cannot force the CVCCVC shape without calling on an otherwise prohibited anti-iambic template.[9]

This completes the examination of the Arabic noun. We have seen that the core of the noun system is fully templatic in character, with templates conforming to the Iamb Rule (22) and by extension to the Prosodic Morphology Hypothesis. Two types of anti-iambic noun patterns, which could not be templatic in this sense, were shown to have a number of properties that separate them from the rest of the nominal system and they were given treatments in terms of mora affixation and a-templatic prosodic morphology that illuminate their peculiarities.

4. The Verb in Arabic

The properties of the verb in Arabic are strikingly different from those of the noun. As we will see, there is just a single authentic template in the verb system, with other regularities of shape derived from that core template by affixation. The expositional strategy I will follow is first to give an affixational analysis of the derivational system of the Arabic verb and provide a number of arguments for this approach from within the grammar of Arabic. Then in section 5 I will turn for confirmation to the richer system of verbal derivation in Akkadian, a fairly distant relative of Arabic within the Semitic language family.

The more common derivational classes or “measures” of the Arabic verb, numbered according to the traditional Occidental system, appear in (27). They are exemplified with citation biliteral, triliteral, and quadriliteral roots, approximate glosses for each derivational class are given, and the exact frequency of each type is provided from the whole of the Wehr (1971) dictionary (N = 3330 verb roots, of which 339 are quadriliteral).

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[9]CvCCvC nouns like /mijnan/ ‘shield’ cannot be a-templatic, since they have biliteral roots with *m*- prefix. There are just six examples, so this type might be inconsequential. Such nouns may also be secondary (deverbal), because of connection with thematic vowel of corresponding verb: *yašrab* ‘he drinks’/*mašrab* ‘place of drinking’; *yajlis* ‘he sits’/*majlis* ‘place of sitting’.

(27) Common Arabic Verb Measures

Citation roots *sm* ‘poison’, *fʕl* ‘do’, *dħrj* ‘roll’

Measure #	Biliteral	Triliteral	N	Meaning
I	samam	faʕal	2569	Basic, underived
VII	nsamam	nfaʕal	260	Passive of I
VIII	stamam	ftaʕal	622	Passive, middle of I
IV	ʔasmam	ʔafʕal	951	Causative of I
X	stasmam	stafʕal	389	Reflexive of I, IV
II	sammam	faʕʕal	1398	Causative of I
V	tasammam	tafaʕʕal	1025	Reflexive of II
III	saamam	faaʕal	463	Reciprocal of I
VI	tasaamam	tafaaʕal	394	Reflexive of III
	Quadriliteral			
QI	daħraj		296	Basic, underived
QII	tadaħraj		111	Reflexive of QI

Other verb measures are exceedingly rare by comparison (v. (33)) and will be mostly disregarded in subsequent discussion. Later, though, I will suggest how to integrate them into the overall approach.

From the standpoint of the theory of Prosodic Morphology and the analysis of the noun developed in section 3, the Arabic verb is quite puzzling. The verb forms are prosodically incoherent and difficult to rationalize with anything like the Iamb Rule or the Prosodic Morphology Hypothesis. Examples of prosodic incoherence in the verbal measures include: the anti-iambic Heavy-Light sequence of Measures II (*faʕʕal*), III (*faaʕal*), IV (*ʔafʕal*), and QI (*daħraj*); the initial unsyllabified consonant of Measures VII (*nfaʕal*) and VIII (*ftaʕal*); and the combination of the two in Measure X (*stafʕal*). The verbs of Measures II and III, in particular, have characteristics that are essentially forbidden in nouns (cf. (23) and (24)), for reasons attributed to the Iamb Rule and the Prosodic Morphology Hypothesis. It is clear, then, that the analysis of the verb requires a very different approach.

In outline, the proposal is this: take the Measure I form *faʕal* as truly basic for the triliteral and biliteral verb. Its LL template, a type of iambic foot, conforms to the Prosodic Morphology Hypothesis. The other measures are derived from this base by affixation. Therefore there are no separate templates for the other measures; all derive ultimately from the prosodically well-formed *faʕal* template of Measure I. In comparison with earlier accounts of Arabic root-and-pattern morphology, particularly McCarthy (1979, 1981), this claim is surprising. After all, the Arabic verb measures were supposed to be the prototype of template-based morphology. The claim that there is just a single template, *faʕal*, with other forms derived from it by affixation, represents a significant departure from this earlier view. I will take up the explicit comparison of the two approaches below, after establishing the basic premises of the new one.

