

Antigemination: Natural or Unnatural History?

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# Antigemination: Natural or Unnatural History?\*

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## 1. Introduction.

Within Evolutionary Phonology (Blevins, to appear), recurrent sound patterns are argued to be a direct consequence of recurrent types of phonetically based sound change. Synchronic markedness constraints of structuralist, generativist, and optimality approaches are abandoned, and replaced, for the most part, with historical phonetic explanations which are independently necessary. Under the general Evolutionary Phonology approach, any recurrent sound pattern which does not lend itself to phonetic explanation is problematic.

Already, this framework has proven useful in identifying new phonetic explanations for well documented recurrent sound patterns and for distinguishing sound patterns with a natural history in phonetic substance from those with an unnatural history involving rule inversion, rule telescoping, analogy, or language contact. To take just one example, consider the phonetic typology of metathesis presented in Blevins & Garrett (1998, to appear). Given the recurrent nature of certain metathesis sound patterns, but not others, historical phonetic explanations grounded in perceptual ambiguity and coarticulation are proposed. Nasal-obstruent metathesis is not accounted for by these phonetic explanations. Nevertheless, nasal-obstruent metathesis is attested in at least seven East Cushitic languages. In this case, as detailed by Garrett and Blevins (to appear), a seeming exception to the phonetic typology of metathesis has an unnatural history rooted in pre-existing patterns of morphophonological alternation.<sup>1</sup> Nasal-obstruent metathesis then is a recurrent sound pattern with an unnatural history. Within Evolutionary Phonology, it is only by understanding the precise history of language change that sound patterns with natural and unnatural histories can be distinguished. The general Neogrammarian dichotomy of regular sound change and analogy is strengthened by giving further substance to both the phonetic sources of regular sound change, and the morphological and phonological bases of analogical change.

In this paper, I examine another recurrent sound pattern which is potentially problematic for the Evolutionary approach. The sound pattern in question is one in which phonological syncope rules are sometimes blocked from applying if their output would create a sequence of adjacent identical consonants. This recurrent

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\* I am grateful to Bob Blust, Andrew Garrett, and Tony Woodbury for helpful discussion of the Chamorro, Old Irish, and Yup'ik syncopes respectively.

<sup>1</sup> Other cases of nasal-obstruent metathesis with unnatural histories are summarized in Blevins and Garrett (to appear).

sound pattern was first characterized and analysed by McCarthy (1986), who referred to it as ‘antigemination’.

One case of antigemination analysed by McCarthy (1986:220-21) is that found in Afar, an East Cushitic language of Ethiopia. The Afar data in (1) illustrates the general antigemination pattern. Unstressed pre-tonic vowels are lost from open syllables when preceded by open syllables (1a-h) unless the consonants flanking the targeted vowel are identical, in which case there is no syncope (1i-k). Unlike other instances of apparent rule-blockage, the constraint on syncope in Afar cannot be attributed to a general constraint against geminates. Geminates in Afar occur freely both within and across morphemes: *cammi* ‘uncle’, *aabb-uk* ‘hearing’, *daffe-s-s-a* ‘she seated’ (from /daffey-is-s-a/ ‘sit-CAUS-she-IMPF’).

(1) Afar unstressed vowel syncope (Bliese 1981:212-16; Barillot 2002)

V → ∅ [wordCVC\_CV]

<u>Stressed</u>	<u>unstressed</u>	gloss
a. xamíla	xamlí	‘swamp grass’ (acc./nom.-gen.)
b. cagára	cagrí	‘scabies’ (acc./nom.-gen.)
c. kaxánu	kaxní	‘love’ (acc./nom.-gen.)
d. digíray	digré	‘let him play’/ ‘he played’
e. gutúca	gutcé	‘push(pl.)’/ ‘he pushed’
f. barisay	barsé	‘let him teach’/ ‘he taught’
g. digibté	digbé	‘she/he married’
h. wagerté	wagré	‘she/he reconciled’
	<u>no syncope</u>	
i. xararté	xararé	‘she/he burned’
j. dananté	danané	‘she/he hurt’
k. walaltá	walalá	‘she/he hurt’

McCarthy (1986) argues that antigemination is a consequence of the Obligatory Contour Principle which prohibits adjacent identical elements in phonological representations. Formerly a constraint on lexical representations, the Obligatory Contour Principle (OCP) is extended by McCarthy to exert an active influence on the mapping between underlying and phonological surface forms. A hypothetical Afar form like **\*\*danné** (from *danané*) is blocked because it contains a sequence of adjacent identical *n*'s.

Odden (1988) presents serious theoretical and empirical criticisms of the OCP-based account of antigemination. First, he highlights weaknesses related to phonological representations and notions of adjacency. Within McCarthy's model, antigemination is predicted to apply to tautomorphic derived C<sub>i</sub>C<sub>i</sub> sequences, but not to heteromorphic sequences, since morphemes are claimed to define independent ‘tiers’. Where antigemination is expected but not found morpheme-internally, McCarthy analyses the segments in question as long-distance geminates. Where antigemination is not expected but attested across morphemes, tier-conflation is claimed to apply prior to syncope. As Odden notes, the freedom to represent C<sub>i</sub>VC<sub>i</sub> sequences as long-distance geminates when necessary to allow syncope, combined with the freedom to order tier-conflation before syncope to derive intra-morphemic antigemination greatly weakens the predictive power of the model. An important empirical observation is that

antigemination is not found in certain languages. Odden concludes that OCP is not a principle of universal grammar.

Within Evolutionary Phonology, where recurrent sound patterns are, for the most part, a reflection of recurrent phonetically based sound change, syncope is easily explained, but antigemination is problematic. Syncopating sound patterns like the Afar rule in (1) are widespread cross-linguistically, and numerous sound changes of precisely this type have been proposed for distinct language families. Thurneysen (1980:67) describes a general syncope sound change for Old Irish, and similar across-the-board syncope of unstressed vowels has occurred in the history of many Austronesian languages. In Chamorro, Proto-Malayo-Polynesian schwa, an extra-short vowel, was lost in the environment VC<sub>0</sub>CV (Blust 2000:88). A similar syncope rule is attested in the history of the Central Alaskan Yupik (Fortescue et al. 1994, Jakobson 1984) where Proto-Eskimo schwa has been lost from the second of a word-initial string of open syllables. Another example of schwa syncope in open weak (odd-numbered) syllables has occurred in the history of Munsee/Delaware, an Algonquian language (Goddard 1982). These syncopating sound changes are illustrated in (2i-iv), where proto-forms are Old Irish, Proto-Malayo-Polynesian, Proto-Eskimo and Proto-Algonquian respectively.

(2) Syncope as sound change

i. Old Irish	*V > ø / [C <sub>0</sub> VC <sub>0</sub> CV	*dilese > dilse ‘ownership’
ii. Pre-Chamorro	*ə > ø / [C <sub>0</sub> VC <sub>0</sub> CV	*qaləjaw > atdaw ‘sun’
iii. Yupik	*ə > ø / VC <sub>0</sub> CV	*aləqa(R) > ałqaq ‘older sister’ (CAY)
iv. Pre-Munsee	*ə > ø / [(C) <sub>0</sub> ] <sub>Weak Syllable</sub>	*wetełkwani > wtołwan ‘branch’

The phonetic explanation for syncope rules like those in (2) is straightforward: short unstressed vowels range in pronunciation from hyperarticulated vowels with recognizable quality to hypoarticulated segments which lack any noticeable formant structure. These hypoarticulated tokens are easily reinterpreted by subsequent generations as consonant release, or zero. Syncope rules, then, have a clear natural history, which we will continue to understand better as our knowledge of speech production and perception deepens.

The problem, however, is that when we look at the potential phonetic precursors of phonological syncope rules, like those illustrated in (2), we do not see evidence of antigemination. On the contrary, McCarthy (1986) describes *phonetic* syncope effects in Odawa, Modern Hebrew, English, Japanese and Hooper Bay Chevak where unstressed vowels *may* be omitted between adjacent identical consonants. (In these and other examples, C° indicates a consonant with audible release.) He argues that it is precisely the phonetic character of these variations, illustrated in (3), which makes the OCP irrelevant. Since the OCP is a constraint on phonological representations, it has no effect on phonetic implementation rules.

