



10-1-2020

I'm Sorry But Time Travel Isn't Real: Against Counterfeeding From the Past

Samuel Andersson

Follow this and additional works at: <https://repository.upenn.edu/pwpl>

Recommended Citation

Andersson, Samuel (2020) "I'm Sorry But Time Travel Isn't Real: Against Counterfeeding From the Past," *University of Pennsylvania Working Papers in Linguistics*: Vol. 26 : Iss. 1 , Article 2.
Available at: <https://repository.upenn.edu/pwpl/vol26/iss1/2>

This paper is posted at ScholarlyCommons. <https://repository.upenn.edu/pwpl/vol26/iss1/2>
For more information, please contact repository@pobox.upenn.edu.

I'm Sorry But Time Travel Isn't Real: Against Counterfeeding From the Past

Abstract

This paper analyzes a type of rule-ordering paradox known as counterfeeding from the past (CFFTP), which violates the transitivity condition on rule ordering. I assume a substance-free version of rule-based phonology, which predicts such paradoxes to be impossible. This distinguishes my theory from several versions of Optimality Theory, which have been shown to generate CFFTP. I evaluate this predictive difference between theories using a typological survey of CFFTP, concluding that contrary to what has been claimed in the literature, there are no convincing cases of this ordering paradox. In all languages, the argument for CFFTP is not justified by the data, or else the data can be reanalyzed without paradoxes in a transitivity-respecting grammar. While other theories overgenerate, rule-based phonology is thus restrictive enough to capture the typological data with respect to CFFTP. Additional time is spent on a variety of Arabic, where the resolution to the apparent paradox has interesting implications for the representation of prosody. I show that data which are conventionally analyzed in terms of syllable structure must be given a purely segmental analysis. This is in line with recent work moving towards flat representations of prosodic structure.

I'm sorry but Time Travel Isn't Real: Against counterfeeding from the past

Samuel Andersson*

1 Introduction

This paper discusses a rare type of interaction between phonological processes which has been dubbed ‘counterfeeding from the past’ (CFFTP) in the literature (Wilson 2006). It is a type of rule-ordering paradox which violates the requirement that rule ordering be transitive: if rule A precedes rule B, and rule B precedes rule C, then rule A must also precede rule C. Specifically, CFFTP involves cases where it seems as if the past state of a phonological derivation can prevent a process from applying in the future, leading to the name counterfeeding from the past.

I examine CFFTP from the perspective of a substance-free and rule-based phonological theory (Chomsky and Halle 1968, Hale and Reiss 2000, 2008, Vaux and Nevins 2008, Samuels 2011, Bale and Reiss 2018 among others). The theory considered in this paper makes the explicit prediction that no process in any language can violate the transitivity requirement on rule ordering. It is thus predictively different from Sympathy Theory and Optimality Theory with Candidate Chains (OT-CC), which can both generate CFFTP-type grammars without difficulty (Wilson 2006, Odden 2008). In order to adjudicate between these theories, I analyze all claimed cases of CFFTP found in a typological survey of the literature (Wolf 2010).

The results of this survey reveal no convincing cases of CFFTP. For several of the languages involved, the data do not provide evidence for any ordering paradoxes. For others, although the data appear to involve paradoxes, straightforward rule-based analyses are available without needing to violate transitivity. For one language, Bedouin Hijazi Arabic, the resolution of the apparent ordering paradox interacts in interesting ways with prosody. A non-paradoxical account must restate rules which seem to be sensitive to syllable structure in purely segmental terms. This ties in well with recent work advocating flatter¹ theories of prosodic structure in substance-free phonology and beyond (Idsardi 2005, Samuels 2011, Scheer 2013, Faust and Ulfsbjorninn 2018, Andersson 2019b, c, d).

I conclude that CFFTP is unattested in the world’s languages, and conjecture that grammars with CFFTP derivations are not possible in human language generally. Thus, while the Optimality Theoretic analyses surveyed in this paper overgenerate, rule-based theories are sufficiently restrictive to capture the typological data with respect to CFFTP. In addition to earlier work on opacity (see Kager 1999, Vaux and Nevins 2008 for discussion) and other ordering paradoxes (Andersson 2019a), this paper provides a further argument that extrinsic rule ordering is the most promising theory of how phonological processes interact.

