

## Remarks and Replies

### Anti Antigemination and the OCP

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In this article I consider arguments for the Obligatory Contour Principle (OCP) presented by McCarthy (1986). The version of the OCP proposed by McCarthy is that "At the melodic level, adjacent identical elements are prohibited" (p. 208). The controversy concerns how this principle is implemented and whether it is a universal. McCarthy claims that the OCP is a universal in nontonal phonology holding for underlying and derived representations and that a phenomenon termed Antigemination provides support for the OCP. Given the tonal arguments of Odden (1986) that the OCP is not universal, it would be surprising if the OCP were a formal universal in nontonal phonology but the residue of a language-learning problem in tonal phonology. The following claims will be important here:

- (a) The OCP is an absolute principle of Universal Grammar (UG).
- (b) Tautomorphemic vowels and consonants may be represented on separate tiers.
- (c) At some point in the derivation, representations with multiple tiers are mapped onto a representation with a single tier (Tier Conflation). Tier Conflation is identified with Bracket Erasure and therefore is part of the lexical phonology.
- (d) Phonological rules are prohibited from creating an output that violates the OCP (Antigemination).
- (e) Lexical representations must obey the OCP.

I argue that these claims must be significantly modified, clarified, or rejected.

First, the possibility that vowels and consonants occupy separate tiers on a language-specific basis radically expands the power of phonological theory and predicts unattested patterns of inalterability and across-the-board rule application. Second, the conclusion

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that the OCP entails the Antigemination effect does not follow logically from the existence of any version of the OCP in UG, is falsified in a number of languages, and leaves unexplained a family of related effects referring to identical consonants. The domain where the OCP seems to apply is the root node, but Antigemination and related properties are properties of place of articulation in consonants. Finally, the OCP in its most general form (disallowing adjacent identical matrices, without reference to the specific tiers being constrained) is false. Multiple occurrences of single features (voicing, nasality, and so on) can stand next to each other without violating the OCP. Much of the problem with testing the universality of the OCP derives from unclarity regarding the organization of features and the precise unit constrained by the OCP. McCarthy's version of the OCP operates "at the melodic level"; it is unclear what constituent the melodic level is. McCarthy points to examples of the OCP involving voicing in Japanese and allows Antigemination to operate in Syrian Arabic without requiring identity in voicing or pharyngealization, which suggests that he has in mind a version of the OCP that considers a portion of the features constituting a segment. Since most examples of the OCP involve identity in consonants computed at the root node in the sense of Clements (1985), one might consider a restricted version of the OCP applying at the root node. This would render a number of McCarthy's examples of the OCP, such as those from Semitic, irrelevant to the issue of the universal OCP. Still, counterexamples to the OCP will be shown to exist even at the level of totally identical segments.

The claim that the OCP is a universal principle is supported by two arguments. The first comes from lexical distribution of geminate consonants and their interaction with inalterability and integrity principles (see Hayes (1986) and Schein and Steriade (1986)). The ingenious new argument that McCarthy presents for the OCP is based on the "Antigemination" restriction on Syncope, which is found in Iraqi Arabic, a language with a rule deleting an unstressed vowel in a doubly open syllable. If the flanking consonants are identical, Syncope is blocked.

- (1) a. xaabar 'he telephoned'      xaabr-at 'she telephoned'  
           haajaj 'he argued'        haajij-at 'she argued'
- b. Syncope  
 $V \rightarrow \emptyset / V(C)C \text{ — } CV$

The proffered explanation for this restriction is that application of Syncope in *haajij*at would yield a structure with two adjacent instances of *j*.

- (2)  $\begin{array}{ccccccc} \text{h} & \text{a} & \text{j} & \text{i} & \text{j} & \text{a} & \text{t} \\ | & \wedge & | & | & | & | & | \\ \text{C} & \text{V} & \text{V} & \text{C} & \text{V} & \text{C} & \text{V} & \text{C} \end{array} \rightarrow \begin{array}{ccccccc} \text{h} & \text{a} & \text{j} & \text{j} & \text{a} & \text{t} \\ | & \wedge & | & | & | & | & | \\ \text{C} & \text{V} & \text{V} & \text{C} & \text{C} & \text{V} & \text{C} \end{array}$

Application of Syncope in (2) yields a structure violating the OCP, so Syncope cannot apply. If Antigemination can be deduced directly from a universal OCP, Antigemination should also be universal. In fact, Antigemination is not universal—it is an independent effect requiring independent explanation. Such an explanation will be offered below.