(3) Problem I: phonetic syncope does not show antigemination (McCarthy 1986)

<u>Language/family</u>	<u>variant surface forms</u>
Odawa /Algonquian	tətanisi, t°tanisi, ttanisi ‘he stays for a while’
Modern Hebrew /Semitic	nadədu, nad°du, naddu ‘he/they wandered’
English /Indo-European	sɪnənɪm, sɪn°nɪm, sɪnnɪm ‘synonym’
Hooper Bay Chevak /Eskimo	ənəni, ən°ni ‘house-loc.sg’

In the historical domain, there is also evidence that regular syncope does not show evidence of antigemination. For the Central Alaskan Yup'ik (CAY) and Munsee developments summarized in (2iii-iv), there are apparent cases where syncope has applied between identical consonants. Relevant data for Yup'ik is presented in (4i) and that for Munsee in (4ii). In (4i.a-c) the expected reflex of intervocalic Proto-Eskimo \*ʔ is CAY ʔ as shown by the forms in (4i.d-f). Attested [x] or [xx] then reflects earlier geminate \*ʔʔ derived via syncope. In (4ii), proto-forms with weak C<sub>1</sub>∅.C<sub>2</sub> sequences show Munsee reflexes with vowel loss, followed by degemination. Unami maintains some adjacent identical consonants in these contexts (Goddard 1979).

(4) Problem II: syncope as regular sound change does not show evidence of antigemination

i.	Proto-Eskimo	Central Alaskan Yupik	gloss
a.	*iʔəʔəʔ-	ixəʔ-	'lean (against)'
b.	*pəʔəʔəR-	pəxxəR-	'stay up all night'
c.	*təʔəʔ-	təxə-	'be hard'
		təxxi-	'get hard'
d.	*əʔə-	əʔə-	'go (over or past)'
e.	*iʔə-	iʔə-	'swallow'
f.	*təʔu-	təʔu-	'take'
ii.	Proto-Algonquian	Munsee	
a.	*ne-ne:me	ne:m (< nne:m)	'I see (it)'
b.	*kə-kawi:	kawi (Unami kkawi)	'he sleeps'
c.	*pe-pak-	pake:w (< ppake:w)	'it is flat'

Just as phonetic perceptual and coarticulatory accounts of metathesis do not predict nasal-stop metathesis, so phonetic perceptual and coarticulatory accounts of syncope generally fail to predict antigemination (though see section 4). With no clear phonetic basis for antigemination effects, the Evolutionary approach leads us to consider alternative unnatural histories for this recurrent sound pattern. This paper is a first attempt at such a consideration, as well as a search for any cases of antigemination whose history is arguably phonetically natural.

In this paper, I observe strong correlations between antigemination and other sound patterns. As I illustrate in section 2, antigemination is attested in languages with pre-existing geminate-singleton contrasts and in languages with degemination, but not elsewhere. After demonstrating these correlations, I attempt to explain precisely where and how antigemination arises. In the most common cases discussed in section 3, syncope between identical consonants appears to be blocked just in case its output would give rise to neutralization of a *paradigmatic* opposition. This subcase comes under the general heading of 'non-homophony', 'anti-identity', or 'paradigmatic contrast' effects. Here, antigemination is a composite of natural phonetically based syncope sound change, and independent morphological effects. In section 4, antigemination in Central Alaskan Yup'ik is claimed to have a singularly natural history. One question which arises is why the effects seen Yup'ik are not found in other languages. Section 5 highlights distinct empirical predictions made by this account in contrast to others and briefly explore implications of this study for modern phonological theory. A strong prediction of this model is that phonetic

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antigemination effects will not be phonologized unless rule inversion, rule telescoping, language contact, or paradigmatic effects are involved.

### **2. Languages with and without antigemination.**

A summary of languages with claimed antigemination effects from McCarthy (1986) is given in (5).

#### (5) Languages with antigemination effects (McCarthy 1986)

	<u>Language</u>	<u>Family</u>
I. Pre-existing C/C: contrast	Afar	Cushitic/Afro-Asiatic
	Iraqi Arabic	Semitic/Afro-Asiatic
	Damascene Arabic	Semitic/Afro-Asiatic
	Tunisian Arabic	Semitic/Afro-Asiatic
	Tiberian Hebrew	Semitic/Afro-Asiatic
	Central Alaskan Yup'ik	Eskimo/Eskimo-Aleut
II. Degemination	Tonkawa	Isolate (Texas, USA)
	Modern Hebrew	Semitic/Afro-Asiatic

The languages in (5) are organized into two classes. In class I languages, a geminate/non-geminate contrast exists, and, it turns out, is also reconstructable for relevant subgroups. In class II languages, there is no underlying length contrast, but there is evidence for degemination. Some languages in class I also show evidence of degemination in certain contexts (e.g. Iraqi Arabic, Tunisian Arabic, Damascene Arabic).

Note that while pre-existing length contrasts and degemination are sound patterns strongly associated with antigemination, they cannot be used to predict whether or not antigemination effects will be found. A sample of languages without antigemination effects is given in (6). Syncope in Hindi shows no antigemination effects (Odden 1988:465), but Hindi does have an underlying geminate/non-geminate contrast (6.I). In Piro (Matteson 1965, Lin 1997), on the other hand, where underlying geminate/non-geminate contrasts are absent, there is active degemination of obstruents, yet syncope also shows no antigemination effects (6.II).

#### (6) Languages without antigemination effects

	<u>Language/Family</u>
I. Pre-existing C/C: contrast	Hindi/Indo-European
	Akkadian/Semitic
	Hooper Bay Chevak/Eskimo
II. Degemination	Piro/Arawakan
III. Neither	Klamath/Lutuamian (see below)
	Outlier Polynesian, Mussau,
	Trukese, Iban/Austronesian (Blust 1990)

On the other hand, if a language *does not* have a robust length contrast and *lacks degemination*, then it *will not* exhibit antigemination. A language of this type is Klamath, a Lutuamian language of south-central Oregon (Barker 1964, 1965). Unlike the class I languages in (5), Klamath does not have a robust underlying length contrast (6.III).

In Klamath, only a small number of stems are analysed as containing geminates which contrast with singletons in the same environment, though on the basis of internal reconstruction, it is clear that these are of recent origin. And unlike the class II languages in (5), there is no evidence of general degemination in Klamath. With the exception of /...s-s.../ clusters, sequences of identical consonants which arise across morpheme boundaries surface without degeminating. Some examples are shown in (7).

In Klamath, as illustrated in (8), short vowels in open stem-initial syllables are lost when a prefix is added. This rule of syncope does not show antigemination effects. Compare *qoqa* ‘puts on, wears a dress’ in (8a), with the causative *hosqqa* ‘puts a dress on someone’ from /hVs-qoqa/ via stem vowel copy, and prefix-induced syncope. In this example, as in (8b), a surface geminate is derived via syncope. In (8c) the expected form is *snoc’c’e:y’a*, however, laryngeal neutralization takes *c’c’* to *cc’* (Blevins, 1993).

(7) Another language without antigemination: Klamath (Lutuamian, Oregon)

- i. Pre-existing C/C: contrast? Highly limited.
- ii. Degemination? No. (only for /ss/)

a. <i>telli:na</i>	‘looks off the edge’	/tel-li:na/ [D:100]
b. <i>tilnne:ka</i>	‘rolls into a hole’	/tiln-ne:ka/ [D:115]
c. <i>tinne:ka</i>	‘sets (of sun)’	/tin-ne:ka/ [D:116]
d. <i>l<sup>h</sup>ewwa</i>	‘grazes in a flat place’	/lt <sup>h</sup> ew-wa/ [D:225]

(8) Klamath syncope

<u>Base</u>	<u>Syncope:</u>	<u>V</u> → ∅ / Prefix + [(C)C_CV...
a. <i>qoqa</i>	<i>hosqqa</i>	/hVs-qoqa/ ‘puts on a dress/CAUS’ [D:157]
b. <i>lalamna</i>	<i>sallamna</i>	/sV-lalamna/ ‘puts a round obj. on back/REFL’ [D:205]
c. <i>c’oc’e:y’a</i>	<i>snoc<sup>h</sup>e:y’a</i>	/snV-c’oc’e:y’a/ ‘melts/CAUS’ [D:95]

Though there is no general degemination process in Klamath, as illustrated by the forms in (7), the language does simplify derived /...s-s.../ clusters to [s] (Barker 1964:95), as illustrated in (9a-c).

