Iraqi Arabic Verbs:
The Need for Roots and Prosody*

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1 Introduction

- Iraqi Arabic has Nonconcatenative Templatic Morphology (exx. in Table 1).
- Descriptively: a {2, 3, 4}-consonantal root is nonconcatenatively affixed in/around vocalic material.
- Prosody is influential in word formation in these languages (McCarthy (1979), *et seq.*).

Binyan	Triliteral	Template	Biliteral	Template
Root	√fʕl		√mr	
I	**faʕal**	**$C_1VC_2VC_3$**	**marr**	**$C_1VC_2C_2$**
II	faʕʕal	$C_1VC_2C_2VC_3$	marrar	$C_1VC_2C_2VC_2$
III	faaʕal	$C_1VVC_2VC_3$	maarar	$C_1VVC_2VC_2$
V	tfaʕʕal	$tC_1VC_2C_2VC_3$	tmarrar	$tC_1VC_2C_2VC_2$
VI	tfaaʕal	$tC_1VVC_2VC_3$	tmaarar	$tC_1VVC_2VC_2$
VII	**nfaʕal**	**$nC_1VC_2VC_3$**	**nmarr**	**$nC_1VC_2C_2$**
VIII	**ftaʕal**	**$C_1tVC_2VC_3$**	**mtarr**	**$C_1tVC_2C_2$**
X	**stafʕal**	**$staC_1C_2VC_3$**	**stamarr**	**$staC_1C_2VC_2$**

Table 1: Bi- and Triliteral Roots in IA (Iraqi lacks binyanim IV and IX)

1.1 Previous Treatment

- Initially, such languages were treated transformationally (Chomsky, 1955).
- For a long time, these languages were treated autosegmentally by associating a Root to a CV-timing tier (McCarthy, 1979, 1981, 1985).

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- The CV-tier was then removed in favor of prosodic TEMPLATES (McCarthy, 1985; McCarthy and Prince, 1990; McCarthy, 1993).
- It was argued that the root was unnecessary; words could be formed by OO-correspondence (of prosodic shape) to other output forms (Bat-El, 1994; Ussishkin, 1999, 2000; Bat-El, 2003; Buckley, 2003; Ussishkin, 2005).
- *Problem*: Roots exist (Marantz, 1997; Prunet et al., 2000; Berent et al., 2001; Arad, 2003, 2005; Idrissi et al., 2008); not all root-template combinations do, though.
- Thus, the question of exactly how to analyze such systems is still an open one.

1.2 Theoretical Background and Outline

- Generalized Template Theory (McCarthy and Prince, 1994): templates aren't morphemes as such. Whenever one sees "templatic effects," it's actually satisfaction of strict constraints on prosodic markedness.
- **Today's Goal**: Outline a novel approach to Nonconcatenative Templatic Morphologies (NTM), following Kramer (2007), called the Root-and-Prosody (RP) approach.
- This approach attempts to unify the root-based approaches with both Generalized Template Theory and the work of Bat-El (1994); Ussishkin (2000); Buckley (2003); Ussishkin (2005).
- Demonstrate the analysis on some of the verbal patterns in (1).
  1. Arguments for primitives: the root without templates (§2).
  2. Sketch an analysis of Iraqi Arabic derivational verbs (§3).
  3. Consider some theoretical implications (§4).

2 Arguments for Primitives: Roots without Templates

- Since the root has recently come under fire, it is worth revisiting and strengthening the arguments for the root's analytic reality.
- Two arguments here:
  1. Semivowel assimilation (§2.1)
  2. Voicing assimilation reversals (§2.2)

2.1 Semivowel Assimilation

- One of the original arguments for the root remains recalcitrant, as first observed by McCarthy (1979), *et seq.*
- Roots with semivowels as one of the three root consonants display strongly prosodically conditioned allomorphy.
  - These roots are called Weak Roots, as the consonant semivowels often alternate with long vowels.
- In the form VIII/ftaʕal pattern, root-initial semivowels undergo complete assimilation to the infixal /-t-/:

(1) Weak Consonants in Iraqi (Erwin, 2004, p.74):
   a. ttiʤah, "to head (for)" (√wʤh; *utiʤah, *wtiʤah)
   b. ttiqan, "to master, know well" (√jqn, *itiqan, *jtiqan)
   c. ttixað, "to take, adopt" (√ʔxð, *ʔtixað)

