

A Footless, Constraint-Based Analysis of Stress in Cairene Arabic

With its variation in stress across dialects, Arabic has been very visible in the literature on stress. In particular, the Cairene variety has been subject to much discussion. This is partly due to the fact that it is a well-known and well-documented dialect, but also due to a corpus of data published by Mitchell in 1960. These data, which actually deal with Egyptian pronunciation of neo-Classical Arabic, were interesting because of the complex, but entirely predictable stress pattern they exhibited which:

1. was sensitive to three degrees of syllable weight: light, heavy, and superheavy; and
2. entailed a curiously long-range correlation between a word's (primary) stress, which was always near the word's *right* edge, and, in the absence of intervening heavy syllables, whether there was an even or odd number of syllables from the word's *left* edge.

These data have formed the basis of many subsequent metrical analyses, such as Hayes (1995) and Kenstowicz (1994).

The aim of this paper is to reanalyze the facts of stress of Cairene Arabic within a framework which is non-metrical (i.e. footless) and Optimality Theoretical (i.e. expressed in terms of competing constraints rather than rules). Although feet are an intuitive and elegant tool for explaining a wide variety of stress patterns occurring in the world's languages, we do have motivation to doubt their existence, as the vast majority of these patterns can be accounted for without reference to feet by invoking constraints such as moraic and syllabic *CLASH and *LAPSE. Under this view, feet are not true entities, but the effect of such competing constraints.

The question as to whether or not feet exist is important, because the enriched vocabulary of a metrical framework, with its feet, foot forms (iambic and trochaic, monosyllabic and disyllabic), heads of feet, and extrametricality, imply the operation of constraints on each of those supposed entities. An analysis without feet will not only allow us to forgo an entire level of complexity, but may lead us to discover new constraints useful elsewhere in our grammars.

Beyond an analysis of the basic stress pattern, this paper will also deal with three other phenomena which interact with stress in Cairene Arabic, namely vowel shortening, high vowel deletion, and lexical stress. The line of discussion will be as follows:

1. Exposition of the colloquial and regularized¹ Classical stress patterns in the framework of a descriptive algorithm (p. 3) and a foot-based analysis (p. 5).
2. A footless, OT analysis of the forms used in colloquial Cairene, with discussion of the basic stress pattern (p. 10), high vowel deletion (p. 16), vowel shortening (p. 19), and lexical marking (p. 24).
3. Conclusions and questions for further research (p. 31).

The Colloquial and Regularized Classical Stress Pattern

The Syllable Canon

The syllabic structures possible within both Cairene and Classical Arabic are CV, CV:, CVC, CVCC#, and CV:C#.² These syllable types can be categorized as light, heavy, and superheavy:

¹In this paper, “regularized Classical Arabic” refers to the highly regular variant (in terms of stress) described in the sections on the descriptive algorithm and the metrical analysis. This variety is typical of speakers who by virtue of their profession (radio announcers, theology students, etc.) are required to speak Classical Arabic on a regular basis. The ordinary Egyptian pronouncing Classical Arabic exhibits a great deal of variation.

²CV:C is always word final in colloquial forms, but not in Classical forms, as explained in footnote 16 on page 19.

Syllable Type		Structure		Symbol Used
light σ	=	CV	=	˘ (breve)
heavy σ	=	CVC, CV:	=	ˉ (macron)
superheavy σ	=	CVCC, CV:C	=	ˉˉ (double macron)

Both the Cairene colloquial and Classical varieties of the language use a complex system of morphological templates, from which words are generated from root consonants, known to Arabists as “radicals”. However, in contrast with Classical Arabic, a systematic deletion of high vowels in certain positions and an absence of case and mood markers conspire to severely limit the word shapes available in Cairene colloquial forms. For example, when a sufficient number of morphemes are concatenated into a single word in Classical Arabic, it is quite possible to obtain a string of five light syllables:

/ʃa.ga.ra.tu.hu.maː/
 [ʃagarat+u+hum+aː]
 tree+nom+them+dual
 “their (*dual*) tree”

Such forms do not occur in colloquial Arabic.

A Descriptive Algorithm to Predict Stress

If we had to account only for colloquial forms, or indeed any form wherein the antepenult is not immediately preceded by a light syllable, the stress rules could be expressed in the terms of the following algorithm:

1. Stress the ultima if it is superheavy or a colloquial /CV:/'

ka.tábt “I wrote”
ki.táːb “a book”
ʃa.li.móː “a drinking straw” (*colloq.*)

2. Otherwise, stress a heavy penult.

ka.táb.ti “you (*f.*) wrote”
is.taf.ham.tu “you (*pl.*) enquired”
ki.taː.ba “writing”

3. Otherwise, if the antepenult is heavy, stress the penult.

in.ká.tab “it (*m.*) was written”
mit.nar.fí.sa “touchy (*f.*)”

#(˘˘)ⁿ˘˘
 #... - (˘˘)ⁿ˘˘

#(˘˘)ⁿ˘˘˘˘
 #... - (˘˘)ⁿ˘˘˘˘

A Foot-Based Analysis

Using both the extended set of word shapes of Classical Arabic and Mitchell’s observed stress patterns, hereafter referred to as “regularized stress”, Hayes (1995, following McCarthy 1979) gives a metrical analysis which elegantly predicts the stress pattern of Cairene. The analysis can be summarized as follows:

1. Trochaic feet are formed from left to right, a moraic trochee being both minimally and maximally bimoraic. A heavy syllable (CVC, CV:) is bimoraic. A single light syllable (CV) can never constitute a foot. In the examples that follow, a disyllabic trochee, derived from two light syllables (˘˘), is represented on the foot tier as (× .), while a monosyllabic trochee, derived from one heavy syllable (˘) is written as (×).

(× .)	(×)	(× .)
mí.jí	xab.ʔá	ká.ta.bu
“he left”	“a knock”	“they wrote”

2. The stress of the rightmost foot is enhanced to bear primary stress, indicated on a separate tier of ×’s.

(×)	(×)
(×) (× .)	(× .) (×)
màd.rá.sa	jà.ga.rít.ha
“school”	“her tree”

3. The final mora in the ultima cannot be footed (CV<C>#, CV:<C>#, CVC<C>#, CV<:>#),

(×)	(×)
(× .)	(× .)
ká.ta.bi<ʔ>	ká.ta.ba<: >
“she wrote”	“they (dual) wrote” Cl. ⁴

4. However, the final mora of a colloquial form ending in a long vowel (CV:) is footed.

(×)	(×)
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⁴Classicisms and Classical pronunciations will hereby be labeled *Cl*.

