Feeding Duke of York derivations in Arabic and their architectural consequences

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Background: *Feeding Duke of York* (FDY) derivations (McCarthy 2003, cf. Pullum 1976) are derivations of the form /A/ → |B| → [A], where B conditions some process P, as in (1). In FDY derivations, P is conditioned by information that is available at an intermediate level of representation but crucially not at the underlying or surface level.

(1)

UR	/CAD/	
A→B / _ D	CBD	A→B sets up environment for next rule.
C→E / _ B	EBD	Now B conditions C→E change.
B→A / _ D	EAD	B→A, undoing effect of first rule.

McCarthy (2003) made the following two claims about FDY derivations:

1. Phonological patterns requiring FDY derivations are unattested in natural language
2. The absence of FDY patterns is evidence for theories that cannot generate them

Theories that generate FDY patterns include rule-based phonology (Chomsky & Halle 1968) and Stratal OT (Kiparsky 2000), which posit at least one level of intermediate representation and no restrictions that prevent undoing earlier changes. Theories that exclude FDY patterns include parallel OT (Prince & Smolensky 1993/2004, with or without OO-Correspondence (Benua 1997)), which does not posit intermediate representations, and Harmonic Serialism (HS; McCarthy 2008, 2010), which posits them along with restrictions that prevent FDY derivations.

Summary: This work argues that the distribution of stress and vowel length in Palestinian Arabic (PA) shows two core properties of FDY: it involves derivations of the form /A/ → |B| → [A] and a process sensitive to B that crucially applies at the intermediate level. While the PA pattern will be shown to meet a weaker definition of FDY than McCarthy's, the architectural consequences are the same: the pattern is incorrectly excluded by parallel OT and HS, and its existence provides an argument for theories such as rule-based phonology and Stratal OT.

Stress and vowel length in Palestinian Arabic (simplified) (see also Kenstowicz & Abdul-Karim 1980, Abdul-Karim 1985, McCarthy 2005): Stress in PA is sensitive to syllable quantity and obeys the following generalization:

(2) a. Stress the ultima if it is superheavy (CVCC or CV:C)
b. Otherwise, stress the penult if it is heavy (CVC or CV:) or word-initial
c. Otherwise, stress the antepenult

Vowel length is contrastive in stressed syllables (e.g., kátab vs. ká:tab). Vowels in word-final position are always short (3a), but the same vowels are long when followed by a morpheme boundary (3b). Hypothetical verbs in the same pattern with a word-final long vowel (3d) or a short vowel before a morpheme boundary (3e) are ungrammatical. However, vowels that precede a morpheme boundary and do not receive stress are short (3c).

(3)

a.	tíʔra	'you read'		d.	*tíʔra:
b.	tiʔrá:-ha	'you read it'		e.	*tíʔra-ha
c.	tiʔra-há:-ʃ	'do not read it'			

Serial analysis: The analysis will be illustrated using three ordered rules: a) LENGTHENING: lengthen vowels before a morpheme boundary. b) STRESS: assign stress according to (2). c) SHORTENING: shorten stressless vowels. Without constraints on URs, URs with any vowel-length configuration must be considered. LENGTHENING blocks (3e) and must apply before STRESS. Otherwise, /tiʔra-ha/ would surface as *[tíʔra:-ha]. SHORTENING blocks (3d) and must apply after STRESS. Otherwise, /tiʔra-ha-ʃ/ would surface either as *[tiʔra:-há:-ʃ]) (if

SHORTENING precedes LENGTHENING) or as *[tíʔra-ha-ʃ] (if LENGTHENING comes first). (4) shows the derivation of [tiʔra-háː-ʃ] from four possible URs. The leftmost column illustrates the two core properties of FDY: SHORTENING removes an effect of LENGTHENING (/a/ → |aː| → [a]) and STRESS is crucially fed by LENGTHENING at the intermediate level.