2 Substance-Free Rule-Based Phonology

This section discusses the phonological framework I will investigate in this paper. Following work such as Hale and Reiss (2008) and Bale and Reiss (2018), I assume that phonology is substance-free, which is to say that it does not make reference to phonetic content, or substance. As a concrete example of what this means, the phonological component of the grammar does not in any way favor a phonetically-natural rule such as $t \rightarrow ts / _i$ over a phonetically-unnatural rule such as $v \rightarrow k / _b$. In general, there is no notion that some features or segments are more ‘marked’ than others, and no sense in which some outputs are sub-optimal or in need of being repaired. The typological facts

*I would like to thank all the native and non-native speakers of Yup’ik, Luiseño, and Bedouin Hijazi Arabic who have provided the data I analyze: Paschal Afcan, Hamza Qublan Al-Mozainy, Marie Blanchett, Feliz Calac, Leonidas Calac, Willy Calac, Joseph Coolidge, Villiana Hyde, Anna Jacobson, Steve Jacobson, Michael Krauss, Jeffrey Leer, Sophie Manutoli, Johnny McDowell, Pachito, Irene Reed, Martha Teeluk, and Cornelia Ward. I would also like to thank all of the unnamed consultants of these and other languages analyzed in this paper. Finally, thanks are due to Hovsep Deovlatian, Ollie Sayeed, Bridget Samuels, Bert Vaux, members of the Yale Phonology Reading group, as well as audiences at SYNC2018 and PLC43 for discussion.

¹More flat theories are those which rely less on hierarchies and tier-based representation.

usually attributed to markedness and phonetically-based phonology are instead explained diachronically, outside of the synchronic grammar (Blevins 2004, 2006, Samuels 2017 among others). These assumptions about a substance-free phonology will not play a major explanatory role in this paper. They are mentioned here nevertheless, to set this paper apart from other work where phonetic naturalness plays an important role in evaluating phonological analyses, including markedness-laden rule-based theories (such as Chomsky and Halle 1968:ch. 9, Donegan and Stampe 2009 among others).

More important for our purposes are the assumptions about how phonological processes do and do not interact in rule-based theories. I will use the usual phonological rewrite rules of the form $A \rightarrow B / C _ D$. As in most rule-based work, I take these rules to be extrinsically ordered, and assume that every rule is ordered with respect to every other rule. In cases where there is no evidence for one order over another, different speakers may have different solutions, but I still assume that every mental grammar specifies an order. Importantly for this paper, I take rule ordering to be transitive. Using \ll to denote precedence, if rule A \ll rule B, and rule B \ll rule C, then rule A \ll rule C. It is impossible to write a grammar where A \ll B, B \ll C, and C \ll A. As we will see in the next section, this predicts that the rule-ordering paradoxes which this paper discusses are literally not representable in human language.

3 Counterfeeding from the Past

This section introduces the ordering paradox CFFTP, with an example from Samothraki Greek. We will see how different phonological theories can or cannot explain CFFTP-type grammars, and discuss previous work on whether these grammars are genuinely attested.

An example from Wolf (2010) will serve to illustrate CFFTP and the apparent time travel involved. Samothraki Greek (data from Newton 1972, Kaisse 1975) has rules of r-deletion, mid vowel raising, and glide formation:

- (1) R-Deletion (RD) $r \rightarrow \emptyset / V _ V$
 Mid Vowel Raising (MVR) $e \rightarrow i / _ [+back, -high]^2$
 Glide Formation (GF) $i \rightarrow j / _ V$

The rules appear to apply in this order, with R-Deletion preceding Raising, and Raising preceding Glide Formation (the acute accent is used to indicate stress, not high tone as in the IPA):

- | | | | |
|---------|-------------------|---------|------------------------|
| (2) UR | /méra/ | UR | /roméos/ |
| RD | méa | MVR | romíós |
| MVR | mía | GF | romjós |
| SR | [mía] | SR | [romjós] |
| Transl. | ‘day’ | Transl. | ‘(a) Greek, masculine’ |
| | (Kaisse 1975:375) | | (Kaisse 1975:374) |

Paradoxically, Glide Formation fails to apply to the output of Mid Vowel Raising if and only if R-Deletion applied earlier in the derivation. Without this restriction [mía] ‘day’ would have surfaced as *[mjá]. Although *[mjá] is not a possible pronunciation of ‘day’ (Kaisse 1975:335), it is a possible word of Samothraki Greek; [mjá] is attested with the meaning ‘one, feminine’ from underlying /mía/ (Kaisse 1975:335). Glide Formation is thus in a sense counterfed by the application of R-Deletion earlier in the derivational history, leading to the name counterfeeding from the past.