At this point we can make one improvement in the analysis set forth in Hayes (1995), obviating the need for differential treatment of long vowels in the ultima in Classical and colloquial forms. It is quite arguable that all final long vowels in the colloquial forms actually end in an underlying /h/. These forms are overwhelmingly of two types:

1. Nouns of foreign origin, the plural forms of which exhibit an overt [h]:

/gatoːh, gatoːh+aːt/ [ga.tóː, ga.tu.háːt] “cake, cakes”

/ʃaleːh, ʃaleːh+aːt/ [ʃa.léː, ʃa.li.háːt] “chalet, chalets”

This [h] is never present in analogous plurals where the singular ends in a consonant:

/ʃanab, ʃanab+aːt/ [ʃá.nab, ʃa.na.bàːt] “moustache, moustaches”

/tilifoːn, tilifoːn+aːt/ [tilifóːn, tilifunáːt] “telephone, telephones”

The argument for an underlying /h/ in these cases is strengthened by the fact that the long final vowel in such words is actually written with an “h” (هـ) in the orthography. This is the only position in which long vowel is spelled this way.⁵ The fact that El-Said Badawi, a phonetician and native speaker of the dialect, has transliterated all such forms with an overt /h/ in his dictionary of colloquial Egyptian Arabic (Hinds & Badawi, 1986), would seem to lend credence to a theory of an underlying /h/ in such words.

2. Words consisting of a vowel-final stem followed by the third person masculine singular pronominal suffix /uh/, some forms of which do exhibit an overt [h].

/katab+uː ⁶	/katab+uː+uh/	/ma+katab+uː+uh+ʃ/
wrote+3p	wrote+3p+him	neg+wrote+3p+him+neg

⁵This argument is slightly weakened, however, by the fact that a handful of nouns ending in a short /u/, such as [rád.yu] “radio”, also take an [h] in their plural [ràd.yu.háːt]. This would seem to justify arguing that the /h/ is simply a constituent of a plural suffix /-háːt/, distinct from /-aːt/. Since no nouns of Arabic origin end in short /u/, a novel plural form would have been needed for these assimilated words. I would not be surprised to learn that some speakers occasionally pronounce this word with a final [h]. However, the presence of an alternate (if stigmatized) plural form [radaːwi] would make the likelihood of an underlying /h/ seem unlikely.

⁶Henceforth, the vowels of subject markers will be assumed to be underlyingly long.

[ká.ta.bu]	[kà.ta.bú:]	[mà.ka.tà.bu.hú:f]
“they wrote”	“they wrote it”	“they didn’t write it”

It is unclear whether the underlying /h/ of the suffix /-uh/ is ever actually pronounced in word-final position.

The only category of words where such alternation with word-final [h] does not occur, albeit a very large one, seems to be that of nouns, adjectives, and verbs of Arabic origin in which the underlying /h/ radical (root letter) is not normally deleted.

/ittiga:h, root: w g h/	[it.ti.gá:h], not *[it.ti.ga:]	“direction”
/safí:h, root: s f h/	[sa.fí:h], not *[sa.fí:]	“foolish”
/ta:h, root: t w h/	[ta:h], not *[ta:]	“he got lost”

However, at times, especially in certain fixed expressions, even a radical /h/ can go unrealized:

/al-la:h yi+sallim+ak/ [ʔal-lá:h yi.sàl.lí.mak], or [ʔal-lá y.sàl.lí.mak]
“May God keep you (*m.*).”

One potential problem for the underlying /h/ hypothesis is the high-register plural form /C₁uC₂á:/, associated only with the singular pattern /C₁a:C₂i(C₃)/ where the third root consonant is a glide:

[má:fí, mufá:]	root: /m ʃ y/	“pedestrian, pedestrians”
[qá:d ^f i, qud ^f á:]	root: /q d ^f y/	“judge, judges”

Here, there is clearly no underlying /h/ in the root, but it might be arguable that the plural pattern itself contains an underlying /h/, i.e. /C₁uC₂á:h/. (This is the position taken in Badawi’s dictionary.) Alternatively, since the construct form of these plurals ends in a /t/, as does the feminine marker present in a few other plural patterns, it is also possible that the exceptional stress arises either because the plural pattern is bimorphemic,

/C₁uC₂a+a, C₁uC₂a+it/
plural+f, plural+f.const.

or that this particular pattern is simply lexically marked for stress, as seems to be the case with a few other plural patterns we shall examine below. Since Classical singular nouns of the form /CVCa:, CVCa:t *const.*/ have colloquial reflexes of the form /CVCa, CVCat *const.*/ (note the

⁷The 3m.s. pronoun suffix /-uh/ undergoes metathesis when followed by another suffix, as does the 2f.s. pronoun suffix /-ik/.

short vowel in the construct form), e.g. Classical [zaká:t-...] and colloquial [zí.kat] “tithe”, the lexical stress explanation seems rather more likely than the bimorphemic one.

Historically, the alternation between [h] and [t] in nouns and adjectives is less ambiguous. In all cases where modern dialects have an alternation between [-a] and [-it, -at], Classical Arabic has [-a(h)]⁸ in pausal forms (where the following case marker goes unpronounced) and [-at] in all other cases, whether the word be in a construct or not:

[ʃá.ʒa.rah]	[ʃà.ʒa.rá.tun ʒa.mí:l.rah]
/ʃaʒar+at+u+n/	/ʃaʒar+at+u+n ʒamil+at+u+n/
trees+f..+nom..+indef.	trees+f..+nom..+indef. beautiful+f..+nom..+indef.
“tree”	“a beautiful tree”

In the orthography, this alternation is represented by the letter (آ), which combines the word-final shape (ا) of the letter (هـ) /h/ and the two dots of the letter (ت) /t/.

To sum up, although the relationship between /h/ and final long vowels is not a clear-cut affair, there appears to be a strong case for positing an underlying /h/ for colloquial stressed word-final long vowels, and just such a position would allow us to treat colloquial and classical input without differentiation.

A Footless Optimality Theoretical Analysis

The Basic Stress Pattern

As did the metrical analysis above, the following footless, optimality theoretical analysis will account for both the colloquial forms and regularized Classical pronunciation. The line of discussion to be followed is from the simplest forms to the most complex. Most of the constraint rankings used in this analysis were arrived at using constraint ranking software developed by Bruce Hayes.

To begin our footless analysis, let us translate some of the metrical concepts into footless constraints. First we must translate the notion of the metrical foot itself. Keeping to the idea that a light syllable consists of a single mora ([CV]_σ = [μ]_σ) while a heavy syllable consists of two ([CVC]_σ, [CVː]_σ = [μμ]_σ), the effect of strings of metrical feet, which in Cairene can be composed

⁸The [h] is pronounced by modern speakers only in careful speech.

of either two light syllables, resulting in a disyllabic trochee (×.), or one heavy syllable, constituting a monosyllabic trochee (×), can be achieved by invoking the following constraints (Kager 1993):

*CLASH

Two consecutive moras are not both stressed.

*LAPSE

Two consecutive moras are not both stressless.

