INTERACTION OF WEIGHT EFFECTS WITH EXTRAMETRICALITY IN CAIRENE ARABIC: A CONSTRAINT-BASED ANALYSIS

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Received on August 5, 2007  Accepted on June 8, 2008

Abstract
The present paper is coached within the framework of Optimality Theory (Prince and Smolensky, 1993; McCarthy and Prince, 1993a, b) to show that intrinsic prominence of the syllable is not a determining factor in stress placement in Cairene Arabic (Mitchell 1960; McCarthy, 1979b; Kenstowics, 1994: 551). The argument hinges on the assumption that Prince and Smolensky’s (1993) PK=PROM and WSP, the two constraints responsible for the intrinsic prominence of syllables, are low-ranking in Cairene Arabic. That is, violation of one or both constraints never results in incorrect stress pattern(s). The stressing of a final superheavy syllable (and/or the stressing of a heavy penult), it is argued, is, like the stressing of a light syllable, an effect of parsability, not intrinsic prominence of the syllable, suggesting that Cairene Arabic is not, then, a prominence-driven stress system. In order to show this, it is argued that PARSEσ is relativized to syllable weight, i.e., whereas a final light and a final heavy syllable are invisible to parsing, a final superheavy syllable is not.

Keywords: Optimality theory, intrinsic prominence, Cairene Arabic, stress, PARSEσ, WSP.
Introduction

0.1 When accounting for how superheavy (σμμμ) and heavy (σμμ) syllables, in contrast to light (σμ) syllables, receive word main stress in Cairene Arabic, we argue that the intrinsic prominence of the syllable becomes irrelevant. The only determining factor, we hypothesize, is parsability. From an optimality-theoretic (hereafter OT) point of view, what this basically means is that Peak-Prominence (hereafter PK-PROM) and the Weight-to-Stress Principle (hereafter WSP) are low-ranking in Cairene Arabic. A unifying account for all Cairene Arabic stress patterns can be achieved by re-provoking the notion of extrametricality (McCarthy, 1979b; Hayes, 1982, 1995; Hammond, 1999; inter alia) or its OT successor NONFINALITY (Prince and Smolensky, 1993; Hyde, 2003).

The present treatment makes at least two significant departures. First, unlike previous research (Cf. Prince and Smolensky, 1993; and Hyde, 2003), NONFINALITY is intended to literally duplicate extrametricality effects, i.e., “achieving descriptive invisibility.” However, it is worth noting that we here advance the claim that extrametricality can be constrained to syllable extrametricality, thus eliminating consonant and foot extrametricality. Second, we present evidence from Cairene Arabic for factoring out violable constraints such as NONFINAL, PARSEσ and WSP. The rationale for parameterizing metrical constraints like these is that parsing a syllable increases as the weight of the syllable increases, and thus devising a set of parse constraints that are moraic-sensitive. The present study shows how these two assumptions are motivated on empirical grounds.

Discussion

1.1 Prince and Smolensky (1993: 42) assert that NONFINALITY is slightly different from extrametricality in that its focus is stress peaks. As a result, NONFINAL, the OT successor of extrametricality, is formulated along the following lines:

(1) NONFINAL The prosodic head of the word does not fall on the word-final syllable.

Hyde (2003: 1) makes a further slight departure as far as the formulation of NONFINAL is concerned in that the grid marks, not prosodic heads, represent stress, and thus the formulation of NONFINAL is slightly altered:

(2) NONFINAL No PCat1-level gridmark occurs over the final Cat of a PCat2.

Accordingly, Hyde (2003: 2) reproduces foot, syllable and consonant extrametricality as follows:

(3) a. \( \omega \)NonFinal (F, \( \omega \))
   No prosodic word-level gridmark occurs over the final foot of a prosodic word

b. FNonFinal (σ, \( \omega \))
   No foot-level gridmark occurs over the final syllable of a prosodic word
No mora-level gridmark occurs over the final consonant of a prosodic word. Within the framework of this paper, however, a big departure is made. Unlike Prince and Smolensky’s (1993), Crowhurst’s (1996), and Hyde’s (2003) formulations, NONFINAL is intended to be, to use Prince and Smolensky’s (1993: 42) words, “a general mechanism for achieving descriptive invisibility”, i.e. to focus on the parsability of the final segment (be it the final foot, syllable or mora); and thus a new formulation of NONFINAL is put forward:

(4) NONFINAL (F, σ, μ) The final (foot, syllable, or mora) is not parsed into a higher prosodic structure

This basically means that the current formulation of NONFINAL literally duplicates Hayes’ (1995) linear formulations of foot, syllable, and consonant extrametricality:

(5) a. Foot extrametricality $F \rightarrow <F> / \underline{\_\_\_\_\_\_} \ ] \ \text{word}$

b. Syllable extrametricality $\sigma \rightarrow <\sigma> / \underline{\_\_\_\_\_\_} \ ] \ \text{word}$

c. Consonant extrametricality $C \rightarrow <C> / \underline{\_\_\_\_\_\_} \ ] \ \text{word}$

2.1 Extrametricality in Cairene Arabic

The proposal we put forward here is that there is only syllable extrametricality in Cairene Arabic. This is achieved by decomposing PARSE-$\sigma$ into mora-sensitive constraints, i.e., the pressure to parse a syllable increases as its weight increases. This proposal is, we believe, superior to previous treatments, especially when accounting for final weight effects (Halle & Vergnaud, 1987a; Hayes, 1979, 1982, 1991, 1995; McCarthy, 1979a, 1979b; Hung, 1993, 1994; Crowhurst, 1996). To illustrate, Hayes (1991: 47) proposes that extrametricality “designates a particular constituent as invisible for the purposes of creating metrical structure.” And one of the restrictions on extrametricality is constituency in that “only constituents (e.g., segment, mora, syllable, foot, phonological word) may be marked as extrametrical” (Hayes, 1991: 47). Compared with the more traditional approach that assumes final consonant extrametricality (see McCarthy, 1979a, b; Ito 1986, 1989; Borowsky, 1986b; Halle and Vergnaud, 1987a; Hung, 1993)\(^3\), the proposed analysis advances the claim that it is always the final syllable that should be considered extrametrical\(^4\). Hence, PASRE- SYLL is decomposed into a family of constraints differing in the weight of the syllable to which they apply, and thus eliminating (once and for all) consonant and foot extrametricality. The underlying assumption is that parsing a three-mora syllable, for example, is sanctioned by a sub-constraint which does not sanction a two-mora syllable, and so on. We will shortly show how this analysis, on the one hand, accounts for the final weight demotion effects of Cairene Arabic, i.e., the stresslessness of heavy syllables ($\sigma\mu\mu\mu$) in final position (Cf. McCarthy, 1979b; Al-Mozainy et. al., 1985; Hayes, 1995), and how it still accounts for the prominence of superheavy syllables ($\sigma\mu\mu\mu\mu$) in that same position, on the other.
Another big advantage why we choose constrain extrametricality to syllable extrametricality over the more traditional consonant extrametricality, for example, is the widely accepted notion of syllable integrity (Prince, 1976; Prince and Smolensky, 1993; Blevins, 1995; Hayes, 1995; Crowhurst, 1996). Following Prince and Smolensky (1993: 28) and Hayes (1995: 49), for example, we assume that syllable integrity is, at least for purposes of stress assignment, inviolable. Hence, for stress languages like Arabic, “the stress-bearing unit is the syllable” (Hayes, 1995: 49). Feet boundaries do not then fall within syllables, thereby disallowing feet to be constructed over sub-syllabic units.

Be that as it may, the constraint that duplicates syllable extrametricality is then high ranking in Cairene Arabic. (5b) above is reproduced in OT terms as (6) below:

(6) NONFINAL (σ) The final syllable is not parsed into a higher prosodic constituent

2.2 Weight in Cairene Arabic

By applying the Weight by Position rule (Hayes, 1989: 258) or its OT equivalent Coda/μ (Hyde, 2003: 8), Cairene Arabic then recognizes three degrees of intrinsic prominence: light (μ), heavy (μμ) and superheavy (μμμ), resulting in a heaviness scale similar to that suggested by Prince and Smolensky (1993: 41) for Hindi:

(7) |μμμ| > |μμ| > |μ|

The moraic structure of Cairene Arabic, however, spells out that superheavy syllables are only realized in final position; meanwhile, light and heavy syllables surface unstressed in that position. Consider:

(8) a. Final stressed |μμμ| μu.dar.ri.saat (female teachers)
    b. Final unstressed |μμ| μu.Ta.la.ʔah (a divorcée)
    c. Final unstressed |μ| Mus.Ta.fa (proper name)

    Noteworthy here is the fact that stress does not surface on a heavy ultimate (9a) or a heavy antepenultimate syllable (9c). Stressing a heavy syllable is only possible in penultimate position (9b):

(9) a. unstressed final |μμ| ka.ta.ba.taa (they both wrote)
    b. stressed penult |μμ| mak.tuu.bun (a letter)
    c. unstressed antepenult |μμ| Mus.Ta.fa (proper name)

    It is, however, interesting to note that a light syllable surfaces stressed in penult and antepenult positions. Consider:

(10) a. stressed penult |μ| ka.ta.ba.taa (they both wrote)
    b. stressed antepenult |μ| raa.kα.Dα (he ran)

    Inside the tri-syllabic window, word stress may surface on a light penult (11a) below or light antepenult (11b) even if an adjacent heavy syllable is present:

(11) a. mu.Ta.la.ʔah (a divorcée)
    b. mus.tα?.ma.ra.tun (a territory)
Finally, a syllable outside the tri-syllabic window is never stressed irrespective of its intrinsic prominence:

(12) a. mad.ra.sa.tu.hu (his school)
    b. mak.ta.ba.tun (a library)

Hung (1993: 2) asserts that “…in all dialects of Arabic CVC is heavy everywhere except at the end of the word.” However, (11-12) above show that a heavy syllable may surface unstressed even in nonfinal position. These stress patterns above all bring about the first piece of evidence for the suggestion that Cairene Arabic is not a prominence-driven stress system. Under OT, this can be accounted for straightforwardly by hypothesizing that PK=PROM and WSP, the two constraints responsible for the intrinsic prominence of syllables, are low ranking. The crucial factor in stress placement, we hypothesize, is parsability. In the next sub-sections we show how stress assignment in Cairene Arabic is very much determined by the parsability of syllables. In terms of constraint ranking, parse constraints (e.g. PARSE-\(\sigma\), NONFINAL, MAIN-RIGHT, FOOT-BINARITY,…etc.) dominate weight constraints (namely PK=PROM and WSP) in Cairene Arabic.

3. Constraint Ranking

In the foregoing discussion, we have seen that a heavy syllable (\(\sigma\mu\mu\)) is only stressed in penultimate position. When a heavy syllable is not in a penultimate position, stress goes to an adjacent light syllable, incurring a violation of PK-PROM (Prince and Smolensky, 1993: 39):

(13) Peak-Prominence (PK-PROM)
    Peak (x) > Peak (y) if |x| > |y|

A basic premise of OT is that the constraint violated by the optimal form must be demoted to a lower position. There are stress patterns in Cairene Arabic that provide unequivocal evidence as to the demotion of PK-PROM. For example, although the intrinsic prominence of the ultimate syllable and the intrinsic prominence of the antepenult syllable of (14) below are greater than the intrinsic prominence of the penultimate syllable, stress goes to the penult, violating PK-PROM.

(14) a. ?iT.Ti.tuh (his cat)

Tableau (1)

<table>
<thead>
<tr>
<th>Input: /qiT.Ta.tuh/</th>
<th>PK-PROM</th>
</tr>
</thead>
<tbody>
<tr>
<td>a- ?iTTituh</td>
<td>L</td>
</tr>
<tr>
<td>b- !(\Rightarrow)?iTTituh</td>
<td>H</td>
</tr>
<tr>
<td>c. !(\Rightarrow)?iTTituh</td>
<td>H</td>
</tr>
</tbody>
</table>

Tableau (1) above, then, shows that although candidates (b) and (c) best candidate (a) on PK-PROM, they both fail to be the actual output form. On the contrary, it is candidate (a), the violator of PK-PROM, which wins the competition.
Tableau (1) above then raises an interesting inquiry: Why does stress terminate on a less intrinsically prominent syllable?

Before attempting an answer to this question, there is another point that is worth mentioning here. That is, PK-PROM is violated if a less intrinsically prominent syllable surfaces stressed, but it says nothing about the stresslessness of a heavy syllable (candidates b and c above). The constraint that is violated when a heavy syllable surfaces unstressed is the Weight-to-Stress Principle (WSP). Prince and Smolensky (1993: 56) formulate it along the following lines:

\[(15)\quad \text{WSP} \quad \text{Heavy syllables are prominent in foot structure and on the grid. The difference between PK=PROM and WSP is that PK=PROM is violated if a light syllable surfaces stressed, but WSP is violated if a heavy syllable surfaces unstressed. “?iT.Ti.tuh”, then, incurs one violation of PK=PROM, but two violations of WSP.}\]

To account for why candidates b and c above fail to win the competition, we need to do two things. First, we re-invoke NONFINAL as a constraint spelling out the parsability of the final syllable so as to account for how the final heavy syllable of “?iT.Ti.tuh” surfaces unstressed (candidate b). And second, we posit that WSP (the constraint responsible for the intrinsic prominence of the syllable) be low-ranking so as to account for how the heavy antepenult (candidate c) surfaces unstressed, too. Tableau (2) below shows that the candidate form which violates WSP most (candidate a) wins the competition:

**Tableau (2)**

<table>
<thead>
<tr>
<th>Input: ?iT.Ti.tuh/</th>
<th>WSP</th>
<th>PK=PROM</th>
</tr>
</thead>
<tbody>
<tr>
<td>a- ?iTTituh &amp; L <strong>asters</strong></td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>b- ?iTTituh * H</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>c. ?iTTituh * H</td>
<td>1.6</td>
<td></td>
</tr>
</tbody>
</table>

The actual output form “?iT.Ti.tuh”, then, incurs one violation of PK=PROM and two violations of WSP. To reiterate, although candidate (a) is the worst violator of WSP and PK-PROM, it turns out to be the actual output form. The question is then: how does a light syllable surface stressed when sandwiched by intrinsically more prominent syllables? A constraint-based analysis proposes that the constraints violated by the actual output form (namely WSP and PK-PROM) be low-ranking. Tableau (2) above then shows that the stresslessness of a heavy syllable in ultimate and antepenultimate position is one piece of evidence for demoting WSP and PK=PROM to a lower position.