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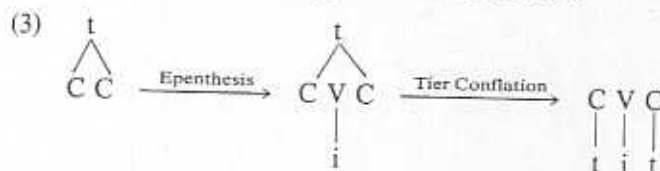
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### 1. The OCP and Independent Vowel/Consonant Tiers

The first issue is the assumption that consonant and vowel features may be represented on separate planes. McCarthy uses this assumption in a number of languages to expand the domain of the OCP beyond the usual case of adjacent identical segments. Taking Classical Arabic as representative, it is often assumed that vowels and consonants are on separate tiers, since the lexical entry for roots specifies only a set of consonants. Components of inflection and derivation specify CV templates and the vocalic elements to be associated with V slots. Hence, vowels and consonants are separate morphemes.<sup>1</sup>

The morphemic separation of vowels and consonants in Semitic does not license the separation of tautomorphemic vowels and consonants in other languages. Semitic languages do not provide strong evidence bearing on this issue since consonants and vowels generally represent separate morphemes. However, "vowels" (that is, [+high] vocalics) do appear on the same tier as true consonants within root morphemes in Arabic; roots may contain glides (for example, *lqy*). Since glides function as consonants for the mapping rules, Arabic weakly counterexamples the independent vowel plane approach.

There are theoretical reasons to reject the phonological separation of vowels and consonants into distinct tiers, unless such a separation can be persuasively motivated. Since consonants and vowels share phonetic features, the separation of vowels and consonants cannot be based on a principled decision as can the separation of tone and tone-bearing units. A more serious problem with the independent vowel plane is that it allows circumvention of the constraints on integrity of geminates. As the derivation in (3) shows, an epenthetic vowel may appear on one tier between the C-slots of a geminate consonant without violating the prohibition against crossing association lines. By Tier Conflation, the epenthetic vowel appears phonetically between the halves of a geminate. (In parallel examples from Semitic, Tier Conflation is assumed to induce segment mitosis as a way of preventing crossing of association lines.)

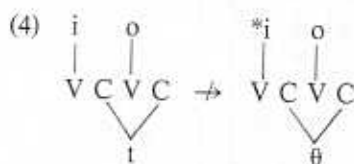


If consonants and vowels stand on separate tiers, geminate integrity is inexplicable, so constraints on the separation of vowel and consonant tiers are imperative. Along the lines suggested by Steriade (1986, 129–130) I assume that "segmental matrices belong to distinct planes if and only if they belong to distinct morphemes."

A third problem relates to the interaction between the OCP and consonant/vowel

<sup>1</sup> Although vocalic patterns are partially provided by morphology, verbs must be provided with some indication of their vocalism for the most basic form, binyan I active perfective and imperfective. Certain verbs select the vocalic pattern *a . . . u* (*jadaba* 'become dry'), others select *a . . . i* (*jaḍila* 'be happy'), and still others select *a . . . a* (*jaḍaba* 'to pull').

separation. Just as strictly adjacent identical segments exhibit inalterability, so should "long-distance geminates." A consonant might be immune to postvocalic lenition when followed by an identical consonant, immediately or separated only by vowels.



In the case of a rule not constrained by inalterability, across-the-board rule application should prevail. Assuming palatalization of *t* after *i* in (4), both manifestations of *t* should palatalize, giving *it'ot'*. No good cases of long-distance integrity or across-the-board rule application have been found in the languages where a vowel/consonant separation is proposed (Rotuman will be discussed below). If separate vowel/consonant tiers are not allowed, the lack of such effects is explained.

### 1.1. Semitic Root Structure

Following Greenberg (1950), McCarthy notes that stems of the form  $C_1VC_iVC_j$  (*\*ddj*) are ruled out in Arabic, but stems of the form  $C_jVC_iVC_i$  (*jdd*) are allowed. The explanation for the restrictions on consonants in roots depends on three assumptions. First, roots contain only consonants. Second, all spreading in Arabic is rightward. Third, Arabic roots obey the OCP.

The facts regarding Arabic (and Semitic) roots are more complex than this. Greenberg (1950) suggests more general constraints on root structure, stated in terms of homorganicity, not identity. Greenberg's generalization is that barring roots such as *jdd*, no root contains two homorganic consonants in any position. He notes (p. 162),

In the first two positions, not only identical but homorganic consonants are excluded. For example, no Semitic language has triconsonantal verb morphemes beginning *bm-*, since this would involve two labials, or *gk-*, since such a form would contain two velars in the first or second positions.

Greenberg also notes that there are few roots with identical  $C_1$  and  $C_3$ .

