Arabic Nonconcatenative Morphology and the Syntax-Phonology Interface

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INTRODUCTION: This paper develops a new integrated analysis of the phonological and syntactic properties of nonconcatenative morphology in (Classical/Modern Standard) Arabic. The account centers around an algorithm for *sub-word linearization* at the syntax-phonology interface, here termed the "Mirror Alignment Principle" (MAP). The MAP determines the ranking of Alignment constraints (McCarthy & Prince 1993) in the phonological component based on asymmetric c-command relations in the syntax. Using the MAP, we can *predict* the exact position of all morphemes/segments in an Arabic verbal form based on their syntactic functions and structures without any recourse to templates (cf. McCarthy 1979, 1981).

PUZZLE: One of the many puzzling aspects of Arabic verbal morphology is the behavior of the Reflexive morpheme *t*, as shown in (1). Reflexive recurs across multiple "Forms" – i.e. morphosyntactic categories descriptively associated with a particular phonological shape and a particular range of morphosemantics (though frequently highly idiomatized). Yet, in some Forms (V,VI,X), the Reflexive *t* surfaces as a "prefix" (before the root-initial consonant, *k*), while in another Form (VIII), it surfaces as an "infix" (after the *k*).

(1) REFLEXIVES

Prefixal			***Infixal***		
V	Reflexive + Causative	***t****akattaba*	VIII	Reflexive	*(ʔi)k****t****ataba*
VI	Reflexive + Applicative	***t****akaataba*			
X	Causative + Reflexive	*(ʔi)s****t****aktaba*			

This distribution cannot be due solely to phonotactic issues. Form V could phonotactically permit an infixal pattern like **ka****t****attaba* or **(ʔi)k****t****attaba*; and Form VIII could permit a prefixal pattern like ****t****ak(a)taba*.

PROPOSAL: Previous purely phonological accounts of this problem (e.g. McCarthy 1979, 1981, Ussishkin 2003, Tucker 2010, 2011) had to stipulate the special behavior of Form VIII. However, there is a *syntactic* generalization about this *(morpho-)phonological* distribution that these analyses have missed. When Reflexive co-occurs with (and scopes over) another verbal derivational morpheme (VDM) (namely, Causative or Applicative), it is prefixal. When it is the only VDM, it is infixal. If we can directly relate syntactic structure to phonological behavior, then we can use this generalization to account for the apparent idiosyncrasy of the Reflexive. To this end, this paper proposes the **Mirror Alignment Principle (MAP)**:

(2) THE MIRROR ALIGNMENT PRINCIPLE (MAP):
If a terminal node ***α*** *asymmetrically c-commands a terminal node* ***β****, then* ***ALIGN-α*** *dominates* ***ALIGN-β****.*

Assuming that linearization is determined *in the phonological component* by Alignment, the MAP allows us to *predict* the position of all segments in an Arabic verbal form, including infixes and peripheral affixes, based on their syntactic functions and structures, in conjunction with phonotactics and other phonological considerations. Conversely, in the face of ambiguous syntactic evidence, the phonological analysis can shed light on the syntax. This framework, which is illustrated below for Reflexive and Causative, allows for an integrated syntactic and phonological analysis of the entirety of the Arabic verbal system, as laid out in (3) (verbal Forms in 3SG.MASC.PERFECTIVE.ACTIVE for the root *ktb* 'write'; [*ʔi*] are epenthetic segments).

(3)

I	kataba	--	V	**t**aka**tt**aba	*Reflexive* (/t/) + *Causative* (/μ_C/)
II	ka**tt**aba	*Causative* (/μ_C/)	VI	**t**ak**aa**taba	*Reflexive* (/t/) + *Applicative* (/μ_V/)
III	k**aa**taba	*Applicative* (/μ_V/)	VII	(*ʔi*)**n**kataba	*Middle* (/n/)
IV	**ʔ**aktaba	*Causative* (/ʔ/)	VIII	(*ʔi*)k**t**ataba	*Reflexive* (/t/)
			X	(*ʔi*)**st**aktaba	*Causative* (/s/) + *Reflexive* (/t/)