(9) Degemination of /...s-s.../ clusters in Klamath /hVs-/ causatives

<u>Base</u>	<u>Degemination</u>	<u>gloss</u>
a. <i>sle’a</i>	<i>hesle’a</i> < /hVs-sle’a/	‘sees/ CAUS’ [D:373]
b. <i>s’aywakta</i>	<i>has’i:watka</i> < /hVs-s’aywakta/	‘knows/teaches’ [D:342]
c. <i>sacaq<sup>h</sup>wa</i>	<i>hascaq<sup>h</sup>wa</i> < /hVs-sacaq <sup>h</sup> wa/	‘wash (hands)/CAUS’ [D:347]
Compare:		
d. <i>q<sup>h</sup>oyqa</i>	<i>hosq<sup>h</sup>i:qa</i> < /hVs-q <sup>h</sup> oyqa/	‘recognize’ [D:323]
e. <i>t<sup>h</sup>sin</i>	<i>hist<sup>h</sup>san</i> < /hVs-t <sup>h</sup> sin/	‘grow/CAUS’ [D:414]
f. <i>c’ayalc<sup>h</sup>n’a</i>	<i>hasc’yalc<sup>h</sup>n’a</i> < /hVs-c’ayalc <sup>h</sup> n’a/	‘backs up/ CAUS’ [D:83]

Compare *sle'a* 'sees' with *hesl'a* 'causes someone to see' in (9a), from /hVs-sle'a/. The causative prefix /hVs-/ is *s*-final, as illustrated in (9d-f). In this case, the expected surface form is **\*\*hesl'a**, but /ss/ degeminates to [s]. Given the suggested correlation between degemination and antigemination in the class II languages in (5), it is instructive to examine word forms in Klamath where syncope could give rise to /s-s/ sequences. Words of this type, with stem-initial /sVsV.../, are shown in (10). Hypothetical surface forms under distributive (C)CV- or reflexive/reciprocal sV- prefixation are shown in bold.

(10) Klamath sVs-initial stems

<u>Base</u>	<u>RED + Hypothetical syncope + degemination</u>
a. <i>sasalk'ya</i>	/sa-sasalk'ya/ > /sa-salk'ya/ > <b>sasalk'ya</b> 'quarrels' [D:349]
b. <i>sesadwi</i>	/se-sesadwi/ > /sessadwi/ > <b>sesadwi</b> 'sells' [D:359]
c. <i>sosannqa</i>	/so-sosannqa/ > /so-ssannqa/ > <b>sosannqa</b> 'wrestles' [D:383]

As illustrated in (10), if syncope and degemination apply, causative and reflexive-reciprocal surface forms are *identical* to the base forms from which they are morphologically derived. Antigemination is clearly not the answer to why there is no evidence for syncope in (10). As shown in (8), Klamath does not show evidence of antigemination in parallel forms where degemination is not applicable. Despite morphological attempts to produce prefixed forms in (10), the phonology conspires to produce forms which are identical to their non-derived counterparts. It is precisely this sort of striking collapse of paradigmatic contrasts which, I will argue, leads to apparent antigemination effects in the majority of the world's languages.

**3. Unnatural history.**

In the following sections, I review cases of antigemination reported in McCarthy (1986) and elsewhere. In each case, I provide evidence that the constraint against syncope between identical consonants has an unnatural history. In 3.1, languages show antigemination in limited morphological contexts which suggest paradigmatic anti-homophony constraints (cf. Yip 1998, Crosswhite 1999). In 3.2 synchronic syncope constitutes diachronic rule inversion.

**3.1 Paradigm effects.**

**3.1.1 Tunisian Arabic.** Tunisian Arabic as describe by Wise (1983:168-170) has a rule of vowel syncope which deletes unstressed high vowels from open syllables.<sup>2</sup> Tunisian Arabic also has conditioned degemination: geminate consonants which are not pre-vocalic are simplified to singletons. The syncope rule is given in (11) along with several examples of its application in (11ii). Notice that in (11ii), syncope can be seen as feeding degemination.

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<sup>2</sup> Syncope is obligatory for high vowels, and optional for non-high vowels. In Arabic transcriptions, capitals write consonants with secondary pharyngealization.

(11) Tunisian Arabic unstressed vowel syncope:  $V \rightarrow \emptyset / [\dots\sigma. C\_CV(C)]_{wa}$   
 [+high]

- |                                   |                                      |
|-----------------------------------|--------------------------------------|
| i. conditions for syncope not met | ii. syncope applies (+ degemination) |
| zarbijja ‘rug’                    | zarbiiti ‘my rug’ < /zarbijjiiti/    |
| quffa ‘basket’                    | qúfti ‘my basket’ < /qúffiti/        |
| /fummi/ ‘mouth’                   | fumha ‘her mouth’ < /fúmmiha/        |
| zarbijjítna ‘our rug’             |                                      |
| quffitna ‘our basket’             |                                      |
| fummi ‘my mouth’                  |                                      |

Though McCarthy (1986:241) suggests that regular antigemination effects are found in Tunisian Arabic, this is not the case. As noted by Wise (1983:169-70), in nouns, adjectives, and participles, syncope applies regularly, even when adjacent identical consonant sequences would be created. The examples in (12) illustrate the absence of antigemination in participles.

(12) Tunisian Arabic syncope without antigemination: participles

- |                                   |                                       |
|-----------------------------------|---------------------------------------|
| i. conditions for syncope not met | ii. syncope applies (+ degemination)  |
| a. mityaǰǰif ‘angry (m.)’         | mityaǰǰa ‘angry (f.)’ < /mityaǰǰif-a/ |
| b. mSamim ‘determined (m.)’       | mSamma ‘determined (f.)’ < /mSamim-a/ |

McCarthy’s reference then, must be to forms within verbal paradigms. In fact, the only place where apparent antigemination effects are observed in Tunisian Arabic is in verbs of the form  $CVC_iC_iVC_i$ . When these verbs take a  $-V$  suffix, as shown in (13), the syncope rule operative in (11) and (12) does not apply, despite the fact that phonological environments are parallel to the participles in (12), where syncope does apply.

(13) Tunisian Arabic syncope with antigemination: inflected verbs

- |                                   |  |
|-----------------------------------|--|
| i. conditions for syncope not met | ii. no syncope + degemin. where expected |
| a. mityaǰǰif ‘angry (m.)’         | yaǰǰifju ‘they angered’ (**yaǰǰu)        |
| b. /xaffif-/ ‘alleviate’          | xaffifu ‘they alleviated’ (**xaffu)      |
| c. /qarr-/ ‘decide’               | qarraru ‘they decided’ (**qarru)         |

Why are syncope and antigemination blocked in inflected verbs in Tunisian Arabic, while applying freely elsewhere? As in the hypothetical Klamath derivations shown in (10), the combination of syncope and degemination results in paradigm collapse within the verb system. Many of the  $CVC_iC_iVC_i$  verbs in question are causative forms of  $CVC_iC_i$  stems. Given this, the consequence of syncope + degemination is to essentially undo the templatic morphology associated with causative formation. Wise (1983:170) suggests this possibility, providing relevant examples:

It is possible that the rules [of syncope and degemination: JB] are suspended in this environment to avoid clashes with verbs with a CVCC stem; most CVCCVC verbs are in fact derived morphologically from verbs of CCVC or CVCC type and are therefore quite closely related to them semantically. For example, we find both /qarru/ ‘they admitted’ and /yaǰǰu/ ‘they cheated’ from /qarr+u/ and /yaǰǰ+u/.