The geometry of features is crucial in deciding whether Semitic exemplifies the OCP. First assume that the calculation of identity performed by the OCP is performed at the level of the individual feature. Roots like *\*ddC* violate the OCP everywhere, and roots like *\*bmC* or *\*gkC* violate it everywhere except in nasality or voicing. If Semitic root constraints are a case of the OCP, then partial identity of segments is sufficient to violate it. We would thus incorrectly expect nasality, voicing, and continuance to be constrained by the OCP and to suffer the same restrictions as are found for place of articulation. However, forms such as *saxiṭa* 'be annoyed' versus *saqaṭa* 'fall down', *saḥida* 'rise' versus *ḥaṣaṣa* 'press', and *namaṭ* 'way' versus *ṣamuna* 'be faithful' show that identical



specifications for continuance, voicing, and nasality can in fact appear on any two adjacent root positions. This necessitates the following contrasts, in violation of the OCP:

(5) Laryngeal	+ voi	+ voi	- voi	- voi	+ voi
Supralaryngeal	ḏ	ɣ	ṭ	s	ʃ d

Furthermore, whereas true geminates appear to be constrained by the OCP, as shown by geminate integrity arguments, consonant sequences with identical laryngeal or stricture features do not constitute an integral unit. Schwa Epenthesis in Syrian Arabic (Cowell (1964)) can separate consonant sequences with identical voicing or continuance (the following examples are nouns and gerunds with the binyan *faʕil*).

(6)	taxʔt	'bed'	wahʔʕ	'wild beast'
	ʕaḏʔm	'bone'	ʕaʔʕ	'sneezing'

The domain of the OCP must be restricted in some way. Returning to the original spirit of the OCP, let us assume that it operates at the root node. Roots with adjacent homorganic but nonidentical consonants such as \*/ydt/ and \*/bmt/ do not violate the OCP since they do not contain identical segments, insofar as the features for nasality and voice make the sequences *d . . . t* and *b . . . m* nonidentical. It is then clear that only a fraction of the Semitic root constraints can be explained by the OCP—the OCP rules out \**ddC*, but not \**dtC* or \**bmC*. An independent constraint against homorganic consonants is still required, but such a constraint automatically entails a prohibition against \**ddC*. Thus, Semitic root constraints do not support the OCP.

### 1.2. Rotuman Vowel Coalescence

A rule of Vowel Coalescence in Rotuman is claimed to support the OCP and give evidence for the phonological separation of vowels and consonants into independent tiers, which poses a problem for theories restricting the use of separate tiers. The problem that vowel/consonant separation is supposed to account for is a vowel change found in the "incomplete phase."

(7)	Complete	Incomplete	
	pure	pūer	'to decide'
	fuʔi	fūʔ	'kava-food'
	mose	mōs	'to sleep'
	pulufi	pūluf	'stick'
	popore	pōpōr	'suddenly'

According to McCarthy, the ligature in *pūer* indicates a "short diphthong." Churchward (1940) uses no ligatures, and McCarthy does not say what principles were followed in introducing them. Churchward states (p. 85) that most words ending in two or more vowels form their incomplete by shortening the penultimate vowel (*pupui/pupūi* 'floor')

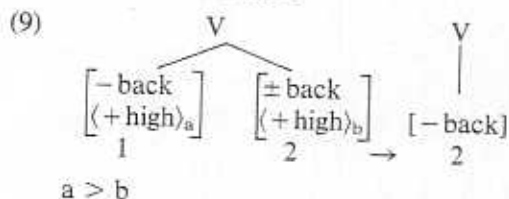
and (p. 74) that vowels have three lengths, where "underlying" vowels may have any length and "tertiary" vowels (vowels created by Vowel Coalescence) appear only with medium length. Elsewhere (p. 86) Churchward notes that incompletes such as *mamoas* are pronounced "almost as two syllables." It is a fairly generous interpretation of these statements to claim that the so-called short diphthongs are monomoraic. Given that vowels such as *ü* are said to be of medium length, not short, and since they appear in closed syllables, one might interpret Churchward's statements as indicating that the final syllable of incompletes is long, but subject to phonetic shortening in an already heavy syllable. Any claims based on the length of the final syllable of the incomplete such as McCarthy's formulation of the rule given in (9) are tentative, pending phonetic evidence.

The analysis of (7) is that the base form ("complete phase") selects an empty V suffix that is not selected in the incomplete; if vowels and consonants are represented on separate tiers, the final vowel of the root maps to the preconsonantal V node in the incomplete.

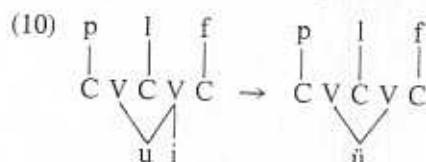


This does not provide strong evidence for independent vowel and consonant tiers, since a metathesis rule could handle the facts.<sup>2</sup>

Putatively stronger evidence for tier separation comes from the across-the-board effect of Vowel Coalescence.<sup>3</sup>



If consonants and vowels are on separate tiers, the derivation of *püluf* from /pulufi/ follows from (9) plus the assumption that the stem contains one *u* mapped to two V slots.



<sup>2</sup> Appropriate constraints can be placed on metathesis, the discussion of which is beyond the scope of this article.