However, two problems are still in order. These are: (1) stressing a heavy syllable in penultimate position, and (2) stressing a superheavy syllable in final position. The inquiry is as follows: If PK=PROM and WSP are low-ranking in Cairene Arabic, how can the stressing of a heavy syllable in penultimate position and the
stressing of a superheavy syllable in final position be accounted for? In the next two sub-sections, we demonstrate how this is possible.

3.1 Stressing a heavy penultimate syllable

The stressing of a heavy syllable in penultimate position is, we argue, due to parsability, too. The interaction of parse constraints such as PARSE-σ, MAIN-RIGHT, TROCHAIC, FOOT-BINARITYμ and NONFINAL yields the correct stress pattern. Consider how the interaction of these violable constraints yield the correct stress pattern for ‘ma.ka.tii.bun’, for example.

Tableau (3)

<table>
<thead>
<tr>
<th>Input: /ma.ka.tii.bun/ (written correspondences)</th>
<th>MR</th>
<th>NF-μ</th>
<th>P-σ</th>
<th>FB-μ</th>
</tr>
</thead>
<tbody>
<tr>
<td>a- ⊥ (maka)(tii)bun</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b- (ma)(katii)bun</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c- (maka)tiibun</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>d- (maka)(tii)(bun)</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e- (maka)(tii)bun</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Accordingly, candidate (a) is the actual output form because it incurs the least number of violations. What is interesting to note is that stress terminates on the heavy penult of /ma.ka.tii.bun/ as a result of the interaction of a set of parse constraints that are all mora-sensitive. In other words, the stressing of a heavy penult can be accounted for without the need to allude to its intrinsic prominence. In terms of constraint ranking, PK-PROM and WSP need not be brought into play; hence they are low-ranking, i.e., their violation never results in incorrect stress pattern. All in all, the penult of /ma.ka.tii.bun/ surfaces stressed not so much because it is intrinsically more prominent than all adjacent syllables, but because it is the optimal parse derived by the interaction of mora-sensitive parse constraints.

3.2 Stressing a final superheavy syllable

Previous treatments of stressing superheavy ultimas in Cairene Arabic have been proposed. For example, Crowhurst (1996: 416), following McCarthy (1979a), argues for treating final Cs in superheavy ultimas as degenerate feet - a repair mechanism to avoid violating NONFINAL. However, following the line of thought set forth in the pervious sections, our inquiry concerns the prominence of final superheavy syllables when WSP and PK=PRISM are low-ranking. It may seem prima facie that the stressing of a superheavy syllable is largely due to its intrinsic prominence. Our uniform analysis will shortly show that this can be considered an effect of parsability, too. The novel insight is that the pressure to parse a syllable increases as the weight of the syllable increases. Parsing a syllable, irrespective of its position, is largely
determined by its weight: the heavier the syllable is, the more likely it gets parsed. A
natural deduction of this line of reasoning is that a parse constraint can be
parameterized; hence, the requirement to parse a superheavy syllable($\sigma_{\mu\mu\mu}$), for
example, will be more compelling than the requirement to parse a heavy syllable($\sigma_{\mu\mu}$),
and so on.

Having this in mind, we propose that there can at least be two alternative
analyses to account for how superheavy syllables, in contrast to light and heavy
syllables, surface stressed in final position. The first analysis calls for splitting the
WSP, that is, to assume that NONFINAL outranks a constraint that requires light and
heavy syllables to surface stressed, but is outranked by another constraint that
requires superheavy syllables to receive main word-stress. The second alternative is to
split PARSE$\sigma$, i.e., to assume that whereas a final light and a final heavy syllable are
invisible to parsing, a superheavy syllable is not. In the next two sub-sections, we
demonstrate how each analysis handles the subject matter. However, despite the fact
that they are prima facie equally competitive analyses, we argue that, for the purpose
of advancing a uniform analysis for all Cairene Arabic stress patterns, the best analysis
is the one which can make do without the need to bring into play WSP and PK=PROM.