When spared the interference of other competing constraints, the effect of *LAPSE and *CLASH is to stress a chain of syllables on every other mora, as illustrated in the following tableau on a chain of open syllables:

/...[μ] _o [μ] _o [μ] _o [μ] _o [μ] _o .../	*CLASH	*LAPSE
☞ [...μ̣μ̣μ̣μ̣...] OR [...μ̣μ̣μ̣μ̣...]		
*[...μ̣μ̣μ̣μ̣...]	**	
*[...μ̣μ̣μ̣μ̣...]		**

This will happily get us alternating stressed and unstressed syllables, but it does not tell us where to *place* those stresses, as the two distinct winning candidates show. To achieve the left-to-right trochaic chain characteristic of Cairene, a constraint must be introduced which prefers candidates stressed on the word's initial syllable:

STRESS INITIAL

The initial mora of a word is stressed.

/d [̣] araba-hu/ "he hit him" <i>Cl.</i>	*CLASH	STRESS INITIAL	*LAPSE
☞ [d [̣] à.ra.bá.hu]			
[d [̣] a.rà.ba.hú]		!	
[d [̣] a.rà.bá.hu]	!	*	
[d [̣] à.ra.ba.hú]			!

Primary stress comes as the result of a constraint RIGHTMOST, promoting the rightmost stressed syllable:

RIGHTMOST

The prosodic head is the rightmost stressed syllable.

/d ^ˈ araba-hu/ “he hit him” <i>Cl.</i>	*RIGHTMOST
☞[d ^ˈ à.ra.bá.hu]	
[d ^ˈ á.ra.bà.hu]	!
[d ^ˈ â.ra.bà.hu]	!

This constraint is undominated for colloquial forms and regularized Classical Arabic.

Recall now that in the metrical analysis we examined earlier, a final consonant or vowel lengthening (ː) was considered extrametrical. In the present footless analysis, this translates as a constraint penalizing candidates in which the ultima bears stress:

NON-FINALITY

A word-final syllable is stressless.

This constraint must be ranked relative to *LAPSE and STRESS INITIAL:

/katab/ “he wrote”	*CLASH	NON-FINALITY	STRESS INITIAL	*LAPSE
☞[ká.tab] [jú] _σ [μμ] _σ				*
[ka.táb] [μ] _σ [jú] _σ		!	*	
[kà.táb] [jú] _σ [jú] _σ	!	*		

/katab+u:/ ⁹ “they wrote”	*CLASH	NON-FINALITY	STRESS INITIAL	*LAPSE
كَاتَبُوا [ká.ta.bu] [μ] _σ [μ] _σ [μ] _σ				*
[ka.tá.bu] [μ] _σ [μ] _σ [μ] _σ			!	
[kà.ta.bú] [μ] _σ [μ] _σ [μ] _σ		!		

Note that a fundamental assumption is made here that a form such as *[kàtáb] must be parsed as [μ]_σ[μ]_σ, not as [μ]_σ[μ]_σ. That is to say, it is only the most prominent mora within a syllable, in this case the one corresponding to the vowel, that can bear stress.

The four constraints presented to this point will generate the Cairene stress pattern for any word of the form [μ(μ)]_σ ([μ]_σ)ⁿ [μ(μ)]_σ, but as we have already seen, Arabic words often have internal heavy syllables (CVC, CV:). For this reason we must reintroduce the notion that a heavy syllable should bear stress, expressed as the constraint STRESS HEAVY:

STRESS HEAVY (*provisional*)

A heavy syllable is stressed. (Prince and Smolensky 1993 as Weight-to-Stress Principle.)

The conflict of STRESS HEAVY with *CLASH, which appears to be undominated in this system, will necessitate violations of *LAPSE whenever a light syllable must be “skipped over”. The relationship between these three constraints is essentially a re-expression of the integrity of the syllable made explicit in the metrical analysis, which dictated that a final mora of heavy syllable not be footed with the following syllable:

(× .)	not	* (× .)(× .)
[μ] _σ [μ μ] _σ [μ] _σ		[μ] _σ [μ μ] _σ [μ] _σ
CV. CV C. CV		CV. CV C. CV

The following tableau demonstrates the effect of STRESS HEAVY:

⁹Treatment of this final vowel is dealt with in the section on vowel shortening.

/ʔistalam+tu/ received+2p “you received”	*CLASH	NON- FINALITY	STRESS HEAVY	*LAPSE
☞ [ʔis.ta.lám.tu] [ǫ̣ǫ̣] _σ [ǫ̣] _σ [ǫ̣ǫ̣] _σ [ǫ̣] _σ				**
[ʔis.tá.lam.tu] [ǫ̣ǫ̣] _σ [ǫ̣] _σ [ǫ̣ǫ̣] _σ [ǫ̣] _σ			! *	**
[ʔis.tà.lam.tú] [ǫ̣ǫ̣] _σ [ǫ̣] _σ [ǫ̣ǫ̣] _σ [ǫ̣] _σ		! *	*	
[ʔis.tà.lám.tu] [ǫ̣ǫ̣] _σ [ǫ̣] _σ [ǫ̣ǫ̣] _σ [ǫ̣] _σ	! *			

*CLASH being undominated, STRESS HEAVY will also force violations of STRESS INITIAL when the postinitial syllable is heavy:

/muhandis/ “engineer”	*CLASH	NON-FINALITY	STRESS HEAVY	STRESS INITIAL	*LAPSE
☞[mu.hán.dis] ¹⁰ [μ] _o [μμ] _o [μμ] _o			*	*	**
[mú.han.dis] [μμ] _o [μμ] _o [μμ] _o			!		****
[mù.han.dís] [μ] _o [μμ] _o [μμ] _o		! *	*		*
[mù.hán.dis] [μ] _o [μμ] _o [μμ] _o	! *		*		**
[mù.hàn.dís] [μ] _o [μμ] _o [μμ] _o	! *	*			*

Another constraint, STRESS SUPERHEAVY, essentially a more restricted and more highly ranked variety of STRESS HEAVY is needed to get stress on superheavy (CVCC, CV:C) ultimas:

STRESS SUPERHEAVY (*provisional*)

A superheavy syllable is stressed.