<sup>3</sup> In McCarthy's formalization the first vocalic segment of the short diphthong must be front, and the second may be either front or back. In fact, the second vowel must be front, and the first vowel may be front or back: *tiko* → *tiok* 'flesh' but *hoti* → *höt* 'to embark'. The inclusion of the features [±back] is the same as leaving backness unspecified in the rule.

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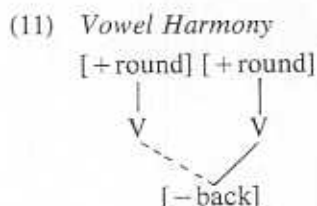
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The argument for the OCP is that there seem to be no stems with final identical vowels in which Vowel Coalescence does not apply to both vowels. Any stem where the last *o* is fronted and the first is not would seem to violate the OCP. The lack of such stems is taken to be evidence for the OCP.

The alternative I propose is a pair of rules: a Coalescence rule like (9) that affects a single vowel, and a frontness Vowel Harmony rule turning /puluf/ into püluf. McCarthy gives two arguments supporting the multiply attached vowel analysis. First, in morphologically complex forms such as *moto-lori* 'motor-lorry' only the vowel of the final morpheme undergoes Coalescence: *moto-lör*. This can be handled in the Vowel Harmony analysis and is clearly independent of the representation of vowels and consonants; the rule simply does not apply between members of compounds. This morphological restriction would follow if Coalescence and Vowel Harmony are on level 1 and precede prefixing and compounding. The second argument is that only a sequence of identical vowels seems to be affected by Coalescence. However, this claim is only weakly supported by the forms *Konousi*, incomplete *Konoüs* (a proper name), and *kalofi* 'egg', incomplete *kalöf*. The word *kalöf* is irrelevant. Only the round vowels *u* and *o* front to *ü* and *ö*, by the following rule of Vowel Harmony.



This leaves the name *Konousi* (as far as I have been able to determine based on a search of Churchward (1940), this is the only form where (11) fails to propagate). Given a single lexical item, many hypotheses are conceivable. The word may merely be an exception to (11). It may be a compound of *kono* 'corn' and *usi* 'bunch' (I have found no information in Churchward (1940) on the structure of proper names, so the compound hypothesis is strictly speculative). Perhaps Vowel Harmony applies only to vowels of equal height (a restriction found in the rounding-harmony systems of numerous Altaic languages and Yokuts (Archangeli (1985))). It is clear that a spreading analysis is possible, and the phonological separation of vowels and consonants is not required.

There is direct evidence that the segment-separation analysis is incorrect. McCarthy mentions only two of the three results of Coalescence. Coalescence applies to *ai*, yielding a front vowel transcribed as *ä* (*a* is centralized to *ə* if the following syllable contains a high vowel: *aŋu* 'row', *aŋi* 'to thrive'). If the stem contains multiple instances of *a*, only the last is fronted (Churchward (1940, 76, 79)).

(12)	aŋi	äŋ	'to thrive'
	masaŋi	masäŋ	'epidemic'
	anasi	anäs	'mullet'

It is hard to imagine how this could be handled in the OCP account. Parallel to the derivation of *pūlūf* from *pulufi*, we would expect *\*māsāʔ*. If low vowels are not subject to the OCP, Rotuman would show that the OCP is not a universal. If the separation of vowels and consonants into autonomous tiers is rejected, then Rotuman is simply irrelevant to the issue of the OCP. These facts are explained by the Vowel Harmony hypothesis; (11) affects only round vowels.<sup>4</sup>

## 2. Antigemination as Evidence for the OCP

The second argument for the OCP is based on Antigemination. McCarthy's illustrations of this phenomenon involve examples of Syncope rules that cannot apply between identical consonants. I show that (a) Antigemination does not "follow" from the OCP and therefore does not argue for the OCP, (b) the OCP implies additional unattested effects besides Antigemination, (c) Antigemination and related effects are manifested in rules that are not amenable to the OCP explanation, and (d) Antigemination is not universal.

### 2.1. Antigemination versus Fusion

The first question is in what sense the OCP directly entails Antigemination. The OCP is simply a negative condition; it does not indicate per se how derivations that might violate the OCP are made to conform to the OCP. It is possible that Antigemination is one language-specific technique for blocking violations of the OCP, an alternative being to fuse adjacent identical segments into a single segment. The choice between fusion and Antigemination is not dictated by logic; at best one might claim that *either* Antigemination *or* fusion follows from the OCP. To strengthen the connection between Antigemination and the OCP, McCarthy denies that OCP violations are patched up by segmental fusion. He states (p. 208) that "Its function in the derivation . . . is not that sporadically assumed in the tonal literature (a process that fuses adjacent identical tones into a single one) . . ." and later (p. 222) that ". . . I reject the fusion interpretation of the OCP . . ." If identical segment fusion were nonexistent, attributing Antigemination to the OCP would be conceivable. Since segmental fusion does occur, it is arbitrary to elevate Antigemination to the status of a universal, rather than make fusion the "universal" option. Of course, if the OCP is, as I argue, a language-specific constraint, then both Antigemination and segmental fusion are language-specific options.