3.2.1 Splitting WSP: WSP is originally put forward to account for the intrinsic
prominence of heavy syllables (Cf. Prince 1983, 1990; Prince and Smolensky,
1993; McCarthy and Prince, 1993a, b). In this paper, we adopt the following
formulation of WSP:

\begin{equation}
\text{(16) WSP heavy syllables are prominent in foot structure and on the grid. Following}
\text{the insight of Prince and Smolensky (1993: 41), we prefer to consider the weight}
\text{of the syllable on a scale rather than merely a two-way contrast. In current}
\text{terms, WSP is then a mora-sensitive constraint. As a universal tendency, the}
\text{heavier the syllable is (in terms of mora count), the more likely it is to surface}
\text{stressed (see Kager, 1999: 155). Arabic, for instance, involves a three-way}
\text{contrast as far as syllable weight is concerned (See Mitchell, 1960; Langendoen,
1968; Brame, 1971, 1973, 1964; McCarthy, 1979b). In OT terms, this means}
\text{that there are at least these three violable weight constraints: WSP($\sigma_{\mu\mu\mu}$),}
\text{WSP($\sigma_{\mu\mu}$), and WSP($\sigma_{\mu}$), which are universally ranked as in (18) below:}
\end{equation}

\begin{equation}
\text{(17) WSP($\sigma_{\mu\mu\mu}$) >> WSP($\sigma_{\mu\mu}$) >> WSP($\sigma_{\mu}$)}
\end{equation}

However, in final position, Arabic only acknowledges the contrast between light
and heavy syllables on the one hand, and superheavy syllables on the other.\textsuperscript{16} This is
substantiated by the fact that only superheavy syllables surface stressed in that
position. Such being the case, (17) above can be encapsulated as (18) below:
For stress placement purposes, crucial here is the ranking of these two constraints relative to NONFINAL. In order for superheavy syllables to receive word main stress, \( \text{WSP}_{\mu \mu} \) must outrank NONFINAL, which in turn must outrank \( \text{WSP}_{\leq \mu \mu} \).

(19) \( \text{WSP}_{\mu \mu} \gg \text{NONFINAL} \gg \text{WSP}_{\leq \mu \mu} \)

Given this ranking, consider how a light and a heavy syllable surface stressless in final position, but a final superheavy syllable surfaces stressed:

**Tableau (4):** stresslessness of a final light syllable

<table>
<thead>
<tr>
<th>Input: /ka.ta.ba/</th>
<th>( \text{WSP}_{\mu \mu} )</th>
<th>NF</th>
<th>( \text{WSP}_{\leq \mu \mu} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>a-( \varepsilon ) (kata)ba</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b- (kata)(ba)</td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>

**Tableau (5):** stresslessness of a final heavy syllable

<table>
<thead>
<tr>
<th>Input: /šagarah/</th>
<th>( \text{WSP}_{\mu \mu} )</th>
<th>NF</th>
<th>( \text{WSP}_{\leq \mu \mu} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>a-( \varepsilon ) (šaga)rah</td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>b- (šaga)(rah)</td>
<td></td>
<td>*!</td>
<td>*</td>
</tr>
</tbody>
</table>

**Tableau (6):** stressing a final superheavy syllable

<table>
<thead>
<tr>
<th>Input: /šajaraat/</th>
<th>( \text{WSP}_{\mu \mu} )</th>
<th>NF</th>
<th>( \text{WSP}_{\leq \mu \mu} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>a-( \varepsilon ) (šaga)(raat)</td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>
| b- (šaga)raat | | *! | *

3.2.2 Splitting PARSE\( \sigma \)

The alternative analysis is to assume that it is PARSE\( \sigma \) which applies distinctively (with NONFINAL\( \sigma \) being interleaved), resulting in the following three violable constraints as in (20) below:

(20) (a) PARSE\( \sigma_{\mu \mu \mu} \) a syllable that weighs three moras must be parsed into a higher prosodic constituent

(b) PARSE\( \sigma_{\mu \mu} \) a syllable that weighs two moras must be parsed into a higher prosodic constituent

(c) PARSE\( \sigma_{\mu} \) a syllable that weighs one mora must be parsed into a higher prosodic constituent

Again, since light and heavy syllables pair up together in final position, the distinction holds between light and heavy syllables on the one hand, and superheavy syllables on the other. (20) above can then be encapsulated as (21) below:

(21) (a) PARSE\( >_{\mu \mu} \) a syllable that weighs more than two moras must be parsed into a higher prosodic constituent
b) \( \text{PARSE}_{\leq \mu} \) a syllable that weighs two moras or less must be parsed into a higher prosodic constituent.