STRESS SUPERHEAVY is undominated in the hierarchy¹¹:

/katab+t/ wrote+ <i>Is</i> “I wrote”	STRESS SUPERHEAVY	*CLASH	NON-FINALITY
☞[ka.tábt]			*
[kà.tábt]		! *	*
[ká.tabt]	! *		

Note that while heavy ultimas are not stressed in Cairene, superheavy ultimas always are. Farther down on the scale of weight, light syllables *may* be stressed, but heavy syllables have a special

¹⁰That the actual form is [mu.hán.dis] rather than *[mù.hán.dis] is supported by the fact that the initial syllable can be subject to high vowel deletion:

/wi muhandis/ [wim.hán.dis] “and an engineer”

¹¹Except by a constraint needed to preserve lexical non-final stress in a handful of borrowings as pronounced by some speakers, e.g. /tíliks/ [tí.liks] “telex”, /tiríning/ [ti.rí.ning] “training suit”, /ʔay.rú.biks/ [ʔay.rú.biks] “aerobics”.

tendency to be so. This leads us to suppose that weight-to-stress constraints are probably of an intrinsically ordered nature, and that in any language a syllable consisting of four moras, e.g. [CV:CC], would be even more likely to bear stress than one consisting of only three moras. With this in mind, let us slightly reformulate our weight-to-stress constraints so that a violation of STRESS SUPERHEAVY also incurs a violation of STRESS HEAVY:

STRESS HEAVY (*revised*)

A syllable consisting of at least two moras is stressed.

STRESS SUPERHEAVY (*revised*)

A syllable consisting of at least three moras is stressed.

/katab+t/ wrote+ <i>l</i> s “I wrote”	*CLASH	STRESS SUPERHEAVY	NON- FINALITY	STRESS INITIAL
☞ [ka.tábt]			*	*
[ká.tabt]		!		
[kà.tábt]	!		*	

At this point we must also revise our formulation of *LAPSE, in light of its failure to eliminate a rival candidate in the following tableau:

/muxtali+f+a/ different+f. “different”	*CLASH	STRESS HEAVY	*LAPSE
☞ [mùx.ta.li.fa] [μμ] _σ [μ] _σ [μ] _σ [μ] _σ			**
*[mùx.ta.lí.fa] [μμ] _σ [μ] _σ [μ] _σ [μ] _σ			**

It seems that Cairene has a distinct dispreference for internal lapses,

*INTERNAL LAPSE

Two consecutive moras preceding a stressed syllable are not both stressless.

/muxtaliḥ+a/ “different (f.)”	*CLASH	STRESS HEAVY	INTERNAL LAPSE	*LAPSE
مختلفة [mùx.tá.li.ḥa] [μμ] _o [μ] _o [μ] _o [μ] _o				**
*[mùx..ta.li.ḥa] [μμ] _o [μ] _o [μ] _o [μ] _o				!***
[mùx..ta.li.ḥa] [μμ] _o [μ] _o [μ] _o [μ] _o			!	**

High Vowel Deletion

Cairene exhibits a form of high vowel deletion, which can be expressed as the following rule:

$$\begin{array}{c} V \\ [+high] \end{array} \rightarrow \emptyset / VC_CV$$

Although we shall discuss the restrictions placed on high vowel deletion, the following examples demonstrate how it operates over a wide range of grammatical categories:

Nouns:	[sáḥ.bi] /saḥib+i/ friend+ <i>Is</i> “my friend”	[wif.tír] /wi fitir/ and <i>fitir</i> -pastry “and <i>fitir</i> -pastry”
Adjectives:	[nít.na] /nitin+a/ foul+ <i>f.</i> “foul smelling”	[húw.wa k.bír] /huwwa kibi:r/ he big “he/it is big”
Verbs:	[fír.bu] /firib+uh/ drank+ <i>3m.</i> “he drank it” ¹²	[bìy.zák.ru] /bi+yi+za:kir+u:/ <i>pres.+3pers.+study+p.</i> “they are studying”
Function Words:	[ta.láḥ.taw.núss] /talaḥta wi nus ^s s ^s / three and half “three and a half”	[híy.yaf.másr] /hiyya fi mas ^r / she in Egypt “she’s in Egypt”

¹²Analyzed differently, this surface form also means “they drank”.

Although easy to state as a rule, translating high vowel deletion into the language of Optimality Theory will require several different constraints. The first of these must provide a general motivation for any high vowel deletion at all, corresponding to a rule without an environment (X→Y). Then, various other constraints, ranked more highly in the hierarchy, will be required to rescue certain otherwise well-formed candidates from elimination.

Because high vowel deletion in Cairene seems to be “trying” to form heavy syllables, but not superheavy syllables (/fitir/ [fi.tir], not *[fitr] “he had breakfast”), at first glance it might appear that motivation for high vowel deletion in light syllables stems from a relationship between two highly general constraints:

HEAVY SYLLABLE (*putative*)
A syllable is heavy.

MAX [NON-HIGH VOWEL] (*putative*)
Every non-high vowel in the underlying form has a correspondent in the output.

However, such a general solution is unnatural, since we know from cross-linguistic evidence that light syllables are less marked than heavy ones, and therefore, that if such a constraint as HEAVY SYLLABLE exists, it must be intrinsically dominated by its close relative LIGHT SYLLABLE.¹³ Hence, we see no other solution than to invoke an environmentally conditioned constraint:

*HIGH VOWEL IN LIGHT SYLLABLE
The output representation does not have a high vowel in a light syllable.

When a vowel is deleted to satisfy this constraint, a violation of MAX[VOWEL] is necessarily incurred:

MAX [VOWEL]
Every vowel in the underlying representation has a correspondent in the output.

¹³Following this same line of reasoning, if a way is found to represent *HIGH VOWEL separately from its environment “in light syllable”, deletion of the high vowel in a final closed syllable will be easily prevented by a constraint SUPERHEAVY SYLLABLE intrinsically dominated by HEAVY SYLLABLE. Of course, it is more natural to think of such constraints expressed in terms that penalize the more marked form: *HEAVY SYLLABLE, *SUPERHEAVY SYLLABLE, etc.

The fact that high vowel deletion cannot occur in a word-final syllable is the effect of a constraint MAX [WORD-FINAL VOWEL]:

MAX [WORD-FINAL VOWEL]¹⁴

The word-final vowel of the underlying form has a correspondent in the output.

Furthermore, high vowel deletion can occur only when the offending syllable is flanked by an open syllable to its left. This is due to a constraint highly ranked in Classical Arabic and many modern dialects:

*SYLLABLE-INITIAL CONSONANT CLUSTER¹⁵

The output representation does not contain a syllable with an initial consonant cluster.

The relationship between *HIGH VOWEL IN LIGHT SYLLABLE, MAX[VOWEL], and MAX[WORD-FINAL VOWEL] is shown in the following tableaux:

/ʃirib+u:/ drank+3p “they drank”	MAX [WORD-FINAL VOWEL]	* _σ [CC]	*V[+high] IN LIGHT σ	MAX[V]
☞ [ʃir.bu]			*	*
*[ʃi.ri.bu]			!***	
[ʃri.bu]		!		*
[ʃrib]	!			**

Unfortunately, predictions made in a footless analysis on the interaction between stress and high vowel deletion cannot be tested because of cyclicity effects. For example, [fíh.mit] the output of /fihim+ít/ “she understood” is used as a base to obtain [ma fih.mi.tákʃ] “she understood you”, rather than using a string of underlying representations (/ma fihim+it+ak+f/).