In more abstract terms, with rules A, B, and C, CFFTP occurs when A precedes B, and B precedes C, but A never precedes C even in the derivations where this is expected. This could be accounted for by a different rule ordering $C \ll A \ll B$ (where \ll means ‘precedes’), but this violates transitivity: if $A \ll B$ and $B \ll C$, only the order $A \ll B \ll C$ is possible.

At least two recent phonological theories have been shown to produce CFFTP-type grammars.

²This formulation only generates raising of e before a and o. However, raising also applies to o, and having the preceding vowel be a or o also triggers raising (Kaisse 1975:330). I set aside these complications, as they are not important in the examples considered here, nor to make the point about CFFTP.

In Optimality Theory with Candidate Chains (OT-CC; McCarthy 2007), CFFTP can be generated using precedence constraints (PREC). Let A' be the faithfulness constraint violated by applying rule A, and C' the corresponding constraint for rule C. The constraint PREC(C', A') penalizes derivations where C' is violated later in the derivation than A'. Ranking this constraint high will produce the desired result: C underapplies if and only if A has applied. As the focus of this paper is rule-based phonology, no detailed OT-CC derivations are shown here, and readers are instead referred to the discussions and tableaux in Wilson (2006) and Wolf (2010).

Sympathy Theory, another constraint-based theory of phonology (McCarthy 1999), has also been shown to produce CFFTP. Odden (2008) discusses a fictional language, Kalaba, which has a CFFTP-type rule interaction which is easy to model in Sympathy Theory. Again the reader is referred to Odden (2008) for detailed derivations. Some rule-based theories also relax the transitivity requirement, with CFFTP being used as a data point which favors such theories (see Anderson 1969, and the discussion of Faroese in Section 3.5). Finally, we must also mention here the work of Sayeed (2016), who claims that transitivity-respecting rule-based grammars *can* generate CFFTP. However, Sayeed has to resort to ad hoc rules, abstract and otherwise unattested segments in the language, and Duke of York derivations. This paper aims to show that much more plausible solutions to the problem of CFFTP are available.

Both Wilson (2006) and Odden (2008) see the ability of different theories to generate CFFTP grammars as a theoretical downside. Since these patterns are not attested in any human language, they reason, theories which allow these phenomena overgenerate, and should be restricted. Wolf (2010) disagrees with this earlier work, and claims that there is in fact evidence from multiple unrelated languages in favor of CFFTP. He adduces a total of six possible examples from the literature, including the Samothraki Greek case discussed above. Wolf concludes that the existence of CFFTP favors OT-CC over derivational rule-based theories, which impose a transitivity condition on ordering. The rest of this paper examines all of Wolf's putative examples of CFFTP, and finds that they are all spurious or reanalyzable. I agree with Wilson (2006) and Odden (2008) that CFFTP-type grammars are unattested, and conjecture that they are unattestable.

3.1 Re-evaluating Samothraki Greek

The problem of CFFTP in Samothraki Greek (Samothraki, Indo-European) can be solved by reordering the rules, and altering one of them slightly. The CFFTP grammar and my proposed grammar without ordering paradoxes are shown below:

(3) With paradox		Without paradox	
RD	$r \rightarrow \emptyset / V_V$	MVR'	$e \rightarrow i / _ (r)[+back, -high]$
MVR	$e \rightarrow i / _ [+back, -high]$	GF	$i \rightarrow j / _ V$
GF	$i \rightarrow j / _ V$	RD	$r \rightarrow \emptyset / V_V$

In the new analysis, R-Deletion is the last rule to apply rather than the first. This looks like it should cause serious problems; in the paradoxical analysis, R-Deletion feeds Mid Vowel Raising, and must therefore be ordered before it. However, these problems have been remedied by rewriting Mid Vowel Raising. The new version of this rule, MVR', now precedes R-Deletion, but the environment of MVR' contains an optional r. This means that MVR' can apply across any r which will subsequently be deleted by R-Deletion. Reordering the rules in this way allows for a transitivity-respecting grammar to generate the data in Samothraki Greek. Derivations in this non-paradoxical account are shown below:

(4) UR	/méra/	/roméos/	/mía/
MVR'	míra	romíos	-----
GF	-----	romjós	mjá
RD	mía	-----	-----
SR	[mía]	[romjós]	[mjá]
Transl.	'day'	'(a) Greek, masculine'	'one, feminine'

This analysis might suggest that rule-based phonology can generate CFFTP after all. However,

this reanalysis was only possible because a deletion rule was involved. The deletion allowed for the incorporation of an optional *r* into the raising rule, thereby avoiding the paradox. Since not all possible CFFTP grammars are of this type, rule-based phonology is still more restrictive than theories like OT-CC and Sympathy Theory which can generate CFFTP freely. The remainder of this paper aims to show that the restrictive rule-based theory is on the right track, since there are no examples of CFFTP which cannot be reanalyzed in transitivity-respecting grammars.

3.2 Re-evaluating Luiseño

In Luiseño (California, Uto-Aztecan), [tʃ] and [ʃ] are generally in complementary distribution. The phoneme has been analyzed as underlying /tʃ/, which deaffricates to [ʃ] at the end of a word, and before [-cont] segments (Munro and Benson 1973:17). There is a claimed CFFTP paradox in ordering deaffrication with respect to reduplication and a process of vowel syncope. Forms such as /tʃara-RED-tʃ/ ‘torn’ appear to first undergo reduplication to tʃaratʃaratʃ, then deaffrication to tʃaratʃaraʃ, followed by syncope to [tʃaratʃraʃ] (Munro and Benson 1973:18). The surface form has [tʃ] before [r], which is opaque with respect to deaffrication. This ordering, however, is in conflict with the fact that deaffrication normally applies to the output of syncope: /motʃi-lat/ → motʃlat → [moʃlat] ‘belt’ (Munro and Benson 1973:17). Only when reduplication has applied does syncope counterfeed deaffrication, making this an example of CFFTP.

However, it is not clear that the Luiseño generalizations are as Munro and Benson (1973) describe them. For example, there are reduplicated forms where syncope feeds deaffrication, exactly as we would expect from a transitivity-obeying rule-based grammar: /tʃik^{wi}-RED-tʃ/ ‘suffer’ → tʃik^{wi}tʃik^{wi}tʃ (reduplication) → tʃik^{wi}tʃik^{wi}tʃ (syncope) → [tʃik^{wi}ʃik^{wi}] (deaffrication; Munro and Benson 1973:17). Other forms show variation, such as [tʃotʃri]~[tʃoʃri] ‘cut much wood, past punctual’ (Kroeber and Grace 1960:23). Kroeber and Grace’s (1960) grammar is riddled with restrictions on, and exceptions to, the supposedly postlexical deaffrication process. For example, we find [watʃqap] ‘there are’ rather than [waʃqap] (Kroeber and Grace 1960:22), and [tʃatʃmiʃ] ‘a stone tool’ rather than [tʃaʃmiʃ] (Kroeber and Grace 1960:23). In summary, it is far from clear that Luiseño has a paradoxical rule ordering, and the status of the rules as phonological generalizations is uncertain.

3.3 Re-evaluating Attic-Ionic Greek

Adams (1972) discusses an apparent case of CFFTP in the phonology of Attic-Ionic Greek (Athens, Indo-European). We will not see the full facts of this variety for reasons of space, but the paradox concerns two generalizations about consonants turning into [h]. Collapsing the different contexts of what Adams calls ‘H-making,’ he notes that the resulting single H-making rule cannot be ordered with respect to the other rules. A number of problems exist for this analysis. Firstly it must be pointed out that the only way to create a single H-making rule for Attic-Ionic Greek is to rely on multiple arcane notational conventions for rules, which do not exist in modern rule-based theories. The paradoxically-ordered H-making rule is written by Adams (1972:410) as:

$$\begin{bmatrix} -syll \\ +cont \\ \alpha son \\ -\alpha cons \end{bmatrix} \rightarrow \begin{bmatrix} -syll \\ -cons \\ -hi \end{bmatrix} / \#((C_0 \left[\begin{matrix} V \\ \langle -back \rangle_a \end{matrix} \right])_0 \left[\begin{matrix} +son \\ \langle +cons \rangle_b \end{matrix} \right]) - \left[\begin{matrix} +son \\ \langle +syll \rangle_c \end{matrix} \right]$$

If $\begin{bmatrix} +son \\ -cons \end{bmatrix}$, *then* *b* *and* *c*. *If* [-back], *then* *a*.

