



# Bottom-Up Stress Assignment: Evidence from Arabic

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I propose analyses of three dialects of Arabic using a set of rules that builds metrical structure from the bottom up, by insertng grid marks and boundary markers (Idsardi 1992, Halle & Idsardi 1995). This analysis avoids problems which are encountered by any top-down theory that uses a set inventory of foot types to parse the syllables of a word (e.g., Hayes 1995).

## Classical Arabic

### (1) Stress Generalizations for Classical Arabic (McCarthy 1979)

a. Stress the rightmost heavy syllable	yušāariku 'he participates,' manaadīlu 'kerchiefs (nom.)'
b. Otherwise stress the initial	bālahatun 'date (nom.sg.)'

### (2) Examples of Classical Arabic Metrical Grids\*

a. x x)	b. x x)	c. x x x)
x x x x)	x(x x x)	x(x x x)
balahatun	yušaariku	manaadīlu

\*For stress assignment rules and grid derivations, see (10) and (11), in the rightmost box.

- The present analysis creates feet of variable length:
  - (2a): 4-syllable foot
  - (2b): 3-syllable foot
  - (2c): 2-syllable and 1-syllable feet.

➤ Classical Arabic has a stress system in which feet can theoretically be any length. Such a system cannot be accommodated in any theory that uses a set inventory of binary foot types.

## CONCLUSIONS

- A bottom-up derivation of stress, which builds metrical structure by inserting grid marks and boundary markers, can account for the stress patterns of Classical Arabic, Bani-Hassan, and Palestinian.
- Moreover, the stress assignment rules for these related dialects are themselves closely related.
- A top-down analysis of stress, which assumes a pre-existing inventory of metrical foot types, encounters problems in dealing with these Arabic dialects:
  - Classical:** Unbounded feet of potentially infinite length cannot be included in a finite foot inventory.
  - Bani-Hassan:** Left-headed heavy-light feet and feet containing a single light syllable are required but do not exist in the inventory.
  - Palestinian:** An account of word-final foot extrametricality must also deal with several exceptions to extrametricality.

## Bani-Hassan Arabic

### (3) Stress Generalizations for Bani-Hassan Arabic (Irshied & Kenstowicz 1984)

a. Stress the rightmost heavy syllable out of the last 3 syllables	ʔallāmt 'I taught,' maktābtī 'my library,' ʔallamat 'she taught'
b. Otherwise stress either the penult or the antepenult; whichever is separated from the nearest heavy syllable on the left by an odd number of syllables	ʔallamātuh 'she taught him'
c. Otherwise stress either the penult or the antepenult; whichever is separated from the beginning of the word by an even number of syllables	sāḥabat > šābat 'she pulled' sāḥabātak > šābātak 'she pulled you (m.sg.)'

### (4) Examples of Bani-Hassan Arabic Metrical Grids\*

a. x x)	b. x x x)
(x x)	(x x)x)
ʔallamat	ʔallamatuh
c. x x)	d. x x x)
(x x)	(x x)x)
sāḥabat	sāḥabatak

\*For stress assignment rules and grid derivations, see (12) and (13), in the rightmost box.

- The present analysis produces binary left-headed feet over both heavy-light (4a,b) and light-light (4c,d) sequences of syllables.
  - Note that right-headed feet produce the wrong stress pattern: \*(ʔal)lamāt.

- A further rule (5) deletes a vowel in an open syllable if it is the head of a binary foot.

(5) Vowel Elision

x	x
v	→ / / _CV

- This results in deletion of the first vowel in sāḥabat and sāḥabatak, with subsequent stress shift to the right (6). The resulting surface form has a stress foot containing only one syllable.

(6) a. x x) → x x)

b. x x) → x x)

sāḥabatak → šābatak

➤ Bani-Hassan requires left-headed feet with the syllable structure heavy-light; e.g., (ʔal.lā.)matuh (4b). However, this foot type is excluded from the foot inventory in Hayes 1995.

➤ Vowel elision results in an initial light syllable forming a stress foot on its own; e.g., )shā)bat. Such feet (sometimes called “degenerate”) are highly disfavored in theories which treat feet as primitives, but are unproblematic for the present analysis.