Examples of identical consonant fusion occur in languages where no assimilations are motivated to explain the integrity of derived geminates. Some of these examples involve word-external combinations of identical consonants, so it is hard to see how such fusions could be the result of Tier Conflation, which is putatively a part of the

<sup>4</sup> McCarthy mentions a rule of *a*-Umlaut turning *a* into *ā* before *e* in *lāmāne* from putative /*lamane*/. Like Coalescence, this rule applies across the board and therefore might support the separate-tier analysis and the OCP. Churchward states that *a* derives historically from *ā* before *e*; but *ā* need not derive from *a* synchronically. Since there are no alternations between *a* and *ā*, one could assume underlying forms such as /*lāmāne*/ and eliminate *a*-Umlaut. A vowel harmony rule triggered by *ā* and *e* is also viable.

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lexical phonology and (according to McCarthy) the source of identical segment fusion. One example of OCP-type fusion is found in Yir Yoront, which separates stop clusters by a schwa, providing the consonants are not homorganic (Alpher (1973)): *lult thil* → *lutəthil* 'cave' and *ḡaṡ thuy* → *ḡaṡəthuy* 'fish fat' (*th* is a laminal consonant, at a different place of articulation from *t* and *ṡ*). Alpher notes that there is usually no transitional vowel with homorganic consonants, as in *wap puy* 'ate some wap', *thut tinnuw* 'went and stood'. Rather than assume an explicit nonhomorganicity restriction on epenthesis, I assume that identical place-of-articulation features are fused by a language-specific rule, an "active" OCP, and that failure of epenthesis into homorganic clusters has the standard geminate integrity explanation. (Alpher does not explain under what conditions this inseparability of consonants is found; the OCP-like rule in Yir Yoront may be optional, or dependent on speech rate.)

Another example of the fusional OCP comes from Tondano, which has a rule of epenthesis inserting schwa into consonant clusters other than nasal plus obstruent. This rule is blocked from applying between words if the adjoining consonants are identical (Sneddon (1975)): *ḡaran ni tuama* → [ḡaran:i tuama] 'the man's name', *mapurut tali* → [mapúruṡáli] 'is picking up the rope', versus *loit rintək* → [loitərintək] 'small change', *susur nado* 'every day' → [susurənədo]. We shall return to Tondano below. Further examples of the fusional OCP include Icelandic, whose preaspiration rule applies to geminate aspirated stops (Hermans (1985), Thráinsson (1978)), including geminates across morpheme boundaries.<sup>5</sup> In Tiberian Hebrew, postvocalic geminate stops do not spirantize, and geminates resisting spirantization include heteromorphemic identical consonants (*karat-ti* 'I cut'). Lenakel simplifies identical consonant sequences between words to single consonants (*menuk kəsil* → *menu kəsil*) (Lynch (1978)), suggesting that identical consonant sequences first fuse, then degeminate.

## 2.2. Evaluating Antigemination as a Universal

Ignoring the fusing effect of the OCP, other conceptually related effects besides Antigemination should be found if Antigemination is the result of the OCP, yet such effects are not found. Besides a restriction on Syncope, consonant deletion should be blocked if the surrounding vowels are identical. Estonian (Ilse Lehist (personal communication)) has a lexically governed rule deleting unaspirated consonants between vowels in "strong" forms (for instance, genitive, 1sg of verbs), yielding alternations such as *tegu* 'deed (nom.)' / *teo* 'deed (gen.)' (followed by lowering of *u* in a vowel cluster). Deletion is not blocked when the surrounding vowels are identical: *lugu* 'story (nom.)' / *loo* 'story (gen.)', *sugu* 'tribe (nom.)' / *soo* 'tribe (gen.)', *kubu* 'arm of grain (nom.)' / *koo* 'arm of grain (gen.)', and *tegema* 'to do' / *teen* 'I do'. Similar consonant deletion rules are found

<sup>5</sup> The version of preaspiration assumed by Thráinsson (1978) treats geminates as adjacent identical segments, in violation of the OCP. The versions proposed by Hermans (1985) and Clements (1985) assume that the preaspiration rule applies to monosegmental geminates; since heteromorphemic and tautomorphemic geminates both undergo preaspiration, there must be some version of the OCP in Icelandic that fuses consonants.

in numerous Bantu languages, for example in the historical development of Kamba and Swahili, which deleted proto-Bantu \**d* in various environments; this deletion is insensitive to the identity of surrounding vowels, so proto-Bantu \**kudu* 'big' becomes Kamba *koo*, Swahili *kuu*. If Antigemination is due to the OCP, there is no explanation for this asymmetry, unless the OCP affects only consonants.<sup>6</sup>