¹⁴Another solution using a constraint penalizing forms which tautosyllabically violate both DEP[VOWEL QUANTITY] and MAX[VOWEL] or the like would require deriving most colloquial surface word-final short vowels from underlying long vowels, which is possible but beyond the scope of this paper. Separate constraints would then be required to protect monosyllabic morphemes, such as the feminine marker /-a/, from deletion.

¹⁵This constraint is independently motivated to explain epenthesis in both imperatives (/ktub/ [ʔuk.tub] “write (*m.imper.*)”) and borrowings (/stiryu/ [is.tir.yu] “stereo”).

Vowel Shortening

Dispreference for long vowels in Arabic can be inferred from three different phenomena:

1. the absence of long vowels in non-final closed syllables in both the Classical and colloquial varieties,¹⁶
2. the shortening of underlying long vowels in final position in colloquial forms (under the assumption set forth earlier that surface long vowels in colloquial forms end in an underlying /h/), and
3. in colloquial forms and informal readings of Classical forms, the shortening of any underlying long vowel which does not bear primary stress in the surface form.

Drawing on our knowledge of the general dispreference for long vowels cross-linguistically, this dispreference can be expressed as a constraint of a very general nature:

*LONG VOWEL

A vowel in the output is not long.

Shortening of a long vowel to satisfy this constraint constitutes a violation of the corresponding faithfulness condition DEP[VOWEL LENGTH]:

DEP[VOWEL LENGTH]

A long vowel in an underlying representation corresponds to a long vowel in the output.

However, the general constraint *LONG VOWEL must be ranked below DEP[VOWEL LENGTH]:

¹⁶Except where an underlying long vowel (in this case almost always /a:/) precedes a geminate consonant (Ca:C_iC_i), as pronounced by some speakers in a Classical style.

/ʃaːbba/ [ʃaːbba] *Cl.*, [ʃab.ba] *colloq.* “young woman”
/mudaːd^ʕd^ʕa/ [mu.daːd^ʕ.d^ʕa] *Cl.* [mu.dad^ʕ.d^ʕa] *colloq.* “counter-” (*adj.*, *f.*)

Since a long vowel never precedes two distinct consecutive consonants (Ca:C_iC_j) in an underlying representation, it cannot be known whether this stems from the geminate nature of the coda or perhaps from the influence of the orthography. However, although in a colloquial reading of both the above tokens the long vowel undergoes shortening [ʃab.ba, mu.dad^ʕ.d^ʕa], it appears that the masculine singular (i.e. suffix-less) forms do preserve the underlying long vowel:

/ʃaːbb/ [ʃaːb(b)] *Cl.*, [ʃaːb(b)] *colloq.* “young man”
/mudaːd^ʕ/ [mu.daːd^ʕ(d^ʕ)] *Cl.* [mu.daːd^ʕ(d^ʕ)] *colloq.* “counter-” (*adj.*, *m.*)

The treatment of geminates deserves special attention, but is beyond the scope of this paper.

/ʃa:lám/ “world”	DEP[V:]	*V:
☞[ʃá:.lam]		*
[ʃá.lam]	!	

This effectively prevents *LONG VOWEL from filtering out any relevant candidates. Thus a more restricted version of DEP[VOWEL LENGTH] is required, allowing long vowels to survive in a syllable bearing primary stress:

DEP[VOWEL LENGTH IN HEAD]

A vowel which is long in the underlying representation is also long in the output if it resides in the prosodic head.

/ʃa:lám/ “world”	DEP[V: in head]	*V:
☞[ʃá:.lam]		*
[ʃá.lam]	!	

Invoking this more restrictive constraint allows us to properly rank the more general DEP[VOWEL LENGTH] below *LONG VOWEL as well as to account for shortening in internal open syllables:

/ga:wíb+t/ answered+ <i>ts</i> . “I answered”	DEP[V: in head]	*V:	DEP[V:]
☞[ʃga.wíbt]			*
[ʃgá:.wíbt]		!	

Shortening of final long vowels is also achieved with the constraints posited so far:

/katab+u:/ wrote+3p “they wrote”	DEP [V: in head]	NON- FINALITY	STRESS HEAVY	*V:	STRESS INITIAL	DEP[V:]
𐌀𐌿[ká.ta.bu]						*
[ka.tá.bu]					!	*
[ká.ta.bu:]			!	*		
[ka.tá.bu:]			!	*	*	
[kà.ta.bú:]		!		*		
[kà.ta.bú]	!	*				*

However, this apparatus alone will not get us the desired retention of long vowels in final closed syllables, as is shown in the following tableau, where a non-occurring candidate fares better than the correct form:

/kita:b/ “book”	DEP [V: in head]	NON- FINALITY	STRESS HEAVY	*V:	STRESS INITIAL	DEP[V:]
*[kí.tab]			*			*
𐌀𐌿[ki.tá:b]		*		*	*	
[ki.táb]	!	*			*	*
[kí.ta:b]	!					

The correct form can be rescued here by invoking a constraint which filters through candidates which stress *underlying* superheavy syllables:

STRESS UNDERLYING SUPERHEAVY¹⁷

An output syllable corresponding to a superheavy syllable in an underlying representation is stressed.

Note that it is the combined forces of STRESS UNDERLYING SUPERHEAVY and DEP[VOWEL LENGTH IN HEAD], rather than a single constraint, that result in the stressed long vowel:

¹⁷STRESS UNDERLYING SUPERHEAVY is needed elsewhere to get final stress in degeminated forms such as /muhimm/ [mu.hím], not *[mú.him] “important”.

/kita:b/ “book”	STRESS UR SUPER- HEAVY	DEP [V: in head]	NON- FINALITY	STRESS HEAVY	*V:	STRESS INITIAL	DEP[V:]
☞[ki.tá:b]			*		*	*	
[ki.táb]		!	*			*	*
[kí.tab]	!			*			*
[kí.ta:b]	!	*					

An additional constraint is needed to get vowel shortening in internal closed syllables. The most principled way to formulate this constraint is as a dispreference for long vowels before two (or more) consecutive consonants, making it similar to the more familiar dispreference for long vowels in closed syllables.¹⁸

*V:CC

The output does not contain a long vowel followed by a consonant cluster.

/sa:ʔb+hum/ left+them “he left them”	*V:CC	DEP[V:]
☞[sab.hum]		*
[sa:ʔb.hum]	!	

Expressed in terms of rules, the phenomena of stress assignment and vowel shortening must be ordered:

¹⁸The constraint as formulated also penalizes internal superheavies of the form [CVCC]_σ, which are non-occurring and which are also filtered out by an undominated constraint *CCC penalizing strings of three consecutive consonants. *CCC is needed independently to account for epenthesis.