## Palestinian Arabic

### (7) Stress Generalizations for Palestinian Arabic (Kenstowicz 1983, Hayes 1995)

a. Stress the rightmost heavy syllable out of the last 3 syllables	darást 'I studied,' darbátna 'she hit us,' ʔallamat 'she taught'
b. If the last four syllables are light, stress the initial	šājaratun 'a tree'
c. Otherwise stress either the penult or the antepenult; whichever is separated from the beginning of the word or the nearest heavy syllable on the left by an even number of syllables	kátab 'he wrote,' kátabu 'they wrote,' ʔallamato 'she taught him'

### (8) Examples of Palestinian Arabic Metrical Grids\*

a. x x)	b. x x)	c. x x x)
(x x)x	(x x)	(x x)
šājaratun	katab	darast

\*For stress assignment rules and grid derivations, see (14) and (15), in the rightmost box.

- In words with four light syllables (e.g., šājaratun (8a)), stress must be retraced leftwards to the preantepenult.
  - This is accomplished in the present analysis by stipulating that a final light syllable does not project a grid mark.
  - Hayes 1995 achieves this by treating word-final feet in Palestinian as extrametrical. However, extrametricality must be blocked in certain cases, as shown in (9b,c).

(9)

a. šājaratun	b. kátab	c. darást
(x )	(x )	( x )
(x . ) < (x . ) >	(x . )	(x )
σ σ σ σ	σ σ	σ σ
/ / / / \	/ / / \	/ / / \
šāja ratu <n>	kata <b>	daras <t>
final foot extrametrical	final foot NOT extrametrical	final foot NOT extrametrical

➤ The present analysis of Palestinian Arabic stress builds feet but does not refer to them as units; it thus avoids the complications of word-final foot extrametricality.

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Selected References:  
 Halle, M. and W. Idsardi. (1995) Stress and metrical structure. In *The Handbook of Phonological Theory*, ed. J. Goldsmith, 403-43. Oxford: Blackwell.  
 Hayes, B. (1995) *Metrical Stress Theory: Principles and Case Studies*. Chicago: Univ. of Chicago Press.  
 Idsardi, W. 1992. The computation of prosody. Doctoral dissertation, MIT, Cambridge, Mass.  
 Irshied, O. and M. Kenstowicz. 1984. Some phonological rules of Bani-Hassan Arabic: a Bedouin dialect. *Studies in the Linguistic Sciences* 14.1:109-47.  
 Kenstowicz, M. 1983. Parametric variation and accent in the Arabic dialects. *Chicago Linguistic Society* 19:205-13.  
 Kenstowicz, M. 1994. *Phonology in Generative Grammar*. Oxford: Blackwell.  
 McCarthy, J. 1979. On stress and syllabification. *Linguistic Inquiry* 10.3:443-65.

## STRESS ASSIGNMENT RULES AND DERIVATIONS

### (10) Classical Arabic Stress Assignment Rules

Line 0	Project: ˘: (x	Heavy syllables project a left bracket.
	Edge:RRR	Place a right bracket to the right of the rightmost grid mark.
	Head:L	The leftmost grid mark in each foot projects a grid mark.
Line 1	Edge:RRR	Place a right bracket to the right of the rightmost grid mark.
	Head:R	The rightmost grid mark in each foot projects a grid mark.

### (11) Classical Arabic Metrical Grid Derivations

		a. bālahatun 'date (nom.sg.)'	b. yušāariku 'he participates'	c. manaadīlu 'kerchiefs (nom.)'
Line 0	Project: ˘: (x	x x x x balahatu <n>	x(x x x yušaariku	x(x(x x manaadīlu
	Edge:RRR	x x x x) balahatu <n>	x(x x x) yušaariku	x(x(x x x) manaadīlu
	Head:L	x x x x) balahatu <n>	x x(x x x) yušaariku	x x x(x x x) manaadīlu
Line 1	Edge:RRR	x) x x x x) balahatu <n>	x) x(x x x) yušaariku	x x) x(x x x) manaadīlu
	Head:R	x x) x x x x) balahatu <n>	x x) x(x x x) yušaariku	x x x) x(x x x) manaadīlu