The *ta-* prefix, which marks some sort of derivational reflexive, is transparently and uncontroversially an affix. Prefixation of *ta-* transforms Measures II (*faʕʕal*), III (*faaʕal*), and QI (*daħraj*) into Measures V (*tafaʕʕal*), VI (*tafaaʕal*), and QII (*tadaħraj*), respectively. But there are three other prefixes that have not been recognized as such. The *n-* prefix of Measure VII (*nfaʕal*) forms the passive of Measure I (*faʕal*). The *ʔa* prefix of Measure IV (*ʔafʕal*) and the *sta-* prefix of Measure X (*stafʕal*) are somewhat less obvious formally, because the output of prefixation undergoes a rule of Syncope (28), deleting the medial vowel of the underlying forms /ʔa+faʕal/ and /sta+faʕal/.

(28) Syncope

$V \rightarrow \emptyset \ / \ [CVC___CVC]_{Stem}$

This is a syncope rule of the classic “two-sided open syllable” type, proposed originally by Brame (1969) and Levy (1971). It is independently motivated by an inflectional alternation: the Measure I imperfect with

prefix C*a* also loses its medial vowel, as in /ya+katub/ → *yaktub* ‘he writes’. Modulo the effects of Syncope, Measures IV and X are both derived by prefixation from the Measure I *faʕal* base.

Though Measure I of the biliteral and triliteral verb is formed on a LL *faʕal* template, Measure QI of the quadriliteral verb (*daħraj*) is a-templatic. Indeed, the treatment of Measure QI is identical to that of the anti-iambic quadriliteral noun.

This much is fairly straightforward. But the crux of any analysis of the Arabic verb lies in how it deals with the measures that are marked by infixation, vowel lengthening, or consonant gemination. We take each of these in turn.

The *t* infix of Measure VIII (*ftaʕal*) is prefixed to the Measure I *faʕal* template under negative prosodic circumscription of the initial consonant. Formally, the morphological rule, restricted in this way, is O/Φ(C, Left), where O = “Prefix *t*”. A schematic derivation is provided in (29):

(29)	Base	faʕal
	Negative Circumscription	<f> aʕal
	Prefix *t*	<f> t + aʕal
	Result	ftaʕal

The infix *t* is a prefix to this prosodically delimited base (like the *ta-* prefix of Measures V and VI, with which it is roughly synonymous). So *t* is an affix, but its mode of affixation is via negative prosodic circumscription.

The Measure III verb (*faaʕal*) with lengthening of the initial vowel is derived from the Measure I *faʕal* base by adjoining a mora to the initial syllable. This is formally equivalent to the derivation of the Measure I active participle in (26). The Measure II verb (*faʕʕal*) with medial gemination is also derived from the Measure I base, but with prefixation of a mora under negative prosodic circumscription. Formally, this rule is O/Φ(μ, Left), where O = “Prefix μ”, exactly like the Balangao example in (12). The prefixed mora is then filled by spreading of the following consonant. A schematic derivation appears in (30).

(30)	Base	faʕal
	Negative Circumscription	<fa> ʕal
	Prefix μ	<fa> μ+ʕal
	Spread	<fa> ʕʕal
	Result	faʕʕal

So the anti-iambic Measures II and III are derived from the prosodically well-formed LL template of Measure I by mora affixation, combined in the case of Measure II with prosodic circumscription.

This covers all of the common verbal measures. The table in (31) summarizes the analysis:

(31) Arabic Verb Measures: Affixational Analysis

Measure #	Triliteral	Analysis
I	faʕal	LL prosodic template
VII	nfaʕal	*n* + Measure I
VIII	ftaʕal	*t* + Measure I mod O/Φ(C, Left)
IV	ʔafʕal	*ʔa* + Measure I
X	stafʕal	*sta* + Measure I
II	faʕʕal	μ + Measure I mod O/Φ(μ, Left)
V	tafaʕʕal	*ta* + Measure II
III	faaʕal	μ + Measure I
VI	tafaaʕal	*ta* + Measure III
	Quadriliteral	
QI	daħraj	A-templatic
QII	tadaħraj	*ta* + Measure QI

The *ta*- prefixed forms are derived from other measures, but the remaining forms of the triliteral verb are derived from Measure I, the semantically neutral, morphologically unmarked, and statistically most frequent of the forms of the Arabic verb.[10]

In contrast to the affixational analysis in (31), the account of the Arabic verb measures in McCarthy (1979, 1981) is almost purely templatic, with each measure (except for the *ta*- prefixed ones) having its own template, unrelated to the templates of the other measures. No special status is accorded Measure I, with its CVCVC template. The affixes *n* and *st* of Measures VII and X are pre-linked to consonantal slots in the templates; similarly, the infix *t* of Measure VIII is pre-linked to the boldface slot of a C**C**VCVC template. Lengthening of the initial vowel in Measure III is specified by a CVVCVC template, and medial gemination in Measure II is accomplished with a CVCCVC template and a special association rule. The table in (32) summarizes the properties of this templatic analysis, except for the treatment of *ta*- prefixed forms, which is the same in both accounts.