Again, additional constraints would be necessary to account for long vowels preceding internal geminate consonants in Classical readings of forms such as /ʃa:ʔbba/ [ʃa:ʔb.ba] “young woman”.

Stress Assignment: Mark off moraic trochees ($[\mu\mu]_{\text{foot}}$) from left to right.

Vowel Shortening: $V: \rightarrow V / [_]_{\sigma}$ where syllable is not prosodic head

	/ʃa:lɑm+i/ world+adj. “international”
Syllabification	ʃa:lɑ.mi [[μμ] _σ [μ] _σ [μ] _σ]
Stress Assignment	ʃâ:lɑ.mi {[[μμ] _σ }{[[μ] _σ [μ] _σ }
Vowel Shortening	ʃâ.lɑ.mi
Surface Representation	[ʃa.lɑ.mi]

	/ʃa:lɑm+i/ world+adj. “international”
Syllabification	ʃa:lɑ.mi [[μμ] _σ [μ] _σ [μ] _σ]
Vowel Shortening	ʃa.lɑ.mi [[μ] _σ [μ] _σ [μ] _σ]
Stress Assignment	ʃá.lɑ.mi {[[μ] _σ [μ] _σ }[μ] _σ }
Surface Representation	*[ʃá.lɑ.mi]

However, the constraints we have presented so far successfully achieve the correct stress and shortening without reference to ordering:

/ʃa:lɑm+i/ world+adj. “international”	DEP [V: in head]	*V:	STRESS INITIAL	DEP[V:]
☞ [ʃa.lɑ.mi]			*	*
[ʃâ:lɑ.mi]		!		
[ʃá:lɑ.mi]		!		
[ʃá.lɑ.mi]	!			*

Surface Word-Final Long Vowels in Colloquial Forms

For the sake of completeness in our discussion of long vowels, let us now account for surface word-final long vowels in colloquial forms. This will require a constraint penalizing surface forms with a final [h] which is not a constituent of an Arabic root:

*NON-RADICAL [h]

The output does not contain a surface form ending in an [h] which is not the constituent of a root.

*NON-RADICAL [h] outranks the otherwise undominated MAX[C]:

MAX[C]

A consonant in the underlying representation has a correspondent in the output.

Overreduction of the final syllable's rime to a bare shortened vowel is again prevented by the force of STRESS UNDERLYING SUPERHEAVY coupled with DEP[VOWEL LENGTH IN HEAD]:

/ʃalimoːh/ "drinking straw"	*NON-RADICAL [h]	STRESS UR SUPER- HEAVY	DEP [Vː in head]	NON-FINALITY	MAX[C]
☞ [ʃã.li.móː]				*	*
[ʃã.li.mú] ¹⁹			!	*	*
[ʃá.li.mu]		!			*
[ʃã.li.móːh]	!			*	

In a variant pronunciation where the final /h/ is retained (which may or may not actually occur), the dominance relationship between *NON-RADICAL [h] and Max[C] is reversed.

/ʃalimoːh/ "drinking straw"	MAX[C]	STRESS UR SUPER- HEAVY	DEP [Vː in head]	NON-FINALITY	*NON-RADICAL [h]
☞ [ʃã.li.móːh]				*	*
[ʃã.li.móː]	!			*	
[ʃã.li.mú]	!		*	*	
[ʃá.li.mu]	!	*			

¹⁹Cairene has a larger set of long vowels than of short ones. The short vowels corresponding to /uː/, oː/ and /iː/, eː/ are /u/ and /e/, respectively.

Lexical Marking Against High Vowel Deletion and Lexical Stress

The following three forms, all of which are underlyingly of the form /CVCVCV/, should suffice to demonstrate that some items are marked in the lexicon either against high vowel deletion or for lexical stress in colloquial forms:²⁰

No Marking:

/marin+a/ [má.ri.na] “flexible (*fem.*)”

Marked Against High Vowel Deletion:

/tilim+a/ [til.ma] “blunt (*fem.*)”

Marked For Stress:

/ħis^ˈína/ [ħi.s^ˈí.na] “horses”

Let us now examine which forms are marked against high vowel deletion and which are marked for lexical stress and the constraints responsible for the relevant surface representations.

Lexical Marking Against High Vowel Deletion

At least four different classes of words are subject to marking in the lexicon against high vowel deletion. Note that only a particular vowel in a pattern is subject to this immunity, and not all the high vowels in the form. The vowel marked against deletion has been indicated with italics.

1. At least two plural patterns (CuCuC and CuCuCa) exhibiting a high vowel in a non-initial syllable:

[kú.tu.bi], not *[kút.bi]	[su.ʔu.la], not *[suʔ.la]
/kutub+i/	/suʔula/
books+me	coy (<i>p.</i>)
“my books”	“coy”

High vowels occurring in other plural patterns, such as CaCa:CaC, are not marked against deletion:

²⁰I am not actually aware of any lexically marked stress in Arabic that does not fall on a high vowel.

[ma.ʃák.lu], not *[mà.ʃa.kí.lu]
 /maʃa:kil+uh, root: ʃ k l/
 problems+him
 “his problems”

[ga.máy.lak], not *[gà.ma.yí.lak]
 /gama:yil+ak, root: g m l/
 favors+you(m.)
 “your favours”

2. Many nouns and adjectives of participial form containing the prefix *mu-*. Colloquial reflexes of these forms prefixed with *mi-* are not marked against high vowel deletion.

root: /x l f/

muCtaCiC:	[mux.tà.li.fí:n] /muxtaliʃ+i:n/ different+p. “different (<i>adj.</i>)”	miCtiCiC:	[mix.til.fi:n] /mixtiliʃ+i:n/ differing+p. “differing (<i>active part.</i>)”
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3. Many nouns of participial form constructed on the pattern Ca:CiC, but not the corresponding active participals proper:

root: /t̚ l b/

Ca:CiC	[t̚a.lí.ba] /t̚a:lib+a/ student+f. “student”	[t̚ál.ba] /t̚a:lib+a/ asking+f. “(f. <i>subject</i>) has asked for”
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4. At least two adjectives of the pattern C₁iC₂iC₂.²¹

[yí.ti.ta] /yitit+a/ unpleasant+fem. “unpleasant (person)”	[mí.zi.za] /miziz+a/ tart+fem. “tart (<i>adj.</i>)”
---	--

The corresponding plural pattern for non-geminate roots, C₁iC₂iC₃, is not marked against high vowel deletion:

²¹No speakers exhibit high vowel deletion in /yitit+a/, but third-hand evidence gathered via an Internet news group indicated that some speakers allow such deletion in /miziz+a/. No other words of this pattern (with a geminate second radical) could be found.

Since this exemption from high vowel deletion is particular to geminates, it is possible that these forms are not actually lexically marked.