In other words, what appears to block phonological rule application in (13ii) is not a phonological constraint, but a morphological one. The forms in (12ii.a) and (13ii.a) provide a minimal pair: in participles, the rules apply, but in verbs, they do not. Within the participle paradigm, verb stems of the form CCVC and CVCC have CVVCVC participles, with vowel length in the first syllable (e.g. *faad* ‘he pulled’, *faadid* ‘pulling, have pulled’). As a result, there is no possibility of homophony arising via syncope between these members of the paradigm, as there is within the class of finite verbs.

The OCP-based account of antigemination in (13ii) can only be rescued by assuming that tier-conflation applies before suffixation of verbal inflection, but after suffixation of nominal inflection, or by equivalent domain restrictions on the OCP itself. This strictly phonological account relies heavily on the manipulation of tier-conflation (or its non-derivational equivalent), and misses the generalization true for both Tunisian Arabic and Klamath: regular phonological alternations may be blocked or unobservable precisely where they result in obliteration of paradigmatic contrasts.

**3.1.2 Iraqi Arabic.** In Iraqi Arabic as described by Erwin (1963:56-58), a syncope rule deletes short vowels from stem-final open syllables when vowel-initial suffixes are added. Iraqi Arabic also has conditioned degemination: as in Tunisian Arabic, geminate consonants which are not pre-vocalic undergo degemination. The syncope rule is given in (14) along with several examples of its application in (14ii).

(14) Iraqi Arabic unstressed vowel syncope:  $V \rightarrow \emptyset / [\dots\sigma.C\_CV(C)]_{wd}$

<p>i. conditions for syncope not met</p> <p>faʃar      ‘hair’</p> <p>xaabar    ‘he telephoned’</p> <p>ybaddil   ‘he changes’</p> <p>ykassir   ‘he breaks’</p>	<p>ii. syncope applies (+ degemination)</p> <p>faʃrak    ‘your hair’ &lt; /faʃar-ak/</p> <p>xaabrat   ‘she telephoned’ &lt; /xaabar-at/</p> <p>ybadluun ‘they change’ &lt; /ybaddil-uun/</p> <p>ykasruun ‘they break’ &lt; /ykassir-uun/</p>
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Notice that, as in Tunisian Arabic, examples like *ybadluun* in (14ii) show syncope feeding degemination: /ybaddil-uun/ → /ybadluun/ → *ybadluun*.

As in Tunisian Arabic, syncope without antigemination is attested. In (15), certain inflected adjectives undergo syncope giving rise to adjacent identical segments. Erwin (1963:242) makes it clear that syncope in this context is optional; nevertheless, it occurs, and leads one to question McCarthy’s general claim that antigemination is a consequence of a general constraint on phonological representations.

(15) Iraqi Arabic syncope without antigemination: inflected adjectives

<p>i. conditions for syncope not met</p> <p>mitraaSis ‘crowded together m.’</p>	<p>ii. syncope applies (optionally)</p> <p>mitraaSis<sub>a</sub>, mitraaSSa ‘crowded together f.’</p> <p>mitraSiSiin, mitraaSSiin ‘crowded together pl’</p>
---	---

However, syncope is consistently blocked in inflected verbs, whether they are associated with CVCCVC (class II) or CVVCVC (class III) templates, as shown in (16).

(16) Iraqi Arabic syncope with antigemination: inflected verbs

- |                                   |  |
|-----------------------------------|--|
| i. conditions for syncope not met | ii. no syncope + degemin. where expected               |
| a. dallal ‘he pampered’           | dallilaw ‘they pampered’ (**dallaw)                    |
| b. jaddad ‘he renewed’            | jaddidaw ‘they renewed’ (**jaddaw)                     |
| c. haajaj ‘he argued’             | haajjaw ‘they argued’ (**haajjaw)                      |
| d. traassas ‘he moved close’      | traassasaw ‘they moved close together’<br>(**traassaw) |

As in Tunisian Arabic, the failure of syncope to apply in (16ii) appears to be determined by a seeming anti-homophony constraint. If verbs of the form CVC<sub>i</sub>C<sub>i</sub>VC<sub>i</sub> or CVVC<sub>i</sub>VC<sub>i</sub> undergo syncope and, in the first case, automatic degemination, under suffixation, they will collapse with inflected CVC<sub>i</sub>C<sub>i</sub> stems from which they are typically derived (Erwin 1963:65-66). For example Class II *tammam* ‘to complete’ is derived from /tamm/ ‘to be complete’. A hypothetical form like \*\**tammaw* ‘they completed’ (< /tammam-aw/) is indistinguishable from *tammaw* ‘they are complete. As in Tunisian Arabic then, the failure of syncope to apply between identical stem consonants in Iraqi verbs may better be explained in terms of paradigm collapse than OCP effects.

**3.1.3 Damascene Arabic.** The facts described for Damascene (Syrian) Arabic by Cowell (1964) are even more strikingly inconsistent with an OCP account than those noted above for other Arabic dialects. In Damascene, syncope optionally applies between adjacent identical consonants if they are both short (17d-eii), but fails to apply between identical consonants if they would produce an identical C<sub>i</sub>C<sub>i</sub> cluster (17iii).

(17) Damascene Arabic syncope: {e,o} → ∅ / [...σ. C\_CV(C)]<sub>wd</sub>

- |                                   |  |
|-----------------------------------|--|
| i. conditions for syncope not met | ii. syncope                                |
| a. btəskon ‘you dwell’            | btəskni ‘you (f. sg.) dwell’               |
| b. bisaaʔed ‘he helps’            | bisaaʔdu ‘they help’                       |
| c. GalTet ‘mistake of’            | GalTTi ‘my mistake’                        |
| d. bihaaʔeʒ ‘to argue with’       | bihaaʔzu, ‘they argue with’ (or bihaaʔeʒu) |
| e. haaTeT ‘having put’            | haaTTe ‘having put, f.’                    |
|                                   | iii. no syncope                            |
| f. bisabbəb ‘he causes’           | bisabbəbu ‘they cause’ (**bisab(b)bu)      |
| g. mSammem ‘determined’           | mSamməme ‘determined, f.’                  |

Precisely in this latter context, degemination is the norm. Notice that the morphological make-up of the cluster is not a factor: In examples like (17d) the identical sequence which results from syncope is tautomorphemic, while in (17e) syncope is blocked in tautomorphemic identical sequences.

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In Damascene, as in the examples above, the underlying cause of antigemination effects appears to be potential paradigm obliteration. Since there is no surface contrast between  $C_iC_iC_i$  and  $C_iC_i$  in the language (Cowell 1964:23-4, 27), in cases where syncope would give rise to  $C_iC_iC_i$ , the contrast between  $CVC_iC_iVC_i$  and  $CVC_iC_i$  templates, so basic to the inflectional system of verbs, is potentially lost.

**3.1.4 Tiberian Hebrew.** McCarthy (1986) claims that Tiberian Hebrew syncope is blocked when a morpheme-internal geminate would be derived (18iii), but can give rise to adjacent identical consonants across morpheme boundaries (18ii.c).

(18) Tiberian Hebrew syncope:  $\text{ə} \rightarrow \emptyset / \dots\sigma. C\_CV$

- |  |  |
|--|--|
| <p>i. conditions for syncope not met</p> <p>a. /zaaxər/</p> <p>b. /haaləχ/</p> <p>c. /hinnen/</p><br><p>d. /Saaləl/</p> <p>e. /saaβəβ/</p> | <p>ii. syncope</p> <p>zaaxrúu ‘they recalled’</p> <p>haalχúu ‘they walked’</p> <p>hinnii ‘behold me’ (&lt; hinnii hinnən-ii)</p><br><p>iii. no syncope</p> <p>Saalélúu ‘they darkened’</p> <p>saaβəβúu ‘they surrounded’</p> |
|--|--|

Odden (1988:467, footnote 11) emphasizes that McCarthy’s entire argument for Tiberian Hebrew rests on the phonetic interpretation of the *shewa* symbol, which can be realized as ə or as nothing, and that the assumed contrast between, e.g. *zaaxərúu* (18a) and *saaβəβúu* (18e), occurs in one of the most controversial environments for interpreting the correct phonetic value of *shewa*. Relevant factors are shown in (19). With not clear basis for McCarthy’s interpretation of *shewa* as schwa vs. zero in (18), we are left to wonder whether the contrast between forms like those in (18ii) and (18iii) ever existed.