Even if we grant Adams’ (1972) general theory of rules, and assume it to be valid, his analysis has been criticized on other grounds. Sayeed (2016) argues that the generalizations Adams discusses are unlearnable on the basis of synchronically-available input. There is, then, no way for anyone to acquire the CFFTP grammar from the data. It is easy to see how this problem might have arisen; Adams repeatedly justifies highly-abstract underlying forms on the basis of diachrony, and evidence not available to an Attic-Ionic Greek learner. By copying sound changes into the synchronic pho-

nology in this way, we end up with a grammar which does not accurately describe anyone's phonological competence (see Anderson 2016, Andersson 2017 among others for discussion). For these reasons, we can set aside Attic-Ionic Greek, since it does not constitute a genuine example of CFFTP.

3.4 Re-evaluating Yup'ik

A CFFTP analysis of Yup'ik (Alaska, Eskimo-Aleut) suffers from the same problems as a CFFTP analysis of Attic-Ionic Greek. There are two relevant rules, and it is only if we attempt to collapse them into one that a paradox is encountered. In Yup'ik, a process deleting dorsal fricatives feeds vowel coalescence, which in turn feeds vowel raising: /atʃaɣ-t/ → atʃaɣət (by epenthesis which will not concern us) → atʃaət (dorsal fricative deletion) → atʃa:t (coalescence) → [atʃi:t] (raising) 'aunts' (Underhill 1976:22). However, a paradox arises when the dorsal fricative that is deleted is the uvular ɣ. All processes apply as expected, with the exception that the final raising step is blocked: /tanəɣuɣ:aɣ-t/ → tanəɣuɣ:aɣət (epenthesis) → tanəɣuɣ:aət (dorsal fricative deletion) → [tanəɣuɣ:a:t] (coalescence) 'boys' (Underhill 1976:22). As Underhill (1976:22) describes it, "[r]aising might now apply to this form, but is blocked from doing so because [dorsal fricative deletion - SA] removed a back velar earlier in the derivation." This makes the Yup'ik derivations a perfect example of CFFTP.

However, there is an important feature which distinguishes CFFTP in Yup'ik from CFFTP in a language like Samothraki Greek. In Samothraki Greek, we were faced with identical forms, e.g. *mía*, apparently being treated differently by the phonology: only when R-Deletion was not involved could Glide Formation produce [mjá]. The situation in Yup'ik is not parallel, since *all* forms containing /ɣ/ behave one way, i.e. triggering raising, while *all* forms containing /ɣ/ fail to trigger raising. This allows us to split what I have been calling 'dorsal fricative deletion' into γ-Deletion and ɣ-Deletion as two separate processes, which can then be ordered differently to avoid the paradox. This is in fact precisely what the previous literature on Yup'ik concludes (Underhill 1976). As with Attic-Ionic Greek, it is sometimes the case that two rules cannot be collapsed into one; keeping them as distinct but similar processes is the only way to write down a grammar which produces the correct outputs without paradoxes.

3.5 Re-evaluating Faroese

On the very particular and highly abstract analysis of Faroese (Faroe Islands, Indo-European) presented by Anderson (1969:82-97), there is an ordering paradox of the CFFTP type, where a process of glide hardening underapplies to forms with underlying /ð, ɣ/. This analysis has already been criticized by Odden (2008), and I repeat his criticism here, while adding some considerations based on the non-paradoxical analysis of Samothraki Greek in Section 3.1.

Odden rightly questions Anderson's arbitrary choice of underlying representations for some of the forms involved. The paradox arises due to underapplication of a hardening rule turning *jj*, *ww* to *dʒ*, *gv*. What Odden notes is that this problem is easily avoided by assuming that the process runs in the opposite direction, with underlying /dʒ, gv/ leniting. Anderson says only: "Let us see what happens if we /.../ tak[e] the form without [glide hardening - SA] as basic" (Anderson 1969:86). No argument for his choice of underlying forms is given, nor is the possibility of a lenition rule ever mentioned.