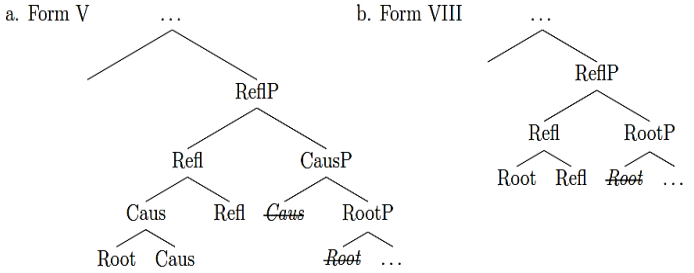
ANALYSIS OF REFLEXIVE: An Alignment-based analysis of the phonological behavior of the Reflexive requires what appears to be a ranking paradox (cf. Tucker 2010). The prefixal Forms (V,VI,X) require the ranking ALIGN-REFL[EXIVE]-L[EFT] » ALIGN-ROOT-L[EFT], but the infixal case requires the reverse ranking, ALIGN-ROOT-L » ALIGN-REFL-L. The MAP provides a rational explanation for the apparent paradox: the two types have different syntactic structures, so the MAP generates distinct Alignment rankings. Using these rankings, tableau (4) generates the phonological linearization of these two Forms, taken to be morphological-word–level units constructed by head movement. (For simplicity, epenthesis is ignored here, though its role in the system is significant, especially in the imperfective. Form V does not select the cluster-initial candidate **(ʔi)****t****kat$_C$taba* due to a ban on Reflexive *t* in pre-consonantal position.)

(4) ALIGNMENT IN FORMS V & VIII

(i)/t, μ_C, ktb, a, a/	ALIGN-REFL-L	ALIGN-RT-L	(ii) /t, ktb, a, a/	ALIGN-RT-L	ALIGN-REFL-L
a. ☞ **t**akat$_C$taba		*	a. **t**aktaba	*!	
b. (ʔi)k**t**at$_C$taba	*!		b. ☞ (ʔi)k**t**ataba		*

The syntactic conditioning of this difference is fairly clear. When Reflexive is the second head to merge with Root (as in (5a)), it asymmetrically c-commands Root – either in its base position or in the complex head generated by head movement. This syntactic structure is independently motivated by its relationship to Form II: Form V is (more or less) transparently the reflexivized version of the Form II Causative (see below). Form VI is likewise the transparently reflexivized (or, rather, reciprocalized) version of the Form III Applicative. (In Form X, Reflexive is actually below the overt Causative morpheme, but the structure contains a null *v* head between Refl and Root. There is independent evidence for this null head within the system; cf. Walkow 2013 on its role in determining clitic distribution in Causative formations.) The MAP thus generates the ranking ALIGN-REFL-L » ALIGN-ROOT-L, resulting in prefixal behavior.

(5) SYNTACTIC STRUCTURES WITH REFLEXIVE



When Refl is the first head to merge with Root (as in (5b)), once the two are joined by head movement, they stand in *symmetric* c-command. Since the MAP cares only about *asymmetric* c-command, it provides no ranking for ALIGN-REFL and ALIGN-ROOT. In situations like this where the ranking is underdetermined, Arabic seems to apply a consistent strategy: resolve the ranking in favor of ALIGN-ROOT. This default strategy suffices to explain the behavior of the sole VDMs in Form II (see below) & Form III, and the syntactically lower VDMs in Forms V (see again (5a)), VI, & X. (The prefixal sole VDMs in the Form IV Causative (see below) & the Form VII Middle are syntactically separated from Root by the null *v*, making their structural position parallel to Refl in (5a) rather than Refl in (5b).) Whether this root-preferring default is a language-specific strategy or something more universal is a question for future investigation.

ANALYSIS OF CAUSATIVE: The same approach also yields an explanation for the Causative, of which there are two types (cf. Wright 1896:29-46, *a.o.*). The Form IV Causative ***ʔaktaba***, which has a prefixal /ʔ/ morpheme, has fairly consistent causative semantics. The Form II Causative ***kattaba***, which is marked by infixal gemination (analyzed as a consonantal mora), can consistently be characterized as adding an external argument to the base meaning (from Form I); this sometimes yields transparently causative semantics, but frequently has some other, highly idiomatized meaning. If we assume that the Causative head in Form II merges directly with the Root, but the Causative head in Form IV merges with a *v*P containing the Root, the distinction in morphosemantics is unsurprising (as we expect the Root-selecting Causative to be more susceptible to idiomatization) and simultaneously allows the MAP to derive the phonological asymmetry. The same principles derive the infixal position of the Causative in the more complex Form V in (4i)/(5a).

CONCLUSIONS: This approach thus offers a number of new insights about the relationship between the verbal syntax of Arabic and its morpho-phonological system, while providing a more complete and consistent account of its phonological complexities and typological unusualness. Furthermore, adopting the MAP approach brings nonconcatenative morphological processes under the umbrella of phenomena which can illustrate the Mirror Principle: "*morphological derivations must directly reflect syntactic derivations (and vice versa)*" (Baker 1985). By using the Alignment ranking determined via phonological analysis, rather than just linear order, to infer the underlying word-internal structure, we can now apply Mirror Principle reasoning to infer syntactic structure from surface morpheme order for any sort of morphological system, concatenative or otherwise. Finally, while the phenomena examined in this paper are restricted to the sub-word level, the Mirror Alignment Principle could be extended to higher-level ordering phenomena, bearing on more general questions of syntactic linearization. The MAP thus opens up a wide range of possibilities for future research in syntax, morphology, and phonology.