It is not obvious that the universality of Antigemination could be refuted, given the options that McCarthy allows. Many counterexamples to Antigemination can be disposed of either by simply declaring them to be "rules of phonetic implementation" or by declaring that the offending rule applies before Tier Conflation and assuming that the language puts vowels and consonants on separate tiers. Noting that certain syncope rules in Odawa and other languages are not blocked when flanking consonants are identical, McCarthy adds a restriction on Antigemination, namely, that rules of phonetic implementation are not subject to it; Syncope in these languages is claimed to be a "rule of phonetic implementation." Without a definition of the term "rule of phonetic implementation," this diminishes the empirical content of the Antigemination claim, since rules violating Antigemination could simply be declared to be phonetic rules, to the extent that a given rule might be freely analyzed as a phonetic versus a phonological rule. The example from Odawa is a case in point. The derivation of *ttanisi* from *tatanisi-w* 'he stays for a while' is given as an example of a phonetic rule creating geminates. According to McCarthy, Syncope "reduces unstressed vowels to schwa, and under poorly understood conditions . . . schwa is further reduced to zero" (p. 251). Presumably the rule's optionality is the evidence that it is a phonetic rule. Piggott (1980) notes that Syncope feeds at least two deletion rules, one deleting glottal stop (which Piggott treats as underlying /h/) before or after a consonant, and another deleting preconsonantal glides. According to Piggott (p. 81), /*misinahkan*/ becomes *msinikan*; the output of Syncope is *msin<sup>2</sup>ikan*, which undergoes glottal stop deletion. Similarly (p. 84) /*otawewikamikw*/ becomes *tawewkamikw* by Syncope and *tawekamikk* by Glide Deletion and other rules. If Syncope in Odawa is a phonetic rule, it is a peculiar phonetic rule, since it precedes other deletion rules. With no statement of the difference between phonetic and phonological rules, counterexamples to Antigemination could be disposed of by gratuitously declaring the offending rules to be phonetic.

Furthermore, if a language is analyzed as having consonants and vowels on separate

<sup>6</sup> A reviewer has suggested that in Estonian vowels and consonants might be represented on separate planes, in which case deletion of the consonant would not violate the OCP. There is no reason to posit independent tiers for vowels and consonants in Estonian other than to preserve the putative universality of intervocalic Antigemination. The crucial point is not just that Estonian demonstrates the failure of the intervocalic parallel to consonantal Antigemination, but also that there are no parallel effects in any language.

There is evidence that a vowel/consonant separation in Estonian will not work. If the two instances of *u* in *lugu* represent one multiply attached vowel, then the noun *kāgu* 'cuckoo bird' has one multiply attached *k* (orthographically *g* between vowels). The second *k* deletes by strong-case consonant deletion (*kāo* (gen. sg.)), showing that the two instances of *k* are independent. If we assume one multiply attached *k*, the consonant is a geminate and should not delete. If we assume two independent instances of *k*, the second is free to delete; because of the assumed vowel separation, however, the OCP will be violated. Therefore, consonant/vowel separation cannot be invoked in Estonian.

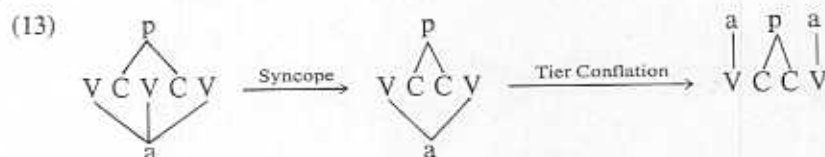
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tiers, then syncope of /apapa/ to [appa] is not a counterexample to Antigemination if Syncope precedes Tier Conflation in that language, since at the pre-Tier Conflation stage there is only one *p*.



This possibility is exploited for Akkadian Syncope, which is said to precede Tier Conflation, with the consequence that /dubub+ii/ can become *dubbii* 'speak! (fem. sg.)' since there is only one *b* (attached to two skeletal positions). Given the possibility of separating vowels and consonants into different tiers on an ad hoc basis, one might eliminate counterexamples to Antigemination by separating consonants and vowels and applying Syncope before Tier Conflation.

It is not even clear why Antigemination should be a part of UG, irrespective of its relation to the OCP. There is a simple alternative to the Antigemination account of failure of Syncope in the languages McCarthy cites, namely, that each exhibits a language-specific constraint against applying Syncope between identical consonants. Syncope in Iraqi Arabic could be formulated as (14) (see Odden (1978)).

$$(14) V \rightarrow \emptyset / VC_i(C_i) \text{ — } C_j V \quad i \neq j$$

It is misguided to attribute every accidentally true statement about human language to UG, for doing so trivializes the theory of UG itself. One argument for placing a principle in UG is that it explains a persistent and otherwise inexplicable consistency in languages. This argument cannot be made for Antigemination, given the rarity of that phenomenon in the first place, as well as the considerable degree of freedom in analysis entailed by the consonant/vowel separation and "phonetic rule" variables.