[yíl.sa]
 /yilis+a/
 silly+fem.
 “silly”

Vowels that are marked in the lexicon in this fashion are never deleted in surface representations. This is expressed in our analysis as a constraint MAX[MARKED VOWEL] which dominates *V[+HIGH] IN LIGHT σ :

MAX[MARKED VOWEL]

A vowel marked in the lexicon (in an underlying representation) has a correspondent in the output.

The effect of this constraint is best demonstrated by examining a minimal pair in terms of lexical marking of a vowel. The following tableau demonstrates the selection of [kát.ba] for underlying /ka:tib+a/, a participle wherein the high vowel is unmarked:

unmarked vowel /ka:tib+a/ write <i>act. part.+f.</i> “has written”	*V:CC	*V [+high] IN LIGHT Σ	DEP [V: IN HEAD]	*V:	MAX[V]	STRESS INITIAL	DEP[V:]
☞ [kát.ba]			*		*		*
[ka.tí.ba]		!				*	*
[ka.ɫí.ba]		!		*			
[kà.ɫí.ba]		!		*			
[ká.ɫi.ba]		!		*			
[káɫ.ba]	!			*	*		

In contrast, the following tableau shows the selection of a different candidate when the vowel is lexically marked, as it is for the noun /ka:ɫɪb+a/:

marked vowel /ka:tɪb+a/ writer + f. “writer”	MAX [MARKED VOWEL]	*V:CC	*V [+high] IN LIGHT σ	DEP [V: IN HEAD]	*V:	STRESS INITIAL	DEP[V:]
[kàt.ba]	!			*			*
كاتب [ka.tí.ba]			*			*	*
*[kaːtí.ba]			*		!*		
*[kàːtí.ba]			*		!*		
*[káːtí.ba]			*		!*		
[káːt.ba]	!	*			*		

Lexical Marking For Stress

Three classes of words which can be marked with lexical stress are:

1. The subject marker /-it/.

[ka.lí.tu]
/kal+ít+uh/
ate+3f.+3m.
“she ate it”

[xa.dí.tak]
/xad+ít+ak/
took+3f.+2m.
“she took you”

The historical reason for this stress is that in Classical Arabic the only suffixes which could follow this subject marker, namely object pronouns, were all consonant-initial, rendering the suffix containing the subject marker heavy and hence stressed:

[târ.ʒa.mát.hu]
/tarʒam+at+hu/
translated+3f.+3m.
“she translated it” *Cl.*

[ʔâr.sa.lát.ka]
/ʔârsal+at+ka/
sent+3f.+2m.
“she sent you” *Cl.*

2. The plural patterns CiCíCa and CuCúCa.

[ʔu.sú.da]
/ʔusúda/
“lions”

[ħi.zí.ma]
/ħizíma/
“belts”

These patterns derive from a Classical plural pattern exhibiting penultimate stress due to a heavy antepenultimate:

[ʔàh.zí.ma]
/ʔahzima/
“belts” *Cl.*

3. A few borrowings as pronounced by some speakers.

[ti.rí.ning]	[tí.liks]
/tiríning/	/tíliks/
“training suit”	“telex”

Except in the case of the subject marker /-ít/, vowels lexically marked for stress always appear as stressed in the citation form of the word. However, the relevant syllable may become stressless when suffixes are added. This unstressed light syllable is not subject to high vowel deletion:

[hì.zí.ma]	[ʔu.sú.da]
/hizíma/	/ʔusúda/
“belts”	“lions”
[hì.zi.mít.na]	[ʔù.su.dít.hum]
/hizímit+na/	/ʔusúdit+hum/
belts (<i>constr.</i>)+our	lions (<i>constr.</i>)+their
“our belts”	“their lions”

This resilience to high vowel deletion could be explained by saying that any vowel marked for lexical stress is also marked against high vowel deletion. However, a constraint already attested in other languages, namely HEAD-MAX(B/O) will achieve the same result:

HEAD-MAX(B/O)²²

Every segment in the base prosodic head has a correspondent in the output. (McCarthy 1995 and Alderete 1995)

²²This constraint is needed elsewhere to prevent high vowel deletion across word boundaries in items which are not marked for stress (data from Kenstowicz, 1980):

[ʔí.na.ba]	[ʔi.náb.tu]	[wi ʔi.náb.tu], not *[wi ʔ.náb.tu]
/ʔinaba/	/ʔinabit+uh/	/wi ʔinabit+uh/
“grape”	“his grape”	“and his grape”

High vowel deletion is the norm when the relevant syllable is not the prosodic head in the base:

[mu.ʔám.mad]	[wi m.ʔám.mad]
“Muhammad”	“and Muhammad”

To account for the non-initial stress in a form such as [hí.zí.ma], a constraint DEP[STRESS] needs to be invoked:

DEP[STRESS]

A vowel stressed in the lexicon (and hence in the underlying representation) is also stressed in the output.

This constraint dominates STRESS INITIAL:

/kal+ít+uh/ ate+3f.+him “she ate it”	DEP[STRESS]	STRESS INITIAL
☞ [ka.lí.tu]		!*
[ká.li.tu]	!	

/hízíma/ “belts”	DEP[STRESS]	STRESS INITIAL
☞ [hí.zí.ma]		!*
[hí.zi.ma]	!	

For the first two categories of words marked for stress (the subject marker /-ít/ and the two plural patterns), DEP[STRESS] is dominated by STRESS HEAVY, and hence necessarily also by STRESS SUPERHEAVY:

/ma kal+ít+uh+f/ neg. ate+3f.+him+neg. “she didn’t eat it”	STRESS SUPERHEAVY	STRESS HEAVY	DEP[STRESS]
☞ [ma kà.li.túːf]			*
[mà ka.lí.tuːf]	!	*	

/hízímit+na/ belts (constr.)+our “our belts”	STRESS SUPERHEAVY	STRESS HEAVY	DEP[STRESS]
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☞[ħi.zi.mít.na]			*
[ħi.zí.mit.na]		!	

The third category of lexically stressed words, namely certain foreign borrowings, needs separate treatment, since in these forms DEP[STRESS] dominates STRESS SUPERHEAVY, as is obvious even in the citation forms.²³ This can be treated by a constraint DEP[STRESS IN BORROWING].²⁴

DEP[STRESS IN BORROWING]

A vowel stressed in the underlying representation of a borrowing is also stressed in the output.

/tí.liks/ “telex”	DEP [STRESS IN BORROWING]	STRESS SUPERHEAVY	STRESS HEAVY	DEP[STRESS]
☞[tí.liks]		*	*	
[ti.líks]	!			*

Conclusions and Questions for Further Research

This paper has shown that, even in an analysis of a system as complex as that of Cairene Arabic, it is possible to dispense entirely with the concept of the foot, a sacrifice made by using constraints on the more basic entities of moras and syllables. This analysis accurately accounts

²³Unfortunately, we cannot know how lexical stress fares in longer forms such as /tíliks+ina/ ?[tì.lik.sí.na], ?[ti.lík.si.na] “our telex”, since pronoun suffixes are not added to borrowings such as these.