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[10]There are, though, some cases where the presumed Measure I source is non-existent (like English *uncanny* < **canny*). Again using lexical entries in Wehr (1971) as a basis, we find that 81% of Measure II verbs, 90% of Measure III verbs, 91% of Measure IV verbs, 96% of Measure VII verbs, and 94% of Measure VIII verbs also occur in Measure I, their claimed source. Remarkably, in the transparently prefixed Measures V, VI, and QII, the ratios are even lower: 68% of Measure V verbs also occur in Measure II, 60% of Measure VI verbs also occur in Measure III, and 68% of Measure QII verbs also occur in Measure QI. So cooccurrence of measures in a lexical entry may be a poor measure of lexical relatedness.

These statistics on cooccurrence of measures are based on the structure of lexical entries in Wehr (1971). Generally, this dictionary only lists two measures in the same lexical entry if they are truly related, rather than accidentally homophonous. But a better though far more cumbersome test would be to judge relatedness based on actual semantic compositionality.

(32) Arabic Verb Measures: Templatic Analysis

Measure #	Triliteral	Template
I	faʃal	CVCVC
VII	nfaʃal	CCVCVC
		n
VIII	ftaʃal	CCVCVC
		t
IV	ʔafʃal	CVCCVC
		ʔ
X	stafʃal	CCVCCVC
		st
II	faʃʃal	CVCCVC mod special association rule
III	faaʃal	CVVCVC
	Quadriliteral	
QI	daħraj	CVCCVC

These CV templates could of course be recast in terms of prosodic notions like syllable, mora, rhyme, or nucleus, as in Levin (1983), Lowenstamm and Kaye (1986), and McCarthy and Prince (1986). That relatively minor reformulation would not alter the profound differences in approach between the affixational and templatic analyses.

The two accounts have now been clearly distinguished. The affixational analysis, which is embedded within Prosodic Morphology and governed by a very restrictive theory of template form (the Prosodic Morphology Hypothesis), posits just a single template for Arabic verbs, the LL *faʃal*. Other invariant properties of the various measures (the infix *t*, vowel length, gemination) are expressed by affixation rules, in some cases via prosodic circumscription. But the templatic analysis of McCarthy (1979, 1981), with a very rich theory of template form, attributes all invariant properties of the various measures to the templates themselves. Infixation of *t* in Measure VIII is done by pre-linking the *t* to the template C**C**VCVC; gemination in Measure II is accomplished with a CVCCVC template and special association rule; lengthening in Measure III is specified by a CVVCVC template. With this sketch of the two approaches in hand, we are now ready to compare them.

The templatic analysis in (32) enjoys the apparent advantage of broader empirical coverage. By introducing additional templates, it encompasses the rare Arabic verbal measures. These are given with their frequencies of occurrence in the Wehr (1971) dictionary in (33), including two measures that are apparently now extinct:

(33) Rare Arabic Verb Measures

Measure #	Triliteral	N	Meaning
IX	fʕalal	18	Colors & bodily defects
XI	fʕaalal	2	Like IX
XII	fʕawʕal	7	Intransitive?, stative?
XIII	fʕawwal	0	"
XIV	fʕanlal	2	"
XV	fʕanlay	0	"
QIII	dħanraj	1	"
QIV	dħarjaj	8	"

But this supposed advantage of the templatic analysis is illusory. For one thing, a vast statistical gulf separates these rare measures from the common ones, so they are probably an entirely peripheral phenomenon, of no probative value. For another, they can be mostly accommodated with a straigthforward extension of the affixational analysis. Like the common measures, the rare ones can be derived from the LL *faʃal* base, but by initially associating the **second** root consonant to the onset of the

first syllable. (The initial root consonant would then receive the same treatment as the extratemplatic consonants of Yawelmani (cf. (10)).) These measures also involve various infixes which, like the μ of Measure II, are located after the first syllable.