- Crucially, this assimilation does not happen elsewhere, when the semivowel is not the member of a root in a form VIII template:

(2) No Weak Consonant – /t/ Assimilation Elsewhere:
   a. **m**a**wwt**ooni, "they would have killed me"
   b. **b**e**yt**hum, "their house"
   c. ʔiʔ**t**i**l**aa**f**, "coalition"

- As McCarthy (1979, 1981) note, the most natural statement of this assimilation rule is makes reference to the root.
- We might envisage a world in which root faithfulness is less important that affix faithfulness. However, we will demonstrate a need for the opposite ranking in §2.2.[1]

2.2 Voicing Assimilation Directionality Reversals

- To properly capture the generalizations inherent in Iraqi Arabic voicing assimilation (Erwin, 2004), we need to reference the root.
- The form VIII/ftaʕal form in §2.1 also shows root-specific progressive voicing assimilation, as in (3):

(3) Progressive Voicing/Emphasis Assimilation in Form VIII (Erwin, 2004, p. 74):
   a. ddiʕa, "to claim" (*dtiʕa; √dʕw)
   b. zdiʒam, "to be crowded" (*ztiʒam; √zʒm)

- **But** this problem is not reducible to a variant on that discussed in §2.1, as voicing assimilation is regressive normally in the language:

(4) Regressive Voicing Assimilation in Iraqi (Erwin, 2004, p.36):
   a. ʔaðgalˤ, "heavier" (*ʔaθgal)
   b. ʔazdaas, "sixths" (*ʔasdaas)
   c. maθkuur, "mentioned" (*maðkuur)
   d. ʔaktˤaʕ, "I cut" (*ʔagtˤtaʕ)

- Furthermore, this voicing assimilation is not morpheme-specific, as the same affix triggers *regressive* assimilation to the root in forms V and VI, as in (5).

[1] Note too that this would require denying the Root-Affix Faithfulness Metaconstraint of McCarthy and Prince (1994). This is most likely the approach the Fixed-Prosodic literature would take (Ussishkin, 1999, 2000, 2005). This solution is descriptively adequate for the semivowel assimilation facts, but as §2.2 shows, this analysis will miss an important generalization about phonological alternations triggered by root consonants *qua* roots.

(5) Regressive Voicing Assimilation in Forms V/VI (from [5]):
   a. ddaxxal, 'to interfere' (*tdaxxal, *ttaxxal; $\sqrt{\text{dxl}}$)
   b. dzawwaʤ, 'to marry' (*tzawwaʤ, *tsawwaʤ; $\sqrt{\text{zw}ʤ}$)

- **But**: this regressive assimilation in V and VI is demonstrably *not* the language-wide voicing regressive assimilation – not all voiced segments trigger it (6).

(6) Regressive Voicing Assimilation is only with Coronals:
   a. twannas, 'to enjoy oneself' (*dwannas, *wwannas; $\sqrt{\text{wns}}$)
   b. tbaddal, 'to be exchanged' (*dbaddal, *bbaddal; $\sqrt{\text{bdl}}$)
   c. tbaaha, 'to brag' (*dbaaha, *bbaaha; $\sqrt{\text{bhj}}$)

- Here, if we tried to state these alternations in terms of stems and affixes, we would be forced into one of two undesirable conclusions:
  1. Deny that the /(-)t-/ of forms V and VI is not the same of that in form VIII (*contra* McCarthy (1979), *et seq.*).
  2. Deny that the semivowel and form V/VI/VIII voicing assimilation facts are unified by a generalization referencing the root.
- Thus, any proper statement of the assimilation facts in Iraqi Arabic will require reference to the root to describe the root-specific voicing assimilation in forms V, VI, and VIII.
- Finally, there are other arguments for the necessity of the root in the literature:
  1. Root-only metathesis in aphasic speech (Prunet et al., 2000; Idrissi et al., 2008).
  2. Bedouin Hijazi language game – root metathesis (McCarthy, 1981).
  3. Root consonant preservation in hypocoristics (Davis and Zawaydeh, 2001).
  4. (Even nonce) roots prime in lexical decision (Frost et al., 1997; Deutsch et al., 1998).
  5. OCP-like effects in root consonants (McCarthy, 1979; Berent et al., 2001).
  6. Selectional restrictions on template form (Marantz, 1997; Arad, 2003, 2005).