In addition to this critique, it should be mentioned that the paradox in Faroese bears some resemblance to what we saw in Samothraki Greek. In Faroese, /ð, ɣ/ delete in certain positions, but it is as if the rest of the derivation remains sensitive to their presence. This is parallel to how Samothraki Greek rules appear to be sensitive to the presence of a deleted /r/. Thus, even if we grant Anderson his underlying forms, we could include optional *ð, ɣ* in the environment of the process for which they appear to be present. As in Samothraki Greek, the deletion of these segments is then shifted to occur later in the derivation. Considering both Odden's critiques and the possibility of a Samothraki-inspired solution, there is nothing to suggest that Faroese has a CFFTP paradox.

3.6 Re-evaluating Bedouin Hijazi Arabic

For a number of reasons, the ordering paradox in Bedouin Hijazi Arabic (BHA; Medina, Afro-Asiatic) is the most interesting one surveyed in this paper. Al-Mozainy (1981), the source of the data we will analyze, takes care to identify external evidence for the phonological processes that he relies on. The existence of the abstract underlying forms he proposes, and the productivity of the rules, is verified by considering children's spellings, a language game played by the speakers, as well as a constructed language game which Al-Mozainy invented for the purposes of testing his analysis. With all of this external evidence, we can be confident that what Al-Mozainy describes is a productive part of the phonology of BHA. BHA thus appears to pose the most serious challenge to theories which cannot produce CFFTP.

As in the other cases of CFFTP, BHA has three relevant phonological rules:

- | | |
|------------------------|--|
| (5) Deletion (D) | $[+high, +syll] \rightarrow \emptyset / _]_{\sigma}$ |
| Raising (R) | $a \rightarrow i / _]_{\sigma}$ |
| Resyllabification (RS) | $VC \# V \rightarrow V.C \# V$ |

As shown below, it seems as if Raising counterfeeds Deletion, and Resyllabification counterfeeds Raising, but, paradoxically, Resyllabification *feeds* Deletion:

(6) UR	/ð ^s irib/	/katab/	/ʕabad # al ^s ʔah/	UR	/ka:tib # al/
D	ð ^s rib	-----	-----	R	-----
R	-----	kitab	----- ₃	RS	ka:.ti.bal
RS	-----	-----	ʕa.ba.dal ^s .l ^s ah	D	ka:t.bal
SR	[ð ^s rib]	[kitab]	[ʕa.ba.dal ^s .l ^s ah]	SR	[ka:t.bal]
Transl.	'he was hit'	'he wrote'	'worshipped Allah'	Transl.	'writing the...'
	(Al-Mozainy 1981:58, 149)		(McCarthy 2007:196)		(McCarthy 2007:196)

With the rules in the order $D \ll R \ll RS$, we cannot explain why Deletion applies after Resyllabification in [ka:t.bal] 'writing the...', but if we have $R \ll RS \ll D$, we predict *[ktab] rather than [kitab] for 'he wrote.' Intuitively, the paradox in BHA is that Deletion applies only in open syllables, but it must somehow apply before Resyllabification tells us which syllables are open. This paradoxical situation can only be avoided if we state in segmental terms what constitutes an open syllable in BHA. The difference between Deletion (fed by Resyllabification) and Raising (counterfed by Resyllabification), comes down to a slight difference in the way 'open syllable' is written in the environments of these two rules:

- | | |
|--------------------|--|
| (7) Deletion' (D') | $[+high, +syll] \rightarrow \emptyset / _ (C)(\#)V$ |
| Raising' (R') | $a \rightarrow i / _ (\#)(C)V$ |

I assume that the optionality brackets are interpreted as abbreviating sets of disjunctively-ordered rules in the exact same manner as in SPE (Chomsky and Halle 1968:29-30):

- | | | |
|--------|--|---|
| (8) D' | $[+high, +syll] \rightarrow \emptyset / _ C\#V$ | $[+high, +syll] \rightarrow \emptyset / _ \#V$ |
| | $[+high, +syll] \rightarrow \emptyset / _ CV$ | $[+high, +syll] \rightarrow \emptyset / _ V$ |
| R' | $a \rightarrow i / _ \#CV$ | $a \rightarrow i / _ CV$ |
| | $a \rightarrow i / _ \#V$ | $a \rightarrow i / _ V$ |

Since these rules do the work of resyllabification, no special resyllabification rule is needed. Below derivations are shown, indicating in parentheses which version of each rule has applied:

³ Raising has additional restrictions which are not important here (Al-Mozainy 1981:55-57). These additional restrictions, however, are the reason that ʕa.ba... does not change to ʕi.ba...