In contrast, the many advantages of the affixational analysis are quite real. First and most important, the single LL template of the affixational analysis explains why there is so little variation in canonical shape among the verbal measures compared to the noun patterns. Unlike nouns, verbs are never monosyllabic and always have a light (i.e., short-voweled) final syllable. Verbs are never monosyllabic because the template that underlies all verbs is disyllabic; the final syllable of verbs is always light because it is light in the LL template and all verbal derivation involves prefixes. But in the templatic analysis, the resemblances among the various templates in (32) are completely unexplained, accidental properties of the system rather than lawful regularities.

Second, the a-templatic treatment of the basic quadriliteral measure QI explains why quadriliteral verbs are **strictly** quadriliteral, being essentially impossible with a doubled root consonant. Among all the 340 verbs in Wehr (1971) that follow a quadriliteral pattern, only four are based on an apparently triliteral root by doubling a consonant (*ta+baγdad* 'to swagger like a Bagdadi', *ta+jalbab* 'to wear a jilbāb'), two affective (*šaxlal* 'to jingle', *zaγlal* 'to dazzle')). The CVCCVC quadriliteral template in the templatic analysis (32) predicts that there should be many such verbs, in which a triliteral root spreads to fill a quadriliteral template.

Third, even the templatic analysis must countenance a mora affixation rule that parallels the one required to account for Measure III in the affixational analysis (v. McCarthy (1979: 322)). Evidence of this comes from a nominalization pattern shared by several verbal measures, in which the final vowel of the stem is lengthened and the vocalism *i-a* is imposed. The measures that normally or always form their nominalizations in this way are listed in (34).

(34) *i-a* Nominalizations

Measure #	Verb	Nominalization
IV	ʔafʕal	ʔifʕaal
VII	nfaʕal	nfiʕaal
VIII	ftaʕal	ftiʕaal
X	stafʕal	stifʕaal
QI	daħraj	diħraaj

This is also the pattern of nominalization with all of the rare measures. Clearly, because the form of the nominalization depends on the form of the related verb, there cannot be a separate template for the nominalization. (Once again, this is parallel to the argument against template substitution in the Arabic plural made by McCarthy and Prince (1990a: 218-9).) Therefore any theory must posit a rule adjoining a mora to the final syllable to nominalize the verb. But of course this rule is not different in kind from the treatment accorded Measure III in the affixational analysis.

Other arguments in support of the affixational analysis over the templatic one rely on more local properties of Measures II and III:

- The moraic prefixes posited in the affixational analysis of Measures II and III are actually absent in some nominalizations of these verbs, so the moraic affix may be strictly verbal. All attested nominalizations of Measure II—*tafʕiil* (N = 383), *tafʕil+at* (N = 48), and *tafʕaal* (N = 8)—lack medial gemination. A common nominalization of Measure III—*fiʕaal* (N = 80)—also lacks the moraic prefix (and follows the pattern in (34)).
- The difference in mode of attachment of the mora—adjunction in Measure III versus prosodic circumscription in Measure II—accounts for the difference between vowel lengthening and consonant gemination without requiring a prosodic distinction beween Cvv and CvC heavy

syllables. Though not an issue in CV theory, this is an important problem in more recent approaches (Levin 1983, Lowenstamm and Kaye 1986, McCarthy and Prince 1986, 1990b).

- The circumscriptional analysis of the Measure II verb (v. (30)) solves the classic problem of how to reconcile medial gemination in Measure II with left-to-right mapping in biliteral verbs (*samam*) and Measure IX (*fʃalal*). This has been very much a vexed question in the literature, with different proposals offered by, among others, Broselow (1984), Farley (1987), Farwaneh (1990), Goldsmith (1990), Hoberman (1988), Levin (1983), Lowenstamm & Kaye (1986), McCarthy and Prince (1990b), and Yip (1988).

In summary, the evidence makes a strong case for the plausibility of the affixational analysis of the Arabic verb. Since the affixational analysis is actually forced on us by the comparison with the noun and ultimately by the Prosodic Morphology Hypothesis, the overall program of Prosodic Morphology is supported as well. But the most compelling arguments for the affixational analysis come from a related language, Akkadian.

5. The Verb in Akkadian

The system of measures in the Akkadian verbal system is considerably more complex than that of Arabic. Furthermore, Akkadian calls on infixation and gemination to express inflectional as well as derivational distinctions, exercising the resources of Prosodic Morphology much more than Arabic does. Because of this richer morphological environment, Akkadian reveals that a purely templatic treatment of infixation and gemination is provably impossible. They must be analyzed by affixation under prosodic circumscription.