Alternatively, a principle might be assigned to UG if it eliminates an otherwise unneeded apparatus. Such an argument for Antigemination has some potential. Universal Antigemination might be an alternative to (14), which requires a powerful system of segment subscripting and identity checking. Taken literally, rules such as (14) are inadequate for handling the full range of identity references found in phonology. As will be shown, languages differ in what constitutes "identical" segments. Biblical Hebrew identical consonant fusion requires reference to complete identity (including voicing), Syrian Arabic allows identity to ignore pharyngealization and voicing, Koya allows identity to ignore retroflexion, and Telugu Syncope requires only rough identity computed at the place of articulation, which ignores voicing and narrow place distinctions such as alveolar/retroflex/palatal. Other data show that Antigemination cannot handle the full range of rules affected by the identity of flanking consonants, so Antigemination does not eliminate identity references from phonological rules. An adequate formal account of identity references will presumably include Antigemination as one of its cases.



### 2.3. Identical Consonant Rules

In the realm of rules whose application potentially creates or separates geminate consonants, six configurations are possible:

- (a) Delete a vowel unless flanking Cs are identical.
- (b) Delete a vowel blindly.
- (c) Delete a vowel only if flanking Cs are identical.
- (d) Insert a vowel unless flanking Cs are identical.
- (e) Insert a vowel blindly.
- (f) Insert a vowel only if flanking Cs are identical.

Case (a) is Antigemination, case (b) would be a simple counterexample to Antigemination, and case (d) represents standard geminate integrity. Examples of case (e) would presumably not include splitting of tautomorphic geminates, since such a case would either require violation of the OCP or violate geminate integrity.<sup>7</sup> Cases (c) and (f) would (along with (b)) be the most troublesome: case (c) represents the situation where a rule applies *only* if it violates the OCP, and case (f) would show that, beyond fusion, there is another solution to OCP violations besides Antigemination. Below I show that cases (b), (c), and (f) do exist.

First, case (f)—rules of epenthesis that split only identical consonant sequences. Such rules exhibit the effect of Antigemination (keeping identical consonants apart), without the mechanism behind Antigemination being available. Recall that in Tondano (Sneddon (1975, 14)) consonant clusters are optionally split by epenthetic schwa; hence, /kaʔampit + ku/ optionally becomes [kaʔampitəku] 'my friend'. Within words, epenthesis is obligatory when the flanking consonants are identical; hence, /wuʔuk + ku/ obligatorily becomes [wuʔukəku] 'my hair'. (Earlier in this section we saw that between words identical consonants fuse into a long consonant and therefore cannot be split.) Either we must assume two rules, one optional and the other obligatory and applying when flanking Cs are identical, or we must assume one rule with different conditions of obligatoriness depending on the identity of the flanking consonants. Either way, epenthesis in Tondano requires reference to identical consonants.<sup>8</sup> Note also that Tondano selects two of the solutions to OCP violations, epenthesis and fusion. At present it does not seem possible to predict which solution a language will select, or even whether a single solution is chosen.

Another case of epenthesis into geminates comes from Lenakel (Lynch (1978)),

<sup>7</sup> I present examples of case (e) in section 3, however.

<sup>8</sup> One might try to eliminate this example of epenthesis into geminates by assuming that the schwas in question are epenthetic and are deleted by a syncope rule subject to Antigemination. This approach will not work. Given that schwa is not inserted into clusters beginning with a nasal or ʔ, the syncope approach would require the additional condition that syncope always applies after a nasal or ʔ. Underlying schwa is not subject to deletion, as in *kaʔɔʔ-an-na* → *kaʔɔʔana* 'will be cut by him'. Sneddon lists a number of consonant deletion rules that bleed schwa insertion (pp. 199–201); morpheme-initial *m* deletes after consonants (*lamas + mu* → *lamasu*), and morpheme-final *n* deletes before *l* and *n* (*waran + na* → *warana*). These rules would be rendered phonetically implausible if epenthetic schwa were actually present in underlying representations.

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which inserts schwa (realized as *i* or *a* by low-level rules) between identical consonants. A second epenthesis rule applies to initial consonant clusters. Thus, /i-ak-ken/ becomes *yagâgen* 'I eat', /t-r-rai/ becomes *tirray* 'he will write', and /t-r-renam/ becomes *tirirénim* 'he will bury it'; in contrast, *t-r-lélay* becomes *tir-léluy* 'he will return', with epenthesis into the initial cluster but not the -*rl*-cluster. (Syncope is not viable on grounds of predictability: underlying schwa is retained in *tiakofina* 'I will give you', *rimika* 'it was not', *tinisofinaan* 'you will not give'.) Modern Hebrew has a similar rule (Bolzky (1973, 28)) inserting *e* between stems ending with *d* or *t* and affixes beginning with *t* (/yalad + ti/ → *yaladeti*, /kišat + ti/ → *kišateti*). The epenthesis rule in English inserting schwa before +*s* (plural, possessive, and reduced auxiliary) after coronal stridents and before +*d* after coronal stops can be seen as another instance of geminate epenthesis. These examples demonstrate that identical segment fusion is not an automatic consequence of Tier Conflation, contrary to McCarthy's claim. At best, one might expect Tier Conflation to result in insertion or fusion.