3 The Root-and-Prosody Approach and Iraqi

- **Informal Idea**: use constraint interaction to derive nonconcatenative behavior as discontinuous linearization of the root.
- I derive the subset of the Iraqi Arabic verbal system shown in Table 2.
- While there are ten forms, we can divide them into three analytical classes which behave similarly.
  1. The form I *faʕal* pattern.
  2. The pure prefixing/infixing patterns (forms VII, VIII, X).
  3. (The moraic patterns, forms II and III (and their passives V and VI).)

- We need to settle on an input to begin, and so I assume (*cf.* Ussishkin (2000, ch.6)):

(7) Input to Root-Derived Verbs in IA for the RP Approach:

Binyan	Triliteral	Template	Biliteral	Template
Root	$\sqrt{\text{fʕl}}$		$\sqrt{\text{mr}}$	
I	faʕal	$C_1VC_2VC_3$	marr	$C_1VC_2C_2$
VII	nfaʕal	$nC_1VC_2VC_3$	nmarr	$nC_1VC_2C_2$
VIII	ftaʕal	$C_1tVC_2VC_3$	mtarr	$C_1tVC_2C_2$

Table 2: Verbs to Be Derived

a. Form I *faʕal*: / $\sqrt{\text{ROOT}}$/, /a/
b. Form VII *nfaʕal*: / $\sqrt{\text{ROOT}}$/, /a/, /n-/
c. Form VIII *ftaʕal*: / $\sqrt{\text{ROOT}}$/, /a/, /t-/

3.1 Form I/faʕal

- Form I/faʕal is arguably the most basic of the verbal patterns (Ussishkin, 2000, ch.6).
- Across different numbers of root consonants, we see syllabicity alternations in this form, as (8-9) shows for various verbs (*cf.* Moore (1990)).

(8) Biliteral Roots in Form I – marr:
  a. ʒabb, 'to like' (*ʒabbab, *ʒabab; $\sqrt{\text{ʒb}}$)
  b. ɣaʃ, 'to cheat' (*ɣaʃʃaʃ, *ɣaʃaʃ; $\sqrt{\text{ɣʃ}}$)
  c. wann, 'to moan' (*wannan, *wanan; $\sqrt{\text{wn}}$)

(9) Triliteral Roots in Form I – faʕal:
  a. tˤubax, 'to cook' (*tˤbax, *tˤabx, $\sqrt{\text{tˤbx}}$)
  b. ʔaxað, 'to take' (*ʔxað, *ʔaxð, $\sqrt{\text{ʔxð}}$)
  c. kitab, 'to write' (*ktab, *katb, $\sqrt{\text{ktb}}$)

- Since the verbal system of Iraqi displays differential prosodic behavior based on the number of root consonants, we explore that interaction here.
- **Generalization**: bisyllabicity results in triliteral roots from avoidance of complex margins.

3.1.1 Biliterals

- Here we use NonFinality as a minimality constraint, as in Ussishkin (2000).
- With a biliteral root and /a/ vocalic input, the basic conflict is between the nonfinality preference for prominence and faithfulness to the input.
- We can model this as follows:

(10) NonFin(ality)(σ):
The head syllable of a prosodic word is not final in ω.

(11) Int(egrity): A segment in the output has a single correspondent in the input.[2]

[2] In this work I do not show or consider candidates which violate Uniformity, the constraint which bans coalescence. For all practical purposes, uses of Integrity in this work can be understood to mean both Integrity and Uniformity.

(12) MD: A cover constraint for:

a. MAX:
No deletion.

b. DEP:
No epenthesis.

(13) INT, MD ≫ NONFIN(σ):

/ $\sqrt{\text{mr}}$/, /a/	INT	MD	NONFIN(σ)
☞ a. [(marr)]			*
b. [(ˈmarɪ)]		*!	
c. [(ˈmara)]	*!		

- With only two consonants and one vowel to play with, nonperipherality of the vowel is derivative of the preference for simplex margins, as in (16).
- Notice that here, we have derived the NTM behavior of biliterals from crucial domination of CONTIGUITY!

(14) *COMP(LEX): A cover constraint for:

a. *COMPLEX^{ons}:
No complex onsets.

b. *COMPLEX^{cod}:
No complex codas.

(15) CONTIGUITY (CONTIG; McCarthy and Prince (1995)): The portion of the input and output strings standing in correspondence forms a continuous string.