The discussion of Akkadian begins with an overview of the verbal system and continues with a characterization of the simple concatenative morphology, introducing certain essential phonological processes as required. This is followed by the analysis of infixation and consonant gemination in the verbal system, leading to the argument for an affixational over a templatic treatment. The Akkadian evidence is mostly drawn from the standard handbook of this language, von Soden (1969), augmented with some of the more important specialized studies, Gelb (1969), Goetze (1947), Heidel (1940), Reiner (1966), Steiner (1981), Voigt (1987), and Whiting (1981).

The derivational classes or measures of the Akkadian verb are denoted by German abbreviations: G (Grundform), N (*n*-Form), D (Doppelungsform), and Š (*š*-Form). The G corresponds approximately to Measure I of Arabic, the N to Measure VII, the D to Measure II, and the Š to Measure IV. Within each of these principal derivational classes, there are sub-classes denoted by X*tn* and X*t*. The X*tn* form, which has no counterpart in Arabic, expressses an iterative or habitative meaning. The X*t* Measures are described as "direction-changing", meaning that they refer to both passive-like notions and to reversal of motion. Finally, within the measures themselves, Akkadian (unlike Arabic) has different stem shapes to form different tenses. The table in (35) summarizes the properties of the system.[11]

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[11]Detailed analysis of the vocalization ("vowel melodies") of the Akkadian verb is beyond the scope of this article, but the central regularities are quite compact and straightforward. For the tensed and imperative verb forms cited, there are just two basic vocalization patterns. In the G, N, QN, and QŠ, the initial syllable of the stem is *i*, medial syllables have *a*, and the final syllable is a thematic vowel that alternates between the past and the present/perfect. The quality of this vowel is lexically idiosyncratic (compare *iparras*/*iptaras*/*iprus* 'decide', *ipaqqid*/*iptaqid*/*ipqid* 'hand over', *ilammad*/*iltamad*/*ilmad* 'teach'). In the D and Š, the initial syllable is vocalized with *u*, medial syllables again with *a*, and the final syllable has *i* in the past, *a* in the present and perfect. The active participles, except for the exceptional G form *paaris*, are vocalized *u*-*a**-*i*. Therefore all vocalization patterns observe the "edge-in" pattern identified by Yip (1988), with specified initial and final syllables and default *a* in medial syllables.

(35) Akkadian Verb System

Citation roots *prs* ‘decide’, *blkt* ‘cross over’

Meas.	Present	Perfect	Past	Imperative	Meaning
	Triliteral				
G	iparras	iptaras	iprus	purus	Basic
G*tn*	iptanarras	iptatarras	iptarras	pitarras	Iterative of G
G*t*	iptarras	iptatras	iptaras	pitras	Passive of G
N	ipparras	ittapras	ipparis	napris	Passive of G
N*tn*	ittanapras	[ittatapras]	ittapras	itapras[12]	Iterative of N
D	uparras	uptarris	uparris	purris	Factitive of G
D*tn*	uptanarras	uptatarris	uptarris	putarris	Iterative of D
D*t*	uptarras	uptatarris	uptarris	putarris	Passive of D
Š	ušapras	uštapris	ušapris	šupris	Caus. of G
Š*tn*	uštanapras	uštatapris	uštapris	šutapris	Iterative of Š
Š*t*[13]	uštapras	uštatapris	uštapris	šutapris	Passive of Š
	Quadriliteral				
QN	ibbalakkat	ittabalkat	ibbalkit	[nabalkit]	Basic
QN*tn*	ittanablakkat	ittatablakkat	ittabalakkat		Iterative
QŠ	ušbalakkat	uštabalkit	ušbalkit	šubalkit	Causative
QŠ*tn*	uštanablakkat		uštablakkit		Iterative

As in (27), the meanings of the various measures are only approximate and do not reflect the inherent variability of this lexical system. There are other untensed verb forms not given in this table, such as the participle (G *paaris*, N *mupparis*, D *muparris*, Š *mušapris*) or infinitive (G *paraas*, N *naprus*, D *purrus*, Š *šuprus*).

We begin the analysis with the most transparent, plainly concatenative morphology in the Akkadian verb, the system of prefixation. The tensed verbs cited in (35) have the prefix *i* or *u*, which marks 3rd masculine singular subject agreement. (Compare *aprus* ‘I decided’, *iprusu* ‘they decided’, *niprus* ‘we decided’.) There are also two derivational prefixes, the eponymous *š*V- and *n*V- prefixes of the Š and N Measures, which form derived causatives and passives. The prefix *š*V- alternates with *š*- (e.g., Š*t* imperative *šutapris* vs. past *uštapris*) under phonologically-defined conditions, in accord with a completely general Syncope rule. Syncope deletes a short vowel in a (non-final) open syllable if the preceding syllable is also open and short-voweled. Thus, it is a typical two-sided open syllable deletion rule (cf. Greenstein (1984)), with the added twist that it cannot yield CvvC syllables. Some examples appear in (36).[14]

(36) Syncope: Exemplification

šaakinat (const.)	šaakØnátum (nom.)	‘placing (fem.)’
šubat (const.)	šubØtum (nom.)	‘seat’
šakin (const.)	šakØnum (nom.)	‘placed’
eniš (masc.)	enØšat (fem. const.)	‘weak’
iptaras (3rd sg.)	iptarØsu (3rd pl.)	‘has decided’

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[12]An idiosyncratic rule deletes initial *n* of the N*tn* verb form.