(19) Tiberian Hebrew *shewa* (Malone 1986, 1993; Odden 1988)

- a. phonetic value of *shewa* is ə or nothing
- b. grapheme *metheg* is thought to support interpretation of zero, but it is nonmandatory and therefore an unreliable indicator
- c. all cited examples of antigemination in Tiberian Hebrew contain *metheg*, irrespective of surrounding consonants

**3.1.5 Tonkawa.** Our knowledge of Tonkawa, an isolate of central Texas, is based on the collected works of Hoijer (1933, 1946, 1949, 1972). In Tonkawa, as described by Hoijer vowel syncope effects stem vowels which are non-final, preceded by at least one open syllable, and in open syllables themselves. Hoijer (1933:1) refers to stems as ‘themes’ and highlights the fact that vowel elision of this type is limited to themes, and never effects the form of affixes regardless of their position within the word. The syncope rule, stated in (20), is highly lexicalized then, applying only to stem vowels which themselves are both non-final in the stem and non-initial within the word.

(20) Tonkawa syncope:  $V \rightarrow \emptyset / V. C\_CV$   
[+stem] [+stem]

Alternations which this rule is meant to capture are shown in (21), where abstract trivocalic stems /picna/ and /notoxo/ fail to surface with all three vowels intact.

(21) Syncope alternations in Tonkawa

- |               |                        |               |                     |
|---------------|------------------------|---------------|---------------------|
| a. picen      | ‘steer, castrated one’ | f. notox      | ‘hoe’               |
| b. picno?     | ‘he cuts it’           | g. notxo?     | ‘he hoes it’        |
| c. wepceno?   | ‘he cuts them’         | h. wentoxo?   | ‘he hoes them’      |
| d. picnano?   | ‘he is cutting it’     | i. notxono?   | ‘he is hoeing it’   |
| e. wepcenano? | ‘he is cutting them’   | j. wentoxono? | ‘he is hoeing them’ |

Kisseberth (1970) notes that syncope is inhibited if a sequence of adjacent identical segments would be created. In (22), stems with regular syncope are compared with those in which syncope appears to be blocked. Though Kisseberth (1970) attributes this effect to the absence of underlying geminates in Tonkawa, McCarthy (1986) argues that antigemination in Tonkawa is another case where the OCP blocks syncope.

(22) Antigemination effects in Tonkawa

- |                    |                 |                     |                   |
|--------------------|-----------------|---------------------|-------------------|
| i. Underlying stem | ii. syncope     |                     |                   |
| a. /notoxo-/       | notxo?          | (< /notoxo-o?/)     | ‘he hoes it’      |
| b. /picena-/       | picno?          | (< /picena-o?/)     | ‘he cuts it’      |
| c. /yakapa-/       | yakpo?          | (< /yakapa-o?/)     | ‘he hits him’     |
| d. /topo-/         | ketpo?          | (< /ke-topo-o?/)    | ‘he cuts me’      |
|                    | iii. no syncope |                     |                   |
| e. /hewawa-/       | hewawo?         | (< /hewawa-o?/)     | ‘he is dead’      |
| f. /ham’am’a-/     | ham’am’o?       | (< /ham’am’a-o?/)   | ‘he is burning’   |
| g. /totopo-/       | ketotopo?       | (< /ke-to-topo-o?/) | ‘he cuts me rep.’ |

The reanalysis of antigemination proposed here, follows Hoijer’s morphological analysis of Tonkawa closely. Of primary importance is the recognition that all sequences showing apparent antigemination effects are reduplicated C<sub>i</sub>V<sub>i</sub> sequences. A close examination of all examples of stem-internal C<sub>i</sub>VC<sub>i</sub> strings in Tonkawa, where V is a potential syncope target suggest that CV-reduplication is always involved. Reduplication in Tonkawa is used to productively mark repetitive aspect as well as plural subject or object, as shown by the pairs in (23) which are shown in their underlying (non-syncope) forms.

(23) Productive CV-reduplication in Tonkawa (pre-syncope forms)

- |     |                           |                              |                            |
|-----|---------------------------|------------------------------|----------------------------|
| i.  | <u>Non-repetitive</u>     | <u>repetitive</u>            |                            |
|     | /topo-/                   | /totopo-/                    | ‘to cut (it) off’          |
|     | /nota-/                   | /nonota-/                    | ‘to touch’                 |
|     | /kayce-/                  | /kakayce-/                   | ‘to be chopped off’        |
|     | /nawele-/                 | /nawewele-/                  | ‘to spread out a fabric’   |
|     | /tama?axe-/               | /tatama?axe-/                | ‘to be smashed, shattered’ |
|     | /notoxoko-/               | /nototoxoko-/                | ‘to expectorate’           |
|     | /yapece-/                 | /yayapece-/                  | ‘to sew, make clothes’     |
| ii. | <u>non-plural subject</u> | <u>plural subject/object</u> |                            |
|     | /nataya-/                 | /natataya-/                  | ‘to choose, select’        |

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/panoxo-/	/panonoxo-/	‘to bathe’
/napasxa-/	/napapasxa-/	‘to play ball’
/noko-/	/nonoko-/	‘to pick up’
/yatisxe-/	/yatitixse-/	‘to butt’

In some cases, reduplication holds of the first stem element like /to-to-po/ in (22g), while in other cases, it is the second stem element which is reduplicated as in /ha-m’a-m’a/ (22f). In some instances, reduplicated forms are somewhat semantically opaque, but synchronic evidence for a reduplicated base is still present. This is the case for /hewawa-/ ‘die, be dead, be killed’ (22e), with mediopassive prefix /he-/ , to which we can compare /hehewa-/ ‘to stop dying; recover (from an illness)’ (Hoijer 1933:42-43), and /ham’am’a-/ ‘to burn’ (22f) with /ha-/ prefix (Hoijer 1933:39-42), and /m’a-/ theme also found in /m’a-ye-/ ‘set fire to’ (Hoijer 1946:301).

As noted by Hoijer (1933:7), reduplicated  $C_iV_i$  sequences have either the form  $C_iV_iC_i$  or  $C_iV_iC_iV_i$ . In other words, no reduplicated string ever undergoes syncope of the first vowel of the derived  $C_iV_iC_iV_i$  string, while some reduplicated strings will lose their second vowel, if it is in the context for syncope (20) to apply. In addition to the syncope rule in (20) then, reduplicated stems must be lexically marked as to whether their second vowel can or cannot undergo the syncope rule. Examples of these two reduplicated stem types are illustrated in (24). Notice that the failure of vowels to syncope in (24ii) is entirely independent of phonotactics: when the stem is not reduplicated, syncope occurs between the same two consonants as shown in the plural object forms.

### (24) Lexical syncope in reduplicated $C_1V_1C_2V_2$ strings

#### i. Syncope of $V_2$

yataso?s	‘I stab him’
yaytaso?s	‘I stab him rep.’
/ya-yatasa-o?/	
coxno?s	‘I sleep’
cocxa:yewo?	‘several sleep together’
/co-coxa:-yewa-o?/	

#### ii. No syncope of $V_2$

komo?s	‘I suck it’
kokomo?s	‘I suck it rep.’
cf. wokmo?s	‘I suck them’
topo?s	‘I cut it’
totopo?s	‘I cut it rep.’
cf. wetpo?s	‘I cut them’

What then accounts for the failure of syncope in forms like (22e-g)? I suggest that, as in the Arabic cases reviewed earlier, syncope is blocked just when its output would give rise to paradigm collapse. In this case, as in others, a regular degemination process is active in Tonkawa. As described by Hoijer (1946:292): “combinations of identical consonants always unite to form a single consonant.” Examples of degemination across morpheme boundaries are illustrated in (25).

### (25) Regular degemination in Tonkawa

<u>Underlying form</u>	<u>Surface form</u>	<u>gloss/text</u>
a. /tanmaslak-k <sup>w</sup> a:low/	tanmaslak <sup>w</sup> a:low	‘jackrabbit’ [T2.1]

- b. /yakon-nacaka-.../ yakonacka:tewa:nes 'I'll knock you unconscious' [T1:4]  
 c. /ha:csokonay-yayka'ay/ ha:csokonayayka'ay-'a:la 'wolves-quot.' [T4:7]

Now consider the effect of syncope + degemination in the reduplicated forms where syncope appears to be blocked. Hypothetical derivations are in (26).