(16) *COMP ≫ CONTIG:

/ $\sqrt{\text{mr}}$/, /a/	*COMP	CONTIG
☞ a. [(marr)]		*
b. [(amr)]	*!	

- Arabic words are minimally bimoraic (McCarthy, 1993, 1997; Watson, 2002; Tucker, 2011).
- However, the minimality is always satisfied by gemination of the final consonant as opposed to lengthening of the input vowel.
- For this we employ Rosenthall and van der Hulst (1999) and the observation that codas are only heavy word-finally in Arabic.
- Since this influences root linearization, all of these constraints must dominate LINEARITY, as in (21).

(17) F(OO)TBIN(ARITY):
Feet are binary at the level of the mora.

(18) *APPEND(-to-σ):
Coda consonants are not adjoined directly to the syllable node.

(19) *μ/C:
Consonants are not moraic.

(20) LIN(EARITY):
No metathesis.

(21) Ensuring the Correct Kind of Minimality:

/ √mr/, /a/	FTBIN	NONFIN(F)	*APPEND	*μ/C	LIN
☞ a. [(marr)]		*		*	
b. [(ramm)]		*		*	*!
c. [(maar)]		*	*!		
d. [(mar)]	*!	*			

3.1.2 *Triliterals*

- For the triliteral roots, the observation to exploit is that failure to fission the vowel would result in an illicit margin, as (22) shows:

(22) *COMP ≫ INT:

/ √fʕl/, /a/	*COMP	INT	NONFIN(σ)	CONTIG
☞ a. [(ˈfaʕal)]		*		**
b. [(faʕl)]	*!		*	*
c. [(fʕal)]	*!		*	*

- However, with three root consonants, we have to say something more than we did in §3.1.1 to avoid vowel peripherality.
  - The crucial observation is that *roots like to be both initial and final*.
- The straightforward implementation of this is as in (24).

(23) ALIGN-R(OO)T: A cover constraint for:

a. ALIGN-R(root, ω):
The right edge of every root is aligned to the right edge of some prosodic word.

b. ALIGN-L(root, ω):
The left edge of every root is aligned to the left edge of some prosodic word.

(24) ALIGN-RT ≫ NONFIN(σ), CONTIG:

/ √fʕl/, /a/	ALIGN-RT	CONTIG
☞ a. [(ˈfaʕal)]		**
b. [(ˈaf)ʕal]	*!	*
c. [(ˈfaʕ)la]	*!	*

- This is all we need say, and we thus arrive at the rankings in (25) for the form I/faʕal pattern.

(25) Morphological Rankings for IA Thus Far:
  a. *COMP ≫ INT ≫ NONFIN(σ)
  b. MAX, DEP ≫ NONFIN(σ)
  c. *COMP ≫ CONTIG
  d. ALIGN-RT ≫ CONTIG
  e. FTBIN ≫ APPEND ≫ *μ/C ≫ LIN

3.2 THE PURE AFFIXING FORMS

- The informal idea behind deriving the pure prefixing forms is that an affix's linear position can be morphologically specified via an ALIGN constraint (McCarthy and Prince, 1993a).
- These forms are then just like the form I/faʕal pattern, but with extra affixal material that can create complex margins.
- In the case of the infixal form VII/nfaʕal, the affix must be linearized at the word edge, as shown in (26-27).

(26) Biliteral Roots in Form VII – nmarr:
  a. nʒall, 'to be solved' (*nʒalal, *ʒanlal; $\sqrt{\text{ʒl}}$)
  b. nɣaʃʃ, 'to be cheated' (*nɣaʃaʃ, *ɣanʃaʃ; $\sqrt{\text{ɣʃ}}$)

(27) Triliteral Roots in Form VII – nfaʕal:
  a. ndiras, 'to be studied' ($\sqrt{\text{drs}}$)
  b. nkital, 'to be killed' ($\sqrt{\text{ktl}}$)

- This can be modeled as in (29).

(28) ALIGN-L($prefix_1$, ω) (ALIGN-*n*):
Align the left edge of affixes belonging to the class *prefix*$_1$ to the left edge of some prosodic word.

(29) ALIGN-*n* ≫ ALIGN-RTL ≫ *COMPLEX^{ons}

/ $\sqrt{\text{fʕl}}$/, /a/, /n/	ALIGN-*n*	ALIGN-RTL	*COMPLEX^{ons}
☞ a. [('nfaʕal)]		*	*
b. [('nafʕal)]		**!	
c. [('fnaʕal)]	*!		*

- In the form VIII/ftaʕal case, the same syllabicity alternations seen in forms I and VII occurs, but with an infix, as (30-31).