[13]There is another form of the Š*t*, the so-called lexical Š*t*, with idiosyncratic meaning and present-tense gemination: *uštaparras*.

[14]The handbook N*tn* past form *ittab**a**lakkat* is is one of the few apparent exceptions to Syncope. But it is attested just once, and cf. *it-ta-aš-ra-bi-Tu* in *CAD*.

The *n*V- prefix of the N measure also undergoes Syncope, though the result is subject to a further rule assimilating *n* totally to a following consonant: /inaparis/ → *inparis* → *ipparis*.

Syncope is important in the analysis of the verb, since it permits us to derive the G, N, and Š from the same LL or *faʃal* base posited in Arabic (cf. Gelb (1969)). In the G past, for example, syncope takes underlying /i+parus/ to surface *iprus*. Similarly, in the Š Syncope applies to underlying /u+ša+paris/, yielding *ušapris*. Finally, in the N Syncope deletes the vowel of the prefix rather than the stem, transforming /i+na+paris/ to *ipparis*, perhaps because of a difference in direction of iteration or cyclic organization.[15]

With these preliminaries out of the way, we can now turn to the real goal of the investigation, the analysis of infixation and gemination. (37) lists the three morphologically distinct though partly homophonous infixes of Akkadian.

(37) Akkadian Infixes

-ta-	X*t* Stem 'passive'
-tana- ~ *-ta-*	X*tn* Stem (present ~ otherwise) 'iterative'
-ta-	'perfect'

The *-ta-* passive infix is the characteristic property of X*t* stems like the G*t*, the D*t*, and the Š*t*. The *-tana-* iterative infix marks X*tn* stems like the G*tn*, the D*tn*, the N*tn*, and the Š*tn*. It is idiosyncratically realized as *-ta-* outside the present tense (see Steiner (1981) and Voigt (1987) for discussion). Throughout the verb system, another infix *-ta-* marks the perfect tense. Descriptively, all three infixes are located in the context $_{\text{Stem}}$[CV___, where the category **Stem** includes derivational (but not inflectional) prefixes. Thus, the G perfect and G*t* are *pa-ta-ras*; the D*t* is *pa-ta-rras*; the Š perfect and Š*t* are *ša-ta-paras*; and the N*tn* is *na-tana-paras*. Since the locus of infixation in Akkadian is identical to that of Choctaw and Balangao, it is analyzed in the same way, as negative prosodic circumscription of the initial mora (formally, O/Φ(μ, Left), where O = "Prefix *ta(na)*"). Multiple layers of infixation are possible, with separate infixation operations applied compositionally: base *paras* → G*t* <*pa*>*taras* → G*t* perfect <*pa*>*tataras* (→ *iptatras*).

Besides the fully productive infixes in (37), two other more marginal infixation operations in Akkadian apply to a base circumscribed in the same way. First, the rare R stem *upararras*/*uptararris*/*upararris* is formed from the D stem (Whiting 1981) by infixing a reduplicative affix σ. This construction, though unknown in Arabic, is common in modern Ethiopian languages like Amharic (e.g., *səbabbər* 'shatter'). Second, the quadriliteral verb of Akkadian appears to be the product of a lexicalized rule of infixation, since all quadriliteral verbs have a *r* or *l* formative after the initial syllable (Heidel 1940). An exhaustive list of quadriliteral bases (minus initial *na-* or *ša-*) gleaned from the published volumes of *CAD* appears in (38).