(26) Tonkawa  $C_1V_1-C_2V_2$  strings, syncope, and degemination

<u>Base</u>	<u>RED with hypothetical syncope + degemination</u>
a. /hewa-/	/hewawa-/ > hewwa- > **hewa- 'to die'
b. /ham'a-/	/ham'am'a-/ > ham'm'a > **ham'a- 'to burn'
c. /CV-topo-/	/CV-totopo-/ CV-ttopo- **CV-topo- 'to cut'

As with the Klamath data in (10), if syncope and degemination apply, repetitive and plural subject/object forms derived via reduplication will have exactly the same stem shape as the bases from which they are derived. Unlike Klamath, there are few if any forms outside of those involving reduplication where both syncope and degemination are applicable. However, an independent rule of stem-final vowel loss can feed degemination. As shown in (27), in compounds like those in (25), stem-final vowel loss gives rise to geminates which are subject to degemination.

(27) Final vowel loss (+ degemination ): no antigemination in

- a. /yakona-nacaka-.../ yakonacka:tewa:nes 'I'll knock you unconscious' [T1:4]  
 b. /yas?ene-nacaka-.../ yas?enwencaka 'it was cutting them to death' [T19:11]  
 c. /yakexe-xakana-.../ /yakexakana-/ 'to push it down hard' [D:485.1]

As in the three Arabic dialects examined above, it is not a distinction between tauto- and heteromorphemic identical sequences which determines the distribution of antigemination effects. In productive reduplications like *totopo-*, where syncope is blocked, the CV reduplicative affix is arguably a distinct morpheme in Tonkawa. McCarthy's (1986) proposal that syncope is always blocked between tautomorphemic segments, but only sometimes blocked between heteromorphemic segments, is unsuccessful in predicting precisely where antigemination effects will occur. Antigemination in Tonkawa and the other languages examined above is not a general feature of sound patterns. It is in evidence precisely where vowel loss combined with other regular sound patterns would result in the phonological identity of two morpho-syntactically distinct forms within a paradigm. In the case of Tonkawa, syncope combined with degemination would result in merger of reduplicated and non-reduplicated stems which distinguish the inflectional paradigms in (23).

**3.1.5. Modern Hebrew.** McCarthy (1986) includes Modern Hebrew as a language with antigemination effects. The facts he cites in support of this are shown in (28).

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### (28) Modern Hebrew *e/ø* alternations in suffixed stems

<p>i. conditions for syncope not met</p> <p>a. <i>kaʃar</i> 'he tied'</p> <p>b. <i>kuʃar</i> 'he was tied'</p> <p>c. <i>hitkaʃer</i> 'he contacted'</p> <p>d. <i>nadaʔ</i> 'he wandered'</p> <p>e. <i>kuʃec</i> 'he was cut'</p> <p>f. <i>titpaʔel</i> 'I will pray'</p>	<p>ii. syncope applies</p> <p><i>kaʃru</i> 'they tied'</p> <p><i>kuʃra</i> 'she was tied'</p> <p><i>hitkaʃru</i> 'they contacted'</p> <p>iii. no syncope</p> <p><i>nadeʔu</i> 'they wandered'</p> <p><i>kuʃeca</i> 'she was cut'</p> <p><i>titpaʔeli</i> 'thou (f.) will pray'</p>
---	---

In this case, Modern Hebrew differs quite dramatically from Arabic, and Tiberian Hebrew, where stems of the form shown in (28d-f) are always  $CVC_iC_i$ , -monosyllabic with a final geminate, when followed by a vowel. Under McCarthy's general analysis, antigemination was violated consistently in bilateral roots of this sort in the history of Arabic and Hebrew.

A clear alternative to McCarthy's interpretation of the Modern Hebrew pattern is that, geminates in Modern Hebrew have a peculiar unnatural history themselves. The absence of a length contrasts in the majority of Eastern European languages of the mid-nineteenth century, may have directly influenced the newly arising secular language. In this case, it could be that the historical geminate/non-geminate contrast was replaced with a  $C_i$  vs.  $C_i\epsilon C_i$  contrast directly. Since the syncope rule in question is not an innovation, the remapping of singleton/geminate contrasts can be seen to work on the output of the historical syncope rule. I have schematized the analysis in (29).

### (29) Modern Hebrew reflections of historical $C_i$ vs. $C_iC_i$ contrasts

Mappings from the output of historical syncope:

Pre-Modern Hebrew		Modern Hebrew
$[\dots C_i \dots]_{\text{stem}}$	↔	$[\dots C_i \dots]_{\text{stem}}$
$[\dots C_i C_i \dots]_{\text{stem}}$	↔	$[\dots C_i \epsilon C_i \dots]_{\text{stem}}$

An alternative is to adopt an analysis parallel in nearly all respects to that made for Tonkawa above. If stems like *nadaʔ* (28d) are viewed as partial reduplications of *nad-*, as suggested in Glinert (1989:460), then syncope plus degemination will result in neutralization of the paradigmatic contrast. Assuming regular degemination, what blocks syncope is the neutralization of distinct morphosyntactic paradigms.

### 3.2 Rule inversion and paradigm effects in East Cushitic.

Data from Afar, an East Cushitic language, was presented in (1). The Cushitic languages are distant cousins of the Semitic languages. In a very recent quantitative and comparative study of Somali, Afar, Rendille and Oromo, Barillot (2002) demonstrates that all of these languages show evidence of root OCP effects, and templatic non-concatenative morphology, well known from studies of their distant Semitic cousins (e.g. McCarthy 1981, 1982).

Within this context, Barillot (2002) also reviews the status of antigemination in these East Cushitic languages. One of his most significant findings in this area is that, in Somali, there is a correlation between syncope and identity of vowel quality between  $V_1$  and  $V_2$  in  $CV_1CV_2C$  stems. The general facts for Somali verbs are summarized as in (30). From a historical point of view, it is clear that the majority of CVCVC stems have the same vowel in both syllables because they are the result of vowel copy. The historical process is illustrated in (31), where Proto-East Cushitic is abbreviated PEC. Given historical evidence for vowel copy epenthesis, the generalizations in (30) follow from historical rule inversion: vowels which are historically present do not syncope, while those which are historically inserted may take part in V/zero alternations.

(30) Salient characteristics of CVCVC verbs in Somali (Barillot 2002:279)

- a. The majority of CVCVC stems have identical vowels in both syllables.
- b. When CVCVC stems have two distinct vowels, *there is no syncope*.

(31) East Cushitic vowel copy:  $*CV_iCC- > CV_iCV_iC- / \_ \{C, \#\}$

- a. PEC *\*bull-* ‘flour’; Afar *bulul* ‘become pulverized’; Oromo *bull-aw-* ‘become pulverized’
- b. PEC *\*hizz-* ‘yam, creeper’; Somali *hidid*; Bayso *hidid*; Oromo *hidd-a*.
- c. PEC *\*kilm-* ‘tick’; Afar *kilim*, Oromo *film-a*.

However, in Somali, as in Afar, Rendille and Oromo, vowels are not lost between identical consonants in  $CVC_iVC_i$  stems even when vowels are identical. Barillot (2002) demonstrates that in some cases, this is because the medial consonant in Somali is (historically) geminate. For the remaining cases, he posits abstract underlying forms: stems like *barar-* ‘enfler’, he claims, are underlying quadrilateral  $C_1VC_2C_1VC_2$  stems, with an empty onset to the second syllable (op cit. p.445). By assuming that these stems involve -CVC reduplication, Barillot at once accounts for the identity in vowels and consonants. The abstract medial empty onset is part of a consonant cluster and the structural description of the syncope rule is not met.

Barillot extends this abstract analysis to Afar, Rendille and Oromo where  $CVC_iVC_i$  stems also resist syncope, as illustrated in (32), from (Barillot 2002:465).