(4)

UR	**/tiʔra-ha-ʃ/**	/ tiʔra-haː-ʃ/	/ tiʔraː-ha-ʃ/	/ tiʔraː-haː-ʃ/
LENGTHENING	**tiʔraː-haː-ʃ**	tiʔraː-haː-ʃ	tiʔraː-haː-ʃ	tiʔraː-haː-ʃ
STRESS	**tiʔraː-háː-ʃ**	tiʔraː-háː-ʃ	tiʔraː-háː-ʃ	tiʔraː-háː-ʃ
SHORTENING	**tiʔra-háː-ʃ**	tiʔra-háː-ʃ	tiʔra-háː-ʃ	tiʔra-háː-ʃ
SR	**[tiʔra-háː-ʃ]**	[tiʔra-háː-ʃ]	[tiʔra-háː-ʃ]	[tiʔra-háː-ʃ]

A note on the definition of FDY: While the PA pattern shows two core properties of FDY, it does not exactly meet McCarthy's definition of FDY: in PA, the B in /A/ → |B| → [A] and the B that conditions P are two different B's (the shortened |aː| had no effect on stress assignment). Relaxing that requirement results in a weaker definition of FDY (see below) that does not affect the two classes of theories with respect to FDY: as we will now see, parallel OT and HS (which cannot generate FDY on McCarthy's definition) cannot generate FDY on the new definition.

McCarthy's definition of FDY	Alternative definition of FDY (weak)
1. Some /A/ becomes |B|	1. Some /A/ becomes |B|
2. Some /A/-derived |B| conditions P	2. Some /A/-derived |B| conditions P
3. **The same** /A/-derived |B| becomes [A]	3. **Some** /A/-derived |B| becomes [A]

The challenge for Parallel OT: Parallel OT (with or without OO-Correspondence) computes stress and vowel length in parallel without intermediate representations, as in McCarthy's 2005 analysis of Arabic. The challenge is to choose the output [tiʔra-háː-ʃ] over the incorrect but prosodically-well-formed alternative *[tiʔráː-ha-ʃ] without causing trouble elsewhere. (5) shows the challenge for a standard choice of stress constraints (non-final-stress is the default and final super-heavy syllables attract stress). The incorrect candidate (a) is strictly better. Faithfulness constraints are unhelpful for choosing (b) because both [a]'s alternate for length: given Richness of the Base, URs with any specification of vowel length are possible (indicated with (ː) in the UR). Other familiar markedness constraints are also unhelpful because (a) is *prosodically* well-formed in PA. If the markedness constraints in (5) are modified so as to make final stress the default, the analysis would choose the correct (b) at the expense of incorrectly lengthening vowels in unsuffixed forms in order to respect final stress, e.g., *[titʕamáːl] instead of [titʕáːmal]. OO-Faithfulness constraints, as in McCarthy's 2005 analysis, do not help either, since the incorrect candidate is more similar to the base ([tiʔráː-ha]).

(5)

	/ tiʔra(ː)-ha(ː)-ʃ/	$\text{WSP}_{\text{Super-heavy}}$	No-final-stress	...
a. ☞	tiʔráː-ha-ʃ			...
b.	tiʔra-háː-ʃ		*!	...

The challenge for HS: In HS, candidates are generated by making only one change to the input at a time. The derivation proceeds serially: at each step, the optimal candidate is selected as the output and serves as the input to the next step. All steps are evaluated with respect to the same constraint ranking. Lengthening and shortening in PA create conflicting ranking demands for HS, preventing the theory from generating the PA pattern. The reasoning is as follows. Since lengthening must apply before stress, the markedness constraint that triggers lengthening must outrank stress markedness (say, $^{*}\breve{V}+ \gg$ STRESS). Since stress must apply before shortening, stress markedness must outrank the markedness constraint that triggers shortening (say, STRESS $\gg {}^{*}V{:}_{[-stress]}$). By transitivity we get $^{*}\breve{V}+ \gg {}^{*}V{:}_{[-stress]}$, which means that a long vowel before a morpheme boundary is better than a short vowel. Shortening before a morpheme boundary is therefore blocked, and *[tiʔraː-háː-ʃ] incorrectly wins over [tiʔra-háː-ʃ].

Conclusion: The distribution of stress and vowel length in PA is an attested variant of FDY that cannot be generated by parallel OT or HS. It thus supports serial theories like rule-based phonology and Stratal OT.