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[15]Syncope has two other properties that a more complete analysis would need to contend with. First, it applies cyclically in [[prefix[stem]]suffix] configurations: *[i[pár̄us]]* 'he decided', *[[i[pár̄us]]u]* 'they decided', **[[i[parús]]u]*. Second, the infixes *-ta-* and *-tana-* are systematically dispreferred as targets of Syncope: Š*tn* present *u+šá+tana+pár̄as*; QN*tn* perfect *i+ná+ta+ta+bálakkat*. This latter condition is quite puzzling, but is independently confirmed by the behavior of the untensed forms of the G*t* , where deletion of the infixal vowel is forced: *pi-tá-ras*. When these forms are suffixed, either infixal immunity or cyclicity must be violated. In fact, the Old Babylonian and Old Assyrian dialects differ on exactly this point:

Underlying	Old Babylonian (violates infixal immunity)	Old Assyrian (violates cyclicity)	
[[pi-ta-rus]um]	pitØrusum	pitarØsum	'being decided (nom.)'
[[ʔa-ta-lak]am]	ʔatØlakam	ʔatalØkam	'come!' ('go'+ventive)

(38) Akkadian Quadriliteral Verb Bases

balkut	‘cross over’	galtû[16]	‘awake’
garšû	‘?’	kelmû	‘look angrily’
markû	‘lag behind’	palkû	‘wide’
palsux	‘fall to ground’	palTû	‘pass over’
pardû	‘bright’	parkû	‘stop’
parqud	‘lie flat’	paršud	‘escape’
šallul	‘slither’	šarbuT	‘flit’
xarbuš	‘freeze?’	xarmum	‘collapse’
xarmuT ‘	dissolve’	xaršuš	‘burp?’
xelSû	‘slip’	zarbub	‘rage’
ellû	‘run’		

The *r*/*l* infix is clearly unproductive and lexicalized, since the choice of *r* or *l* is not generally predictable and there is no evidence of a systematic relation between infixed and uninfixed forms. Nevertheless, a couple of verbs may hint at a former regularity: *zabab* ‘be in frenzy, act crazily’, *na+zarbab* ‘rage’; *makû* ‘be lacking’, *na+markû* ‘lag behind, be late, be in arrears’.

Like the Arabic Measure II, the Akkadian D stem is a derived causative marked by medial gemination. But medial gemination also marks an inflectional category in Akkadian, the present tense. Thus, there is a direct alternation within a paradigm between a stem with and without gemination, so the G past and perfect *iprus* and *iptaras* correspond to the present *iparras*. Furthermore, present tense gemination applies to quadriliteral verbs as well as triliteral ones, so the quadriliteral past and perfect *ibbalkit* and *ittabalkat* correspond to the present *ibbalakkat*.

Medial gemination in Akkadian invariably affects the onset of the stem-final syllable, even in affixed or quadriliteral forms like *pata-r-ras*, *napa-r-ras*, *nabala-k-kat*, or *šabala-k-kat*. This is in sharp contrast to the location of the *-ta-* and *-tana-* infixes, which is affected by prior prefixation (compare *pa-ta-ras*, *na-ta-paras*). Therefore medial gemination is anchored on the right edge of the stem, requiring a characterization in terms of positive prosodic circumscription of the final syllable. Formally, then, the process of medial gemination in Akkadian is O:Φ(σ, Right), where O = “Prefix μ”. For an input like *na-paras*, the schematic derivation proceeds as in (39).[17]

(39)	Base	naparas
	Positive Circumscription	<napa> ras
	Prefix μ	<napa> μ + ras
	Spread	<napa> rras
	Result	naparras

In the quadriliterals, where the result of μ infixation would be **nabalkkat*, an independently motivated rule of epenthesis (Greenstein 1984) applies to break up the resulting impermissible CCC cluster.

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[16]Verbs ending in *û* have final radicals *w* or *y*; the *û* is the result of coalescence.

[17]Another source of evidence for the circumscriptional character of medial gemination in Akkadian is the formation of the present of “hollow verbs”, which contain a long vowel (originally from *w* or *y*) in place of the middle radical. In the G of hollow verbs, present tense gemination applies to the **final** radical, but only in the plural, when it is the onset of the final syllable:

	Present	Perfect	Past	
Singular	ikaan	iktuun	ikuun	‘be firm’
Plural	iku-n-nu	iktuunu	ikuunu	

Reiner (1966: 90f.) points out that this pattern of gemination has been extended productively another class of surface biconsonantal verbs, those with a high glide as initial radical.

(40)	Base	nabalkat
	Positive Circumscription	<nabal> kat
	Prefix μ	<nabal> μ + kat
	Spread	<nabal> kkat
	Epenthesis	nabalakkat

Alternatively, we might analyze the quadriliteral infix as *la*/*ra*, with the vowel deleted by Syncope in the past and perfect (*ina*/*tabala*/*kat*, *ina*/*bala*/*kit*) and preserved in the present (*ina*/*balakkat*).