(32) East Cushitic antigemination effects in  $CVC_iVC_i$  verb stems

	Afar		Rendille		Oromo	
	<i>se marier</i>	<i>parler</i>	<i>avoir mal</i>	<i>se regrouper</i>	<i>traire</i>	<i>griffer</i>
1s/3ms	<i>digba</i>	<b>walala</b>	<i>bolxa</i>	<b>urura</b>	<i>elma</i>	<b>tarara</b>
2s/3fs	<i>digibta</i>	<i>walalta</i>	<i>boloxta</i>	<i>ururta</i>	<i>elemta</i>	<i>tararta</i>
1p	<i>digibna</i>	<i>walalna</i>	<i>boloxna</i>	<i>ururra</i>	<i>elemna</i>	<i>tarama</i>
2p	<i>digibtan</i>	<i>walaltan</i>	<i>boloxtaan</i>	<i>ururtaan</i>	<i>elemtani</i>	<i>tarartani</i>
3p	<i>digban</i>	<b>walalan</b>	<i>bolxaan</i>	<b>ururaan</b>	<i>elmani</i>	<b>tararani</b>
CAUS/	<i>digbise</i>	<b>walalise</b>	<i>bolxica</i>	<b>ururica</b>	<i>elmama</i>	<b>tararama</b>
PASS	<i>marier</i>	<i>faire parler</i>	<i>faire mal</i>	<i>regrouper</i>	<i>être trait</i>	<i>être griffé</i>

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In (33) I summarize the descriptive facts for  $CVC_iVC_i$  stems which hold for all four East Cushitic languages.

- (33) Salient characteristics of  $CVC_iVC_i$  verbs in East Cushitic
- a. The second stem vowel does not alternate with zero
  - b. The final consonant is never guttural.
  - c. Vowels in the first and second syllable are identical.

Generalizations (33b,c) follow from the historical analysis presented in (31). Stems of the form  $CVC_iVC_i$  are derived from  $*CV_iC_jC_j$ - stems. It follows that consonants, like gutturals, which are not geminable, will not surface in these forms, and that the vowel in the second syllable will be a copy of the first, since vowel-copy epenthesis is involved. The generalization we need to account for now is that in (33a): why is it that all East Cushitic languages show antigemination in stems of this sort? Since the vowel/zero alternation originally involved vowel-insertion, not vowel deletion, there is no natural history of this process which involves a gradual evolution from phonetic to phonological syncope.

I suggest that in this case, rule inversion is coupled with clear paradigm uniformity effects. In all four East Cushitic languages under discussion, there is synchronic degemination in word-final and pre-consonantal position, as in (34).

(34) East Cushitic degemination:  $C_iC_i \rightarrow C_i / \_ \{C, \# \}$

As a consequence, under suffixation,  $CVC_iC_i$ - stems in the modern languages undergo regular degemination before consonant-initial suffixes, and word-finally. Some of these geminate final stems are lexical (Afar *obb*- 'hear'), but others appear to be the result of regular word-formation processes (e.g. Afar geminate-final imperatives). For the second class, stem-final gemination is morphological. In this case, paradigm leveling occurs precisely where syncope would give rise to a stem-final geminate which is not morphological. As in Tonkawa, it is the morphological or morphotactic non-identity of two stem types (reduplicated and non-reduplicated in Tonkawa, final geminate vs. final  $C_iVC_i$  in East Cushitic) which is maintained under antigemination.

While this analysis involving paradigm leveling has a slightly different character from the direct anti-homophony effects seen in Arabic and Tonkawa, it is supported by facts from Arbore (Hayward 1984), where leveling has not occurred in  $CVC_iVC_i$  stem which reflect historical  $*CVC_iC_i$ -. In (35) relevant sub-paradigms are shown for three different stem-types:  $CVC_iC_i$ - stems,  $CVCVC$ - stems where the second vowel is non-alternating, and  $CVC(V)C$ - stems where the second vowel, in parentheses, alternates with zero in precisely the environments predicted by the historical reanalysis of (31) as vowel insertion.

(35) Some Arbore verb subparadigms (Hayward 1984:274-285).

	<u>2s perfect</u>	<u>2s imperative</u>	<u>1s perfect</u>
i. $CVCVC$ - stems			
ʔeruc- 'vomit'	ʔeructe	ʔeruc	ʔeruce
tatab- 'want'	tatatte	tatap	tatabe
kulil- 'warm oneself'	kulilte	kulil	<b>kulile</b> } cf. bold forms in (35)
harar- 'hurry, be fast'	hararte	harar	<b>harare</b>

ii. CVC<sub>i</sub>C<sub>i</sub>- stems

horr- 'chase'	horte	hor	horre
fuss- 'miss'	fuste	fus	fusse
laww- 'milk'	lawte	law	lawwe
fayy- 'be saved'	fayte	fay	fayye

iii. CVC(V)C- stems

zer(e)n- 'pierce'	zerente	zeren	zerne
war(a)b- 'fetch water'	waratte	warap	warbe
k'in(i)n- 'sting'	k'ininte	k'inin	k'inne <sub>i</sub> expected under rule inversion;
k'ad(a)d- 'shut'	k'adatte	k'adat	k'adde no antigemination

Note that CVC<sub>i</sub>VC<sub>i</sub>- stems which would violate antigemination under syncope fall into two lexical classes: those where the vowel is lost (violating antigemination), and those where the vowel is maintained, as in the related languages in (32). Since the Arbore system comes closest to representing the sound change with rule inversion, it supports an analysis in which the extension of non-alternating CVC<sub>i</sub>VC<sub>i</sub>- stems in other East Cushitic languages is due to analogical change.

4. Natural History.

In Blevins (to appear), I suggest that, despite the seemingly unnatural histories just examined, there is a potential natural history for antigemination effects. I propose that antigemination is a transient stage which occurs when syncope sound changes innovate in languages with pre-existing geminate/singleton contrasts. The critical observation is that, at the stage of variation before sound change occurs, unstressed vowels in the syncope environment are reduced. If a reduced vowel can be re-interpreted as consonant release, or as a simple phonetic transition from one consonant to the next, then vowel loss is phonologized. However, in languages where underlying geminates occur, the audible release between identical consonants (or homorganic ones) in the syncope context will result in temporary resistance to their categorization by language learners as the same phonological entities as underlying (full or partial) geminates. These rearticulated identical elements will resist interpretation as geminates, because in true geminates, there is no release between the two 'halves' of the geminate consonant. At the same time, patterns of coarticulation will be expected to reduce or eliminate the open transition over time, so that eventually, despite the perceptual basis for resistance to syncope between geminates in such languages, if no other factors interfere, syncope should eventually occur. In all of the cases examined above, there is evidence that syncope can and will apply between identical consonants, unless paradigmatic constraints are operative. However, there is at least one known language where antigemination may perhaps be seen in its pure and natural state.

In Central Alaskan Yup'ik (CAY), with underlying geminate/non-geminate contrasts, schwa syncope applies across the board to unstressed vowels in the VC CV context, unless the two consonants are identical (Miyaoaka 1971, Reed et al. 1977, Woodbury 1982, Woodbury 1987, Woodbury personal communication, 2003). In this case, there is gemination of the post-schwa consonant, since in general schwa is not licit in unstressed open syllables. In Hooper Bay Chevak, the usual situation is for schwa to delete even when surrounded by identical consonants. Following Woodbury (1982), McCarthy (1986:245) is very explicit about the output of syncope in Hooper Bay Chevak: "The result of deleting schwa

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between identical consonants in no case merges with a true one-to-many geminate. Rather, the cluster of identical consonants is produced with a medial release that, in sonorant environments, is a full-fledged vowel...In no case does the derived cluster merge with a true geminate.” Representative forms are in (36).

(36) Syncope and antigemination in Central Alaskan Yup'ik

	/kəmə-ni/	/kəmə-mi/	/ənə-ni/
General CAY	kəmni	<b>kəməmmi</b>	<b>ənənni</b>
Hooper Bay Chevak	kəmni	kəm <sup>o</sup> mi	ən <sup>o</sup> ni
	‘his own flesh’	‘of his own flesh’	‘house-loc.sg.’