(9) UR	/ð ^s irib/	/katab/	/ʃabad # al ^s ʔah/	/ka:tib # al/
D'	ð ^s irib (_ CV)	-----	-----	ka:tbal (_ C#V)
R'	-----	kitab (_ CV)	-----	-----
SR	[ð ^s irib]	[kitab]	[ʃabadal ^s ʔah]	[ka:tbal]

This analysis shows that a pattern which has previously been analyzed in terms of syllables can – and on a rule-based analysis, must – be rewritten as a purely segmental rule. This fits in well with research within the substance-free framework moving towards a flat phonology with no prosodic hierarchy whatsoever (Samuels 2011, Andersson 2019b). For other recent work on flat(ter) versions of phonology, see Idsardi (2005), Scheer (2013), and Faust and Ulfsbjorninn (2018). I do not wish to suggest that all of prosody should be analyzed with environments of the type / _ (C)(#) V, as in SPE. One flat alternative to traditional prosodic theories is Universal Boundary Theory (Andersson 2019b, c, d), where prosodic phenomena are accounted for using a boundary symbol |, which is formally the feature bundle [-segment] (for this feature, see Chomsky and Halle 1968:64). Andersson (2019b, c, d) shows that even with just one boundary symbol, we can get very far in capturing data usually used as evidence for prosodic categories like the mora, syllable, foot, and so on. Thus, although BHA requires an SPE-type approach to prosodic structure in its rules, there are other ways of productively moving forward with a completely flat phonology. Indeed, a boundary-theoretic analysis of BHA would simply require the # symbol in the rules in (7) to be replaced with | (see Andersson 2019d on where in the derivation | may be inserted to separate words).

4 Conclusions

In this paper I have evaluated all claimed cases of the rule-ordering paradox known as counterfeeding from the past (CFFTP). Like other ordering paradoxes, CFFTP is predicted to be impossible in most versions of rule-based phonology, where the ordering of rules must be transitive. This stands in contrast to Optimality Theory with Candidate Chains (OT-CC), and Sympathy Theory, where CFFTP grammars can easily be produced. Because of this, CFFTP offers a way of testing these different theoretical predictions empirically. This paper has attempted to do just that, and I have argued that the data correspond to the predictions of the more restrictive rule-based theory. CFFTP does not appear to exist in any language, and I have conjectured that such paradoxes are unattestable and not merely unattested. This means that OT-CC, Sympathy Theory, and rule-based theories without transitivity overgenerate. The more restrictive approach thus represents yet another case – next to opacity and other ordering paradoxes – where rule-based phonology is predictively better than other theories when it comes to predicting possible interactions between phonological processes. These predictive successes constitute strong arguments that phonological computation works by extrinsically-ordered rules.

References

- Adams, Douglas C. 1972. Sonorant Clusters in Ionic and the Ordering of Rules. In *Papers from the Eighth Regional Meeting of the Chicago Linguistic Society*, ed. P.M. Peranteau, J.N. Levi, and G.C. Phares, 405–415. Chicago, IL: Chicago Linguistic Society.
- Al-Mozainy, Hamza Qublan. 1981. Vowel Alternations in a Bedouin Hijazi Arabic Dialect: Abstractness and stress. Doctoral dissertation, University of Texas at Austin.
- Anderson, Stephen R. 1969. West Scandinavian Vowel Systems and the Ordering of Phonological Rules. Doctoral dissertation, MIT.
- Anderson, Stephen R. 2016. Synchronic versus diachronic explanation and the nature of the language faculty. *Annual Review of Linguistics*, 2:11–31. <https://doi.org/10.1146/annurev-linguistics-011415-040735>
- Andersson, Samuel. 2017. Safety in numbers: Geminates in Lisbon Portuguese. *Cambridge Occasional Papers in Linguistics*, 10:22–37.
- Andersson, Samuel. 2019a. There Is No Rule-Ordering Paradox in Mojeño Trinitario. Poster presented at the 2019 Annual Meeting of the LSA, New York, NY.
- Andersson, Samuel. 2019b. We Should Set Some Boundaries: Phonology in Universal Boundary Theory. Invited talk presented at the 2019 Workshop on Theoretical Phonology, Montreal.