The ranking of these two constraints relative to NONFINAL, we claim, yields the correct output forms. A final light and a final heavy syllable escape footing altogether because NONFINAL outranks \( \text{PARSE}_{\leq \mu} \):

\[(22) \quad \text{NONFINAL} \gg \text{PARSE}_{\leq \mu} : \]

**Tableau (10):** stresslessness of a final light syllable

<table>
<thead>
<tr>
<th>Input: /kataba/</th>
<th>NF</th>
<th>( \text{P}_{\leq \mu} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>a- ( \text{kata} )ba</td>
<td>*</td>
<td>!</td>
</tr>
<tr>
<td>b- ( \text{kata} )(ba)</td>
<td>*</td>
<td>!</td>
</tr>
</tbody>
</table>

**Tableau (11):** stresslessness of a final heavy syllable

<table>
<thead>
<tr>
<th>Input: /šagarah/</th>
<th>NF</th>
<th>( \text{P}_{\leq \mu} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>a- ( \text{šaga} )rah</td>
<td>*</td>
<td>!</td>
</tr>
<tr>
<td>b- ( \text{šaga} )(rah)</td>
<td>*</td>
<td>!</td>
</tr>
</tbody>
</table>

On the other hand, a final superheavy syllable surfaces stressed by having the parsing constraint \( \text{PARSE}_{> \mu} \) outrank the anti-parsing constraint NONFINAL:

\[(23) \quad \text{PARSE}_{> \mu} \gg \text{NONFINAL} : \]

In /\text{ša.ja.raat}/, for example, the final superheavy syllable (due to the fact that \( \text{PARSE}_{> \mu} \) outranks NONFINAL) gets parsed; and thus, it is the word main stress carrier.

**Tableau (12):** stressing a final superheavy syllable

<table>
<thead>
<tr>
<th>Input: /ša.ga.raat/</th>
<th>( \text{P}_{&gt; \mu} )</th>
<th>NF</th>
</tr>
</thead>
<tbody>
<tr>
<td>a- ( \text{šaga} )(raat)</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b- ( \text{šaga} )naat</td>
<td>!</td>
<td></td>
</tr>
</tbody>
</table>

(22) and (23) above can be encapsulated as (24) below:

\[(24) \quad \text{PARSE}_{> \mu} \gg \text{NONFINAL} \gg \text{PARSE}_{\leq \mu} : \]

We conclude then that the constraint ranking in (24) above is an alternative analysis for the fact that only superheavy syllables surface stressed in final position in Cairene Arabic. We finally need to argue which analysis is preferable.

One piece of evidence that ties up with this claim comes from foot formation. Arabic, we claim, disallows asymmetric disyllabic feet. In OT terms, a constraint that militates against HL trochees is high-ranking in Cairene Arabic. What this basically means is that FOOT-BINARITY (Cf. Prince 1980, 1990; McCarthy and Prince 1986; Prince and Smolensky, 1993) is moraic-sensitive, too:

\[(25) \quad \text{FOOT-BINARITY}_\mu \text{ feet are binary under a moraic analysis} : \]
Feet are then optimally bimoraic. Syllables of varying weight do not then pair together to make up one single foot, making (LL) the best possible trochee. In addition, monosyllabic feet are, following Prince (1983) and Kager (1993a), inherent trochees, so we get (H). Such being the case, WSP is no longer needed. This is consistent with the asymmetry between directionality, headedness and weight first proposed by Halle (1991) in that parses insensitive to quantity tend to be moraic (i.e., left-headed). By contrast, WSP is definitely needed when FOOT-BINARITY is interpreted under a syllabic analysis, i.e., where the foot is constructed over two syllables of different weight, i.e., (LH) or (HL), and/or iambic parsing (for an illuminating discussion see Kenstowics, 1994: 587). In such cases, WSP must conspire with some alignment constraint (e.g., IAMBIC, TROCHAIC) to yield the correct stress patterns. For example, when WSP dominates FOOT-BINARITY\(\sigma\), a string like LH is footed as L(H) instead of (LH). Similarly, when WSP outranks TROCHAIC, (LH) bests (LH). This later case occurs in a trochaic stress system like that of English, for example. In a word like ‘agenda’, it turns out that stress goes to the heavy penult. Due to FOOT-BINARITY\(\sigma\) and NONFINAL\(\sigma\), /agenda/ is then parsed as (agen)<da>. If this parse were optimal, stress would, due to TROCHAIC, go to the antepenult. To avoid this unhappy conclusion, a constraint like WSP is badly needed. Either WSP is ranked higher than FOOT-BINARITY\(\sigma\) so that a(gen)<da> becomes a better parse than (agen)<da>; or WSP is ranked higher than TROCHAIC, so that (agen)<da> bests (agen)<da>. In Arabic, however, the need for WSP diminishes because there are no asymmetric disyllabic feet of the form (LH) or (HL). A heavy syllable, due to FOOT-BINARITY\(\mu\), makes up a foot by itself, and its prominence (or lack thereof) relates to how the remaining set of constraints conspire to yield the correct output form.