²⁴Rather than instantiating a separate constraint for borrowed words, differential treatment of lexical stress can also be thought of in terms of free ranking. In words of Arabic origin DEP[STRESS] is outranked by STRESS HEAVY, while for borrowings DEP[STRESS] outranks STRESS SUPERHEAVY. A similar approach could have also been taken for MAX[VOWEL] and *V [+high] in light syllable, rather than invoking MAX[MARKED VOWEL]. Separate constraints were adopted here for ease of exposition.

for the stress patterns of regularized Classical Arabic²⁵ as well as colloquial Cairene. However, the much larger task still remains of finding a satisfactory way of accounting for the free variation observed in Classical Arabic as pronounced by the average native speaker of the Cairene dialect. The following are typical examples of such variation:

<u>Underlying Representaiton</u>	<u>Regularized Stress</u>	<u>Variation</u>
/ʃagarat+un/ “a tree”	[ʃà.ga.rá.tun] [ʃ́]σ[ʃ́]σ[ʃ́]σ[ʃ́]σ	[ʃá.ga.ra.tun] [ʃ́]σ[ʃ́]σ[ʃ́]σ[ʃ́]σ
/ʔadwiyat+u+hum/ “their medicines”	[ʔà.d.wì.ya.tú.hum] [ʔ́]σ[ʔ́]σ[ʔ́]σ[ʔ́]σ[ʔ́]σ	[ʔá.d.wi.yá.tu.hum] [ʔ́]σ[ʔ́]σ[ʔ́]σ[ʔ́]σ[ʔ́]σ
/ʃagarat+u+humaː/ “a tree”	[ʃà.ga.rà.tu.hú.maː] [ʃ́]σ[ʃ́]σ[ʃ́]σ[ʃ́]σ[ʃ́]σ	[ʃá.ga.ra.tú.hu.maː] [ʃ́]σ[ʃ́]σ[ʃ́]σ[ʃ́]σ[ʃ́]σ

Among the possible explanations for such variation an analysis could pursue are:

1. Analogy to colloquial forms or Classical pause forms, when the token is stressed identically with or without suffixes which are absent in the colloquial language, e.g. /ʃagarat+un/ [ʃà.ga.ra(h)] (pause form) and [ʃá.ga.ra.tun] (contextual form) “tree”, where /-un/ is a nominative case marker absent in colloquial Cairene.
2. Analogy between Classical forms similar to each other with regards to the suffixations but with different numbers of prepenultimate light syllables. In other words, a form such as [ʃagarat+u+humaː] may be stressed as [ʃá.ga.ra.tú.hu.maː] on analogy with another word with the suffixes /-u+humaː/ such as [ʔà.d.wì.ya.tú.hu.maː] “their (*dual*) medicines”.

The question of secondary stresses must also be pursued. Perhaps it is the weak nature of these stresses that “confuses” the speaker when there is a long string of light syllables. Since much longer strings of light syllables are permitted in Classical Arabic than in colloquial Cairene, it may be that the speaker gives up trying to count off alternating unstressed and barely stressed

²⁵With a higher ranking of MAX[VOWEL LENGTH] to account for realization of almost all underlying long vowels.

syllables and instead attempts to place the stress with reference to the right edge of the word rather than the left edge. An finally, the possibility should be explored as to whether speakers at times produce an unexpected stress in a conscious attempt to accentuate the difference between colloquial and Classical pronunciation, in essence, a form of hypercorrection. Such a study would ideally address the question of relative frequency of occurrence of the various stress patterns and speaker attitudes towards them.

Outside the field of phonology, there are three issues which have direct bearing on the line of reasoning followed in this paper but which are the proper domain of the phonetician:

1. The current analysis has taken the position that word-final long vowels in colloquial forms, such as [ka.ba.re:] “cabaret” are the result of the deletion of an underlying /h/, i.e. /kabare:h/. It should be ascertained whether these underlying /h/s are ever actually pronounced. The findings of such a study would strengthen or weaken this analysis. It would also be helpful to know whether a final [h] is ever present in borrowings ending in the short vowel [u] such as /radyu/ “radio” and /istudyu/ “studio”.
2. It must also be ascertained whether the long vowel in forms such as /ʃa:lám+i/ [ʃa.lá.mi] “international” is actually shortened to the same length as an underlying short vowel. In the present analysis, the selection of [ʃa.lá.mi] is the result of highly ranked DEP[VOWEL LENGTH IN HEAD] and *LONG VOWEL, but if it were found that a shortened long vowel is actually pronounced somewhat longer than an underlying short vowel, candidate selection would be the function of the familiar *LAPSE and *CLASH.
3. Secondary stresses in both casual and careful speech must be measured, not only because our analysis depends so heavily on *LAPSE and *CLASH, but also because the weakness, or even absence, of such secondary stresses may play an important role in variant stress patterns in the Cairene pronunciation of Classical Arabic.

Bibliography

- Alderete, John (1995), *Faithfulness to Prosodic Heads*. Ms., University of Massachusetts, Amherst. (Paper presented at Tilburg Conference on *The Derivational Residue in Phonology*.)
- Badawi, El-Said and Martin Hinds (1986), *A Dictionary of Egyptian Arabic*, Librairie du Liban.
- Broselow, Ellen (1976?), *The Phonology of Egyptian Arabic*, Amherst, Mass.: Graduate Linguistics Student Association.
- Hayes, Bruce (1995), *Metrical Stress Theory: Principles and Case Studies*, Chicago: University of Chicago Press, 1995.
- Kager, René (1993), “Alternatives to the Iambic-Trochaic Law”, *Natural Language and Linguistic Theory* 11, 381-432.
- Kager, René (1996), “Surface Opacity of Metrical Structure in Optimality Theory” prefinal, unpublished version, 1996. To appear in B. Hearnans and M. van Oostendorp (eds.) *The Derivational Residue in Phonology*.
- Kenstowicz, Paul (1980), “Notes on Cairene Arabic Syncope”, *Studies in the Linguistic Sciences* vol. 10, number 2, 39-53.
- Kenstowicz, Paul (1993), *Phonology in Generative Grammar*, Cambridge, Mass.: Blackwell.
- McCarthy, John (1979), “On Stress and Syllabification”, *Linguistic Inquiry* 10, 443-65.
- McCarthy, John (1995), *Extensions of Faithfulness: Rotuman Revisited*. Ms., University of Massachusetts, Amherst.
- Mitchell, T. F., “Prominence and Syllabification in Arabic”, in *Bulletin of the School of Oriental and African Studies* 23: 369-89.
- Prince, Alan and Paul Smolensky (1993), *Optimality Theory*. Ms., Rutgers University.

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