- Andersson, Samuel. 2019c. Are There Boundaries between Segmental and Prosodic Phonology? Talk presented at the 2019 Segmental Processes in Interaction with Prosodic Structure (SPIPS), Tromsø.
- Andersson, Samuel. 2019d. Creating Boundaries and Stops in German: A Universal Boundary Theory analysis. Poster presented at the 2019 Annual Meeting on Phonology (AMP), Stony Brook, NY.
- Bale, Alan, and Charles Reiss. 2018. *Phonology: A Formal Introduction*. Cambridge, MA: MIT Press.
- Blevins, Juliette. 2004. *Evolutionary Phonology: The emergence of sound patterns*. Cambridge: Cambridge University Press.
- Blevins, Juliette. 2006. A theoretical synopsis of Evolutionary Phonology. *Theoretical Linguistics*, 32:117–166.
- Chomsky, Noam, and Morris Halle. 1968. *The Sound Pattern of English*. New York: Harper & Row.
- Donegan, Patricia, and David Stampe. 2009. Hypotheses of Natural Phonology. *Poznań Studies in Contemporary Linguistics*, 45:1–31. <https://doi.org/10.2478/v10010-009-0002-x>
- Faust, Noam, and Shanti Ulfsbjorninn. 2018. Arabic stress in Strict CV, with no moras, no syllables, no feet and no extrametricality. *The Linguistic Review*, 35:561–600.
- Hale, Mark, and Charles Reiss. 2000. ‘Substance abuse’ and ‘dysfunctionalism’: Current trends in phonology. *Linguistic Inquiry*, 31:157–169.
- Hale, Mark, and Charles Reiss. 2008. *The Phonological Enterprise*. Oxford: Oxford University Press.
- Idsardi, William J. 2005. Calculating Metrical Structure. Talk presented at the 2005 CUNY Phonology Forum, New York, NY.
- Kager, René. 1999. *Optimality Theory*. Cambridge: Cambridge University Press.
- Kaisse, Ellen. 1975. A Violation of Transitivity in Modern Greek. In *Papers from the Eleventh Regional Meeting of the Chicago Linguistic Society*, ed. R.E. Grossman, L.J. San, and T.J. Vance, 329–339. Chicago: CLS.
- Kroeger, Alfred L., and George W. Grace. 1960. *The Sparkman Grammar of Luiseño*. Berkeley/Los Angeles: University of California Press.
- McCarthy, John J. 1999. Sympathy and phonological opacity. *Phonology*, 16:31–399.
- McCarthy, John J. 2007. *Hidden Generalizations: Phonological opacity in Optimality Theory*. London: Equinox.
- Munro, Pamela, and Peter J. Benson. 1973. Reduplication and rule ordering in Luiseño. *International Journal of American Linguistics*, 39:15–21.
- Newton, Brian. 1972. *The Generative Interpretation of Dialect: A study of Modern Greek phonology*. Cambridge: Cambridge University Press.
- Odden, David. 2008. Ordering. In *Rules, Constraints, and Phonological Phenomena*, ed. B. Vaux, and A. Nevins, 61–120. Oxford: Oxford University Press.
- Samuels, Bridget. 2011. *Phonological Architecture: A biolinguistic perspective*. Oxford: Oxford University Press.
- Samuels, B. (Ed.). 2017. *Beyond Markedness in Formal Phonology*. Amsterdam/Philadelphia: John Benjamins Publishing Company.
- Sayeed, Ollie. 2016. Phonological time travel: ‘counterfeeding from the future’. Paper presented at the 2016 Annual Meeting of the Linguistics Association of Great Britain (LAGB), University of York.
- Scheer, Tobias. 2013. Why phonology is flat: The role of concatenation and linearity. *Language Sciences*, 39:54–74. <https://doi.org/10.1016/j.langsci.2013.02.004>
- Underhill, Robert. 1976. Noun Bases in Two Eskimo Dialects: A study in comparative morphophonemics. In *Papers in Eskimo and Aleut Linguistics*, ed. E. Hamp, 239–272. Chicago: Chicago Linguistic Society.
- Vaux, B., and Andrew Nevins. (Eds.). 2008. *Rules, Constraints, and Phonological Phenomena*. Oxford: Oxford University Press.
- Wilson, Colin. 2006. Counterfeeding from the past. Ms., UCLA.
- Wolf, Matthew. 2010. On the existence of counterfeeding from the past. Paper presented at the 2010 Annual Meeting of the LS, Baltimore, MD.

Department of Linguistics
 Yale University
 PO Box 208366
 New Haven, CT, 06520
samuel.andersson@yale.edu