**Conclusion**

In Cairene Arabic, word stress surfaces on a light penult, a light antepenult, a heavy penult and a superheavy ultimate syllable. The last two stress patterns may suggest, prima facie, that Cairene Arabic be a prominence-driven stress system. In the foregoing discussion, we have shown that a uniform analysis of all Cairene Arabic stress patterns can be accounted for by positing that WSP and PK=PROM (the two constraints responsible for the intrinsic prominence of syllables) are low-ranking. In addition, we have presented evidence for parameterizing some standard metrical constraints, devising a set of violable parsing constraints that are all mora-sensitive. It turns out that the stressing of a heavy penult and/or the stressing of a superheavy ultimate, is, like the stressing of a light syllable, due to parsability. In other words, the stressing of a heavy syllable or a superheavy syllable falls out as a result of the interaction of a set of moraic-sensitive parse constraints, resulting in a unifying account for all Cairene Arabic word stress patterns. This proposal has enabled us to make do without WSP and PK=PROM. Two alternative analyses are suggested to show how superheavy syllables, in contrast to light and heavy syllables, surface stressed in final
position. Although both analyses seem plausible, the parse-based analysis, we argue, is at an advantage, as it backs up the claim that Cairene Arabic is not a prominence-driven stress system.

The proposed parse-based model proves, we believe, to be superior to the more traditional approach that assumes final consonant extrametricality. Decomposing PARSE-SYLLABLE into a family of constraints differing in the weight of the syllable to which they refer makes predictions that may extend beyond the Arabic data. First, an explicit prediction of the proposal is that mora extrametricality should not occur, i.e., no language should treat cvcc and cvv as heavy but treat cvc and cv as light. The analysis allows us to generalize that only the final syllable, irrespective of its quantity, is extrametrical. This seems to be a virtue of the proposed account. Another typological prediction is that there are languages that make a distinction between one and greater than one mora unlike Cairene Arabic which distinguishes between two and greater than two moras. Finish and Estonian, for example, stress odd-numbered syllables but only final odd-numbered syllables that are heavy (cvv or cvc) (for illuminating discussion see Hayes 1985, 1991 and Kager, 1992). More generally, it would predict the existence of languages (e.g. Koya) that stress all and only heavy syllables (see Kenstowics, 1994: 605-7). Third, the proposed parse-based proposal suggests a uniform analysis for a family of parsing (e.g., PARSE-Σ, FOOT-BINARITY) and anti-parsing (e.g. NONFINAL) that can all be mora-sensitive.

Endnotes

1 It should be made clear upfront that the examples used throughout are standard Arabic forms as produced by educated natives of Cairene Arabic. In other words, they show how natives of Cairene Arabic produce Standard Arabic stress patterns, and thus listing them in their H or L forms has no effect whatsoever on stress placement (for details on the subject matter, see Al-Jarrah, 2008). However, the important point to note is that all stress patterns exemplified above are based on Mitchell’s 1960 and 1975, where the assertion is made that Cairene is the lower variety of Arabic that has preserved many of the original stress patterns of Classical Arabic (for further details see McCarthy, 1979b based on Mitchell, 1975). Yet, for details about the differences, see McCarthy (1979b: 441, 446-7) and Welden (1980: 102).

2 Crowhurst (1996: 415) reproduces NONFINAL as:
   NON-FINALITY the final syllable of a PrWr is not stressed

3 For final consonant extrametricality see Prince (1980) for Estonian; and for final syllable extrametricality; see Hung (1994) for Aguaruna.

4 We assume here that an explicit prediction of the proposal is that mora extrametricality should not occur, i.e., no language should treat cvcc and cvv as heavy but treat cvc and cv as light. This seems to be a virtue of the proposed account.

5 For a counter argument, see Halle and Vergnaud (1987: 18) and Everett (1996).

6 An alternative suggestion is that NONFINAL be moraic-sensitive: it can then be split into sub-constraints differing in the weight of the syllables to which they apply. The splitting of NONFINAL goes like this:
a. FNonFinal (σ_{sipr.ū})
Hyde’s assumed formulation: No foot-level gridmark occurs over the final σ_{sipr} of a prosodic word
Present Formulation: The final σ_{sipr} must not be parsed into a higher prosodic constituent

b. FNonFinal (σ>_{sipr.ū})
Hyde’s assumed formulation: No foot-level gridmark occurs over the final σ>_{sipr} of a prosodic word
Present formulation: The final σ>_{sipr} must not be parsed into a higher prosodic constituent

The splitting of NONFINAL is triggered off by the fact that whereas final superheavy syllables surface stressed in Cairene Arabic, final heavy and light syllables do not. The splitting of NONFINAL is motivated cross-linguistically. Many languages provide evidence that, for stress placement purposes, light and heavy syllables pair up together in that they are, contrary to superheavy syllables, less likely to receive stress in final position (see Prince and Smolensky, 1993: 57 for discussion on Latin, for example). What we suggest here is that there are alternative accounts of the weight of final syllables proposed, one assuming a subdivision of Nonfinality into mora-sensitive constraints and the other decomposing Parse-syllable into mora-sensitive constraints. Although the proposed analyses may have typological ramifications, let us assume for the time being that they are empirically indistinguishable.