McCarthy’s account of the two differing dialects relies on representational differences which result from tier conflation. Morphemes are represented on separate tiers, which are conflated at some point in the derivation. If morphemes are on separate tiers, and syncope applies between identical consonants in different morphemes, the output of syncope will not violate the Obligatory Contour Principle, since adjacency is only defined tier-internally. The account is summarized in (37).

(37) An OCP-based account of Yup'ik dialect differences in vowel syncope

	<u>antigemination</u>	<u>rule type</u>	<u>tier conflation</u>
General CAY	yes	post-lexical	yes
Hooper Bay Chevak	no	late lexical	no

To my knowledge, no additional support for the distinction in rule type proposed by McCarthy exists, nor is there any evidence that syncope in Hooper Bay Chevak is anything but post-lexical. It is clearly not structure preserving, producing rearticulated adjacent identical consonants, and also follows other rhythmic rules which appear to be post-lexical (Woodbury 1982, 1987). McCarthy (1986:245) himself admits that “the distinction in the domain of syncope cannot as yet be independently motivated.”

I suggest that the difference between General CAY and Chevak reflect the natural evolution of syncope rules. While pre-existing length contrasts and morphological effects may inhibit the progress of syncope between identical consonants, coarticulatory effects may eventually win out, as in the phonetic alternations illustrated earlier in (3). Central Alaskan Yup'ik stands out in the classification of languages presented in (5.I). In all other languages, templatic morphology defines whole paradigms or subparts of them. In all other languages, gemination can be the primary exponent of a morphological contrast, and this morphological contrast can, in effect, give rise to unnatural phonologization of the transient sound pattern defined by General Yup'ik.

Though the natural evolution of antigemination in Yup'ik appears to be unique cross-linguistically, this evolutionary stage (without Yupik-specific post-schwa gemination) is posited as a transient one for all phonetically natural synscopes in which a pre-existing geminate/non-geminate contrast exists. What is rare is for this transient state to be phonologized without the interference of factors external to phonetic naturalness. In all of the cases reviewed in section 3, a pre-existing morphological contrast appears to influence the grammaticization of antigemination. In Central Alaskan Yup'ik, the independent rule of post-schwa

geminataion (completely generalized in other dialects) may also have played a role: once unstressed  $C_i\text{ə}C_i$  sequences are produced as  $C_i\text{ə}C_iC_i$ , syncope is further inhibited, since the schwa is no longer in an open syllable. Since Chevak lacks the post-schwa gemination rule, syncope is not further inhibited, and naturally extends itself to  $C_i\text{ə}C_i$  sequences as well.

### 5. Explanation in Evolutionary Phonology.

The working hypothesis of Evolutionary Phonology is that common sound patterns typically result from common phonetically motivated sound change. Among these common sound patterns are the general syncope patterns examined above: in all but the East Cushitic case, synchronic syncope alternations mirror, to a great extent, phonetically natural syncopating sound changes. The specific question I have addressed in this study is whether the failure of syncope to apply between identical consonants in unrelated languages can also be viewed as phonologization of a phonetically natural effect. A survey of syncopating sound changes in which antigemination is not found suggests that non-phonetic processes are involved. All languages surveyed in section 3 show strong correlations between antigemination and homophony avoidance within paradigms. Nevertheless, in at least one language, Central Alaskan Yup'ik, antigemination shows no morphological conditioning and appears to have a near-natural history interrupted only by the existence of post-schwa gemination.

Does antigemination have a natural history? The answer within Evolutionary Phonology is complex: yes and no. Sequences of identical consonants which occur as variants of unstressed  $C_iVC_i$  sequences will more readily resist reinterpretation as geminates in languages with pre-existing consonantal length contrasts than in languages without them. If independent self-organizing principles of morphological analysis (i.e. morphological analogy) intervene during the course of language acquisition, antigemination may emerge as a consequence. However, where pre-existing length contrasts are absent, antigemination cannot have a natural history. If it is observed, as in Tonkawa, it is predicted to fall into the class of unnatural histories. Where it is not observed, as in the history of Munsee sketched in (4), the expected natural history of syncope continues uninterrupted.

How are the same facts, correlations and tendencies to be accounted for in purely synchronic terms? In sections 1 and 2 I outlined several problems for previous synchronic accounts of antigemination. McCarthy's (1986) approach is undermined by its dependence on multi-tiered representations (including long-distance geminates) and the operation of tier-conflation, both of which have been eliminated from standard Optimality-theoretic treatments (Gafos 1998, Keer 1999, Kager 1999). Odden's suggestion that the OCP is not a component of Universal Grammar leaves us in an even weaker position to understand the fundamental nature of the sound patterns in question.

The only well developed synchronic alternative to McCarthy (1986) I am aware of is the general account suggested by Rose (2000). Under her account, antigemination is still a phonological OCP effect, but the OCP operates only on  $C_iVC_i$  sequences, since any surface  $C_iC_i$  sequence in a given domain is claimed to be geminate and does not violate the OCP. Such geminates do, however, violate the NO-GEM constraint. The OCP and NO-GEM have distinct rankings in different languages, and McCarthy's tier-conflation is translated into domain-specific constraints. A serious empirical problem with Rose's account is her assumption that "any output sequence of two identical consonants within the same

domain...constitutes a geminate, a single consonant with long duration. This is in line with phonetic evidence, which has found no distinction between surface true and fake geminates..." (Rose 2000:101). However, in McCarthy's original article, he notes that in languages like Modern Hebrew and Hooper Bay Chevak, precisely this contrast occurs: derived sequences of identical consonants can be rearticulated, but underlying geminates cannot.<sup>3</sup>

However, the fundamental problem I see with the range of synchronic approaches is not technical or empirical, but explanatory. While it is straightforward for synchronic approaches to reframe analyses of the antigemination cases described above in terms of the interaction of phonological constraints with morphological anti-homophony constraints (Yip 1998, Crosswhite 1999), or paradigm uniformity effects (Kenstowicz 1996, Benua 1997, Steriade 2000, McCarthy 2002, etc.), such accounts fail to make the same range of predictions as the historical approach advocated here. In (38) I highlight some of these predictions, and present them as a challenge for competing synchronic analyses.

The correlation in (38a) is a consequence of the unnatural histories involved in the majority of antigemination cases reported in the literature, as reviewed in this study. The phonological pattern ruled out in (38b) follows from our phonetic understanding of syncope and sound changes. Though certain variable  $C_1^i C_2$ ,  $C_1^o C_2$  sequences (where  $^i$  is a short unstressed vowel) may prove more resistant to (re)analysis as  $C_1 C_2$  than others, there is a strong phonetic tendency for adjacent identical consonants to merge into single segments over time. Only when non-phonetic analogical effects intervene, is there a recurrent pattern of grammaticized antigemination effects.

(38) Predictions of Evolutionary Phonology regarding syncope and antigemination

- a. Antigemination is strongly correlated with languages which have either lexical geminate/non-geminate contrasts or degemination.
- b. Pure antigemination as a regular feature of an exceptionless phonological syncope alternation with origins in unstressed/weak vowel loss is rare or non-existent. (General CAY is 'impure', due to post-schwa gemination).
- c. In languages with only open syllables, production constraints may result in syncope between identical consonants only. (Blevins, 2003)

Finally, in (38c), I suggest a phonetic explanation for a recurrent pattern not discussed in this paper, but clearly related: in many languages with only open syllables, syncope occurs only between identical or homorganic consonants (Blust 1990; Odden 1988). Within synchronic accounts, the OCP and NO-GEM must both be low ranking, and an additional constraint must be invoked to rule out heterorganic sequences. The alternative is to note that in languages with only CV syllables, there is already an articulatory pattern that each consonantal feature complex must be released into a vowel. The only derived clusters which can be produced with this pattern intact are geminates or homorganic ones. There is no

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<sup>3</sup> Similar facts are detailed for Imdlawn Tashlhiyt Berber by Dell and Elmedlaoui (1996).

reference to the OCP, NO-GEM, or any additional synchronic markedness constraints. The sound pattern is predicted by a simple interaction of syncope under pre-existing patterns of C-V coarticulation (Blevins 2003).

While the primary focus of this study is antigemination, I hope to have demonstrated more generally the extent to which Evolutionary Phonology provides a concrete model in which natural and unnatural sound patterns can be identified and, ultimately, understood.

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