(30) Biliteral Roots in Form VIII – mtarr
  a. ðˤtˤarr, 'to be compelled to' (*ðˤtˤarar, *ðˤatˤrar; $\sqrt{\text{ðˤr}}$)
  b. htamm, 'to become interested' (*htamam, *hatmam; $\sqrt{\text{hm}}$)

(31) Triliteral Roots in Form VIII – ftaʕal
  a. xtilaf, 'to differ' ($\sqrt{\text{xlf}}$)
  b. ʕtaqad, 'to think, believe' ($\sqrt{\text{ʕqd}}$)

- The infixal linearization implies that aligning the root's edge with the word's is more highly valued:

(32) ALIGN-L(t, ω) (ALIGN-t):
Align the left edge of affixes belonging to the class *prefix*$_2$ to the left edge of some prosodic word.

(33) ALIGN-RTL ≫ ALIGN-t ≫ *COMPLEX^{ons}

/ $\sqrt{\text{fʕl}}$/, /a/, /t/	ALIGN-RTL	ALIGN-t	*COMPLEX^{ons}
☞ a. [('ftaʕal)]		*	*
b. [('fatʕal)]		**!	
c. [('tfaʕal)]	*!		*

4 Conclusions and Implications

- Crucially, the RP approach needs only three kinds of constraints, all of which are independently needed for any GTT approach:

(34) Constraints in an RP Approach:
  a. PROSODIC/SYLLABIC CONSTRAINTS: Constraints on prosody/syllable structure independently needed in the language (FTBIN, *COMPLEX, ONSET, etc.).
  b. MORPHOLOGICAL CONSTRAINTS: Constraints which align morphemes in linear prosodic structure (ALIGN-L(n, ω), ALIGN-L(-t-, ω), etc.).
  c. FAITHFULNESS CONSTRAINTS: Faithfulness constraints of the usual family (IDENT[F], DEP-ROOT, MAX, etc.).

- (34a) are needed to get stress and minimal word facts correct, and are needed by any approach which wants to account for this data (not shown here, but see Tucker (2011) for discussion).
- (34b) are constraints which realize affix placement – everyone needs these, as they tell which affixes are prefixes, which are suffixes, etc. (see McCarthy and Prince (1993a) for discussion of this).
- (34c) are the standard Correspondence-Theoretic faithfulness constraints (McCarthy and Prince, 1995).

- The RP approach explains the generalization that all NTM language always have active and stringent prosody – NTM can *only* arise under the RP approach as a result of the ranking below, where *MP-Markedness* means the class of morphological and prosodic markedness constraints:

(35) Ranking for NTM in the RP Approach:
MP-Markedness $\gg$ Contiguity

- We have an explanation for why there are *no* 5-consonant roots in Semitic – there would be no way to incorporate such a root into a licit prosodic word in the RP system.
- Finally: the RP approach does not need an existing output form as a base, which Marantz (1997); Arad (2005); Nevins (2005) have noted is a problematic need.
- . . . and we can provide a novel twist on the root versus word debate in Semitic:

(36) Central Claims of the Root-and-Prosody Approach:

a. Roots and Vowels are Morphemes: the input to NTM forms consists of the consonantal root and a "discontinuous" vowel affix (e.g., /aa/ for perfective aspect).

b. Templates are Given by Prosody: Templates are emergent properties of words in NTM languages which surface from the necessary satisfaction of high-ranking prosodic markedness constraints[3]

- Assuming a low-ranking Contiguity provides for a lexicon full of (possibly) discontinuous morphemes.
- When the above is combined with generally needed constraints on prosodic well-formedness, affix placement, and faithfulness, a parsimonious analysis of NTM results.
- This RP approach to NTM can then fit the morphophonological analysis of Arabic/Hebrew into a larger context of prosodic typology.
- Finally, this approach provides a way to answer several outstanding questions in the lexicon/phonology of (Iraqi) Arabic.
- Future work could look toward integrating this approach with morphosyntactic facts. . .
- As well as extending the RP approach to other dialects/languages.

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[3] This is an extreme version of "templates are made up of the authentic units of prosody" (McCarthy and Prince, 1993b)).

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