This completes the sketch of an affixational account of the Akkadian verb, parallel to the affixational analysis of the Arabic verb above in (31). Can the templatic analysis of McCarthy (1979, 1981), summarized for Arabic in (32), be similarly extended to Akkadian? No, the fundamental regularities of infixation and medial gemination in Akkadian verbal morphology can only be captured by affixation under prosodic circumscription, not by mapping to a template. There are two reasons for this.

First, mapping to a template specifies an invariant shape for the whole affected stem, not just the infix or geminate of interest. But infixation and gemination in Akkadian are independent of the shape of the input, except for the single peripheral constituent targeted by prosodic circumscription. So *-ta-* infixation applies to quite diverse stems like *ša-ta-balkit* or *ša-ta-taparis*; and medial gemination applies to triliterals like *pa-r-ras*, to affixed forms like *napa-r-ras*, and to quadriliterals like *nabala-k-kat*. No template could account for this independence of infixation and gemination from the overall shape of the host word combined with very strict dependence on a small substring of the host word located at an edge. Only a prosodic circumscriptional analysis can explain how infixation and gemination are applied in a "structure-preserving" way to diverse inputs.[18]

Second, mapping to a template in a root-and-pattern morphological system requires selection of the template to map to at the very outset of the derivation, since the template actually forms the stem to which subsequent morphology is applied. But infixation and gemination in Akkadian are not just derivational as they are in Arabic; they also mark an inflectional category, tense, in stems that have already undergone derivational morphology. For example, (41) shows an abbreviated derivation of the QN present, with a derivational *n*V- prefix added prior to medial gemination.

(41)	Base	*balkat*
	*n*V- Prefixation (derivational)	*nabalkat*
	-μ- Infixation (inflectional)	*nabalakkat*
	Agreement Prefixation	*inabalakkat*
	Syncope, *n* Assimilation	*ibbalakkat*

Only infixation and gemination by affixation under prosodic circumscription, not by template mapping, are compatible with the requirements of compositionality in derivations like (41).

The argument, then, is that a template-mapping account like that in McCarthy (1979, 1981) (cf. (32)) makes two predictions that do not hold in Akkadian. Contrary to the template-mapping analysis, infixation and gemination are possible with inputs and outputs of varying canonical form, not just a single fixed one; and infixation and gemination can have diverse morphological functions, not just an early derivational one. Therefore the analysis of infixation and gemination based on prosodic circumscription turns out to be the only possible one, once we turn from Arabic to the richer verbal system of Akkadian.

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[18]After this paper was completed, I received from the author a copy of Bat-El (1992), which presents a structurally similar argument for a non-templatic treatment of the verb in Modern Hebrew based on the transfer of consonant clusters from base noun to derived verb.

6. Conclusions

The picture that has emerged here is one in which a strong constraint on template form, the Prosodic Morphology Hypothesis, determines how various generalizations about Arabic and Akkadian root-and-pattern morphology must be expressed. Regularities that conform to the Hypothesis are captured with templates, as we saw throughout the Arabic noun. But regularities that do not conform to the requirements of prosody must be dealt with in other ways—in the cases discussed, by affixation under prosodic circumscription and a-templatic prosodic morphology. The core morphology of the Arabic and Akkadian verb has exactly this property.

Thus, the principal theme of this article is the central role of the Prosodic Morphology Hypothesis in actually forcing an affixational analysis of some phenomena that cannot accounted for templatically. This analysis receives extensive empirical confirmation. More broadly, these results show that not all morphological phenomena involving fixed canonical shape have templatic origins; some may derive only indirectly from templates. Moreover, the results also establish somewhat closer connnections between work in Prosodic Morphology and work in process-based theories of morphology such as Anderson (1991), by securing a role for rules of word formation as well as templates in expressing generalizations about canonical form.

Finally, there is another, less obvious connection that this work suggests. The profound formal differences between nouns and verbs in Arabic—the former principally templatic, the latter principally non-templatic—accord with the morphological organization of the language. There is a systematic derivational relation among verb stems (*katab* 'write', *kattab* 'cause to write', etc.) that is the focus of the analysis developed in sections 4 and 5. But N→N derivation involves only external morphology, really simple suffixation, like *salb* 'negation' → *salb+iiy* 'negative (adj.)' → *salb+iiy+at* 'negativism'. (The only systematic exception to this is the formation of the plural and diminutive (2), which is mediated by prosodic circumscription (McCarthy and Prince 1990a).) Therefore, essentially all morphological relationships in which one word is derived from another in Arabic are affixational. Mapping to a template is not used in word-based word formation; it is used only to derive words from consonantal roots. Possible functional explanations for this observation come to mind, but full realization of its consequences must be left for the future.

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