7 According to Hayes (1989: 258), the Weight by Position rule states that postvocalic consonants must be parsed as moraic. Kager (1999: 147) formulates the Weight by Position constraint as: “Coda consonants are moraic.” Hyde (2003: 8) reproduces the Weight by Position rule in OT terms as “Every coda consonant is associated with a mora”

8 As for stress, this is one of the fundamental differences between the standard (Classical) variety of Arabic and the non-standard (Colloquial) varieties

9 ṭ represents emphatic t (ʼt), and s represents emphatic s (ʼs).

10 Compared with other low varieties of Arabic such as Jordanian, Palestinian, Levantine, … etc., most native speakers of Arabic are probably aware how, for example, the proper name Mustafa is stress-wise produced by native speakers of Cairene Arabic. Whereas the penult is stressed in Cairene Arabic, the antepenult gets the privilege in almost all the other low varieties of Arabic, emphasizing the claim that Cairene Arabic has preserved many of the original stress patterns of Classical Arabic (see McCarthy, 1979b based on Mitchell, 1975).

11 An interesting observation is that the stressing of a light penult (especially when a preceding heavy antepenult is present) is undergoing a change in some Arabic dialects, e.g., Jordanian, Palestinian, Saudi Arabic. In those dialects, stress shifts to the preceding heavy syllable. So, Mustafa and mu?alimah, for example, are stressed on the antepenult (for more details see Al-Ghazo, 1987; Al-Sughayer, 1990; Abu-Abbas, 2003; Al-Mohanna, 2004). Other dialects, especially Egyptian Arabic, have not undergone the change yet. What this basically means is that those dialects which have undergone the change are moving to become more prominence-driven stress systems. In OT terms, WSP and PK=PROM are higher ranking in Jordanian, Palestinian, and Saudi Arabic, but are still low ranking in Classical and Cairene Arabic. However,
due to the complexities of the emerging stress patterns, we leave this issue open, pending future investigation.

12 Following Al-Jarrah (2002; 2008), these violable constraints are defined (with slight modifications) along the following lines:

- **PASRE-σ**: a syllable must be parsed into a higher prosodic structure,
  e.g. (kita)(Bu)hu >> (Kita)buhu

- **MAIN-RIGHT**: align the head-foot with the word, on the right edge,
  e.g. (ki)(Taab) >> (Kl)(taab)

- **FOOT-BINARITYμ**: feet are binary under a moraic analysis,
  e.g. (šaja)(RaTu)hu >> (ša)(ja)(ra)(Tu)hu
  e.g. (mas)(Ru)qah >> (Masru)qah

- **NONFINAL**: the final syllable should not be parsed into a higher ranked constraint, e.g., (kita)(Bu)hum >> (kita)(bu)(Hum)

13 It is worth noting here that MAIN-RIGHT is interpreted as a non-gradient constraint. It is violated if the head-foot is not right-most. A gradient interpretation of MAIN-RIGHT triggers some ranking relative to NONFINAL. Since this ranking has no bearing on the main stream discussion, we choose not to flirt with it.


15 One simple argument against the analysis which treats final Cs as degenerate feet is that it never solves the issue regarding which constituent is NONFINAL—is it the final mora or foot? Our analysis makes unequivocal that it is always the syllable irrespective of its quantity.

16 A typological prediction of the proposed account is that some languages make crucial distinction between one and greater than one mora unlike Cairene Arabic, which distinguishes between two and greater than two moras.
الجراح،

ملخص

تعالج الدراسة الحالية من منظور نظرية الحلول المثلى Optimal Theory أثر البناء الداخلي للقطع بشكل عام، حيث تعتبر أن الظروف التالية: low ranking المقطع الثقيل جداً superheavy syllable الكلمة بخدر النظر من وزنه، يكون النبر في جميع الحالات ناجباً عن التقاطع المقطعي العرضي وليس البناء الداخلي parsing المقطع الثقيل، وذلك يشير إلى أن النظام النبر في هذه اللحظة غير سدودي بشكل المقطع وإذا يقابلته للتقاطع العرضي.

وتم الوصول إلى هذه النتيجة المغايرة لظلم التصورات السابقة عن هذه الظاهرة في تقاطع النبر العرضي، حيث يمكن تجزيئتها بالاعتماد على البناء الداخلي للمقطع العرضي، فأصبح بذلك المقاطع الثقيل جداً قابلًا لعملية البناء العرضي، بينما تشكل المقصاط الأقل ثقلًا مثل light and heavy syllables في تراكيب عرضية أكبر.
References


