True self-counterfeeding vowel harmony in Akan serial verb constructions

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Background: A rule is said to counterfeed itself (*self-counterfeeding*; SCF) if it creates additional inputs to itself but only applies once. Example: a rule that deletes word-final vowels (/CVCV#/ → [CVC#]) and applies once to URs that end with two vowels (/CVCVV#/ → [CVCV#]). In SCF, the structural description of the rule is met on the surface, making SCF a case of underapplication opacity. In rule-based theories of iterativity, a SCF rule can be a [-iterative] rule (Anderson 1974). For OT, SCF poses the usual underapplication challenge (McCarthy 2007, Kaplan 2008). Importantly, Kaplan (2008) argued that reported cases of SCF can be reanalyzed as processes that do not create additional inputs to themselves, and that the absence of true SCF is predicted by OT. A few counterexamples were recently reported by McCollum & Kavitskaya (2018), who also showed that OT generates SCF under some conditions.
Goal: We present a particularly clear case of SCF from ATR harmony in Akan and show that reanalyses as in Kaplan (2008) fail. While the phonology and phonetics of Akan ATR harmony have been extensively discussed in the literature (e.g., Clements 1981, Dolphyne 1988, Hess 1991, O'Keefe 2003, Casali 2012), our argument is based on new phonological data from serial verb constructions, where the pattern is fully productive and reflected in speakers' judgments.
Data: Akan vowels are divided into two [ATR] sets: [+ATR] = {i, e, æ, o, u} , [-ATR] = {ɪ, ɛ, a, ɔ, ʊ}. Across word boundaries, [+ATR] spreads leftwards exactly once. This can be seen clearly in serial verb constructions – syntactic constructions in which multiple verbs share the same arguments in a single clause. An example of a serial verb construction with all [-ATR] vowels (and no spreading) is given in (1).

(1) Ama da sɔrɪ pra kɔ hɔ
Ama sleep wake.up sweep go there
'Ama sleeps, wakes up, sweeps and goes there.'

The two tables below provide new data not previously discussed in the literature on Akan. The data show that when monosyllabic verbs with different [ATR] values are concatenated in any order in a sentence, [+ATR] spreads leftwards exactly once (glosses are omitted for space).

Input	Output	Example	Input	Output	Example
- - -	- - -	/tɔ fa kɔ/ → [tɔ fa kɔ]	- - - -	- - - -	/da tɔ fa kɔ/ → [da tɔ fa kɔ]
- - +	-++	/tɔ fa di/ → [tɔ f**æ** di]	- - - +	- - ++	/tɔ fa bɔ di/ → [tɔ fa b**o** di]
- + -	++ -	/tɔ di fa/ → [t**o** di fa]	- - + -	- ++ -	/tɔ ʃɛ di fa/ → [tɔ ʃ**e** di fa]
- ++	+++	/tɔ di su/ → [t**o** di su]	- + - -	++ - -	/tɔ di ʃɛ fa/ → [t**o** di ʃɛ fa]
+ - -	+ - -	/di tɔ fa/ → [di tɔ fa]	+ - - -	+ - - -	/di tɔ fa kɔ/ → [di tɔ fa kɔ]
+ -+	+++	/tu dɪ di/ → [tu d**i** di]	- - + +	- + + +	/tɔ ʃɛ di su/ → [tɔ ʃ**e** di su]
++ -	++ -	/tu di kɔ/ → [tu di kɔ]	- ++ -	+++ -	/tɔ di su fa/ → [t**o** di su fa]
+++	+++	/tu di su/ → [tu di su]	- + - +	++++	/fa tu ʃɛ di/ → [f**æ** tu ʃ**e** di]

In addition, speakers have conscious knowledge of this pattern. For example, for each of the examples above that meets the conditions for regressive [+ATR] spreading, a speaker pronouncing the relevant verb sequence without harmony would be corrected and pointed out to the right form. The same is true for a speaker who would spread [+] more than once. The ungrammaticality of the alternatives to obligatory non-iterative spreading is exemplified in the table below. We take these facts to indicate that the process is internalized by speakers and should therefore be accounted for by the grammar.

(2)

/- - + -/ → [- + + -]	/tɔ ʃɛ di fa/ → [tɔ ʃe di fa]
/- - + -/ → *[- - + -]	/tɔ ʃɛ di fa/ → *[tɔ ʃɛ di fa]
/- - + -/ → *[+ + + -]	/tɔ ʃɛ di fa/ → *[to ʃe di fa]

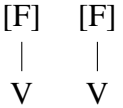
No obvious reanalysis: Kaplan (2008:2) identified several criteria for reanalyzing SCF as processes that do not create additional inputs to themselves (three criteria are illustrated in the table below), but none of them seem to apply in Akan. In type (a) languages (see table), a process that spreads only once can be reanalyzed as being confined to a smaller domain, e.g., a prosodic domain, like a foot. In Akan, this is not possible, since the very same surface environment in which iterative spreading should be blocked (e.g., /- - - +/ → [- - + +], *[- + + +]) triggers spreading when it is underlying (e.g., /- - + +/ → [- + + +]). In type (b) languages, the non-iterativity of harmony can be reinterpreted using restrictions on different triggers and targets (e.g., only [+high] vowels are triggers). In Akan, all vowels participate in harmony and serve as both triggers and targets, so such a reanalysis is not available. In type (c) languages, spreading can be limited to certain morphosyntactic domains (e.g., harmony spreads from a suffix to a root, but nothing triggers further spreading within a root). In Akan, this is again not possible for a similar reason given for type (a) (the very same morphosyntactic environment in which iterative spreading should be blocked also triggers spreading when underlying).

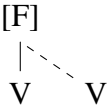
	Factor	**Language**	**Generalization**	**Example**
a)	Domain confinement	Tudanca laxing harmony	Harmony occurs within a foot	/sekú-lʊ/→[se(ká-lʊ)] ‘to dry him’
b)	Distinct trigger and target	Bengali ATR Harmony	triggers are [+high], but targets are [-high]	/ɔʃɔt-i/→[ɔʃot-i] ‘dishonest-FEM’
c)	Attraction to prominence	Lango ATR harmony	[+ATR] must affiliate with root	/amʊk-ni/→[amukki] ‘your shoe’

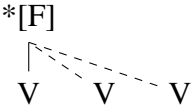
Implications: While the full pattern of vowel harmony in Akan is more complex (see references above), as far we can tell, theories will have to be able to generate the SCF observed in serial verb constructions regardless of how the analysis of these constructions is embedded in a more complete analysis. Rule-based phonology can straightforwardly account for this instance of SCF using a harmony rule specified as [-iterative], as in (3).

(3) V → [+ATR] / _ C_0 [+ATR]; [-iterative]

Contra Kaplan (2008), since true SCF exists, OT needs to commit to some extension that can generate SCF. McCollum & Kavitskaya (2018) note that autosegmental representations, which encode the application of a process on the surface ((4) vs. (5)), allow OT to generate assimilatory SCF (as in Akan) under certain conditions if constraints against non-adjacent associated vowels (6) are permitted, preventing the process from applying twice. McCollum & Kavitskaya’s (2018) OT analysis can work in Akan with only minor adjustments.

(4)


(5)


(6)


Summary: We provided new data from serial verb constructions in Akan that present a particularly clear case of true SCF that is fully productive. This case suggests that, contrary to previous claims, theories of phonology should be able to generate non-iterative SCF patterns.