### (12) Bani-Hassan Arabic Stress Assignment Rules

Line 0	Project: ˘: (x	Heavy syllables project a left bracket.
	Project: #: ∅	Word-final light syllables do not project a grid mark.
	ICC:R.L→R	Insert right brackets iteratively after every sequence of two grid marks, moving from left to right.
	Edge:RRR	Place a right bracket to the right of the rightmost grid mark.
	Head:L	The leftmost grid mark in each foot projects a grid mark.
Line 1	Edge:RRR	Place a right bracket to the right of the rightmost grid mark.
	Head:R	The rightmost grid mark in each foot projects a grid mark.

### (13) Bani-Hassan Arabic Metrical Grid Derivations

		a. ʔallāmt 'I taught'	b. ʔallamātuh 'she taught him'	c. sāḥabat 'she pulled'	d. sāḥabātak 'she pulled you (m.sg.)'
Line 0	Project: ˘: (x	(x (x ʔallam<t>	(x x x ʔallamatu<h>	x x sāḥaba<t>	x x x sāḥabata<k>
	Edge:RRR	(x (x) ʔallam<t>	(x x x) ʔallamatu<h>	x x) sāḥaba<t>	x x x) sāḥabata<k>
	ICC:R.L→R	) (x (x) ʔallam<t>	) (x x)x) ʔallamatu<h>	) x x) sāḥaba<t>	) x x)x) sāḥabata<k>
	Head:L	x x ) (x (x) ʔallam<t>	x x ) (x x)x) ʔallamatu<h>	x ) x x) sāḥaba<t>	x x ) x x)x) sāḥabata<k>
Line 1	Edge:RRR	x x) ) (x (x) ʔallam<t>	x x) ) (x x)x) ʔallamatu<h>	x) ) x x) sāḥaba<t>	x x) ) x x)x) sāḥabata<k>
	Head:R	x ) (x x) ʔallam<t>	x ) (x x)x) ʔallamatu<h>	x ) x x) sāḥaba<t>	x ) x x) sāḥabata<k>

### (14) Palestinian Arabic Stress Assignment Rules

Line 0	Project: ˘: (x)	Heavy syllables project a left and a right bracket.
	Project: #: ∅	Word-final light syllables do not project a grid mark.
	ICC:R.L→R	Insert right brackets iteratively after every sequence of two grid marks, moving from left to right.
	Edge:LLL	Place a left bracket to the left of the leftmost grid mark.
	Head:L	The leftmost grid mark in each foot projects a grid mark.
Line 1	Edge:RRR	Place a right bracket to the right of the rightmost grid mark.
	Head:R	The rightmost grid mark in each foot projects a grid mark.

### (15) Palestinian Arabic Metrical Grid Derivations

		a. kátab 'he wrote'	b. kátabu 'they wrote'	d. šājaratun 'a tree'	e. darást 'I studied'	f. ʔallamato 'she taught him'
Line 0	Project: ˘: (x)	x kata <b>	x x katabu	x x x šājaratu <n>	x(x) daras <t>	(x) x x ʔallamato
	Edge:LLL	(x kata <b>	(x x katabu	(x x x šājaratu <n>	(x(x) daras <t>	--
	ICC:R.L→R	) (x kata <b>	) (x x) katabu	) (x x)x šājaratu <n>	) (x(x) daras <t>	) (x) x x) ʔallamato
	Head:L	x ) (x kata <b>	x ) (x x) katabu	x ) (x x)x šājaratu <n>	x x ) (x(x) daras <t>	x x ) (x) x x) ʔallamato
Line 1	Edge:RRR	x) ) (x kata <b>	x) ) (x x) katabu	x) ) (x x)x šājaratu <n>	x x) ) (x(x) daras <t>	x x) ) (x) x x) ʔallamato
	Head:R	x ) (x kata <b>	x ) (x x) katabu	x ) (x x)x šājaratu <n>	x ) x x) daras <t>	x ) x x) ) (x) x x) ʔallamato