Second is case (c), the rules deleting vowels only when the flanking consonants are identical (hence "Antigemination"). These rules are counterexamples to Antigemination when applied within a morpheme (Yapese) or between words (Koya, Telugu, Yapese), since such rules are postlexical and therefore follow Tier Conflation. In general, these examples show that Antigemination does not solve the problem of referring to the identity of segments. Details of the Antigemination rules in various languages are as follows.

(a) Koya (Taylor (1969, 38)). A vowel at the end of the word is deleted if the flanking consonants are identical (ignoring retroflexion).

(15) Underlying	Surface	Gloss
na:ki ka:va:li	na:kka:va:li	'to me it is necessary'
a:ru ru:pa:yku	a:rru:pa:yku	'6 rupees'
verka:ḍi digte	verka:ḍ digte	'the cat got down'

(b) Telugu (Krishnamurti (1957)). Here a short vowel deletes if the flanking consonants are homorganic (in coronals, minor features such as [distributed] are ignored, and along with voicing are subject to regressive assimilation); the rule applies within words and between words.

(16) Underlying	Surface	Gloss
gulābi mogga	gulābmogga	'rose bud'
cūci ceppu	cūcceppu	'look and tell'
nāṭ-aṭam	nāṭṭam	'plant + ing'
pāta ceppu	pācceppu	'old sandal'
peruku-kō	perukkō	'pull it out for yourself'
ceruku-gaḍa	ceruggaḍa	'sugarcane stick'

(c) Nukuoro (Carroll and Soulik (1973)). Intensive reduplication copies the initial CVCV, and if the final V is flanked by identical consonants, it is deleted.

(17) Base	Reduplicated	Gloss
balavini	balabalavini	'awkward'
badai	badabadai	'meddle in others' affairs'
bobo	bobbobo	'rotten'
babu	babbabu	'noise like snapping fingers'

(d) Moroccan Arabic (Harrell (1962, 44-45)). Harrell states that binyan III of doubled roots vacillates between *šafef* and *šaff* (orthographic *e* is schwa) 'to line up'. Harrell also notes (p. 17) that there is some free variation between CeC and CC, commenting that "If the last two consonants of the word are identical or similar in place of articulation . . . the dropping of the *e* is especially common. . . ."

(e) Maliseet-Passamaquoddy (Sherwood (1983)). Sherwood motivates a rule deleting short vowels (*ā* and *a*) in a doubly open syllable when the flanking consonants are identical.

(18) a.	$\text{ə, ā} \rightarrow \emptyset / V C_i \text{ — } C_i V$		
b.	Underlying	Surface	Gloss
	tep-āpi-w	teppo	'he sits inside'
	məkwət-āpi-w	kw'ətəpo	'he sits alone'
	w-təm-əm-a-w-āl	t'əmmal	'he bites (obv.) in half'
	w(t)-əl-əm-a-w-āl	t'ələmal	'he bites him (obv.)'

(f) Yapese (Jensen (1977)). Here a vowel deletes when flanked by homorganic consonants providing the first consonant is postvocalic or word-initial.

(19) a.	$V \rightarrow \emptyset / \left\{ \begin{matrix} V \\ \# \end{matrix} \right\} C_i \text{ — } C_i$		
b.	Underlying	Surface	Gloss
	ba puw	bpuw	'it's a bamboo'
	ba ma:b	bma:b	'it's a door'
	ni te:l	nte:l	'take it'
	rada:n	rda:n	'its width'
	qalaŋeŋe-g(u)	qalaŋe:g	'my headache'

(g) English. As a last potential example of Antiantigeminatation, consider Syncope in English. It seems that Syncope is more likely to apply when the flanking consonants are identical (a judgment shared by a number of linguists I have polled); in other words, it is more likely to apply in *Kankakee* and *sillily* than in *Chicopee* and *happily*. These examples pose a serious problem for the claim that Antigeminatation follows from anything at all, since there seem to be as many syncope rules that only create geminates as there are rules blocked from creating geminates. Hence, even a markedness interpretation of Antigeminatation is unlikely.

Rules that simply disobey Antigeminatation with no other complications also exist.

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Hindi has a schwa syncope rule that can apply between identical consonants (Bhatia and Kenstowicz (1972)); thus, *daanəw + i* becomes *daanwi* 'demon' and *kaanən + i* becomes *kaann + i* 'garden'. Since the rule applies to schwa in the last syllable of the stem but not (for example) in *waaraanəsii* 'Benares', it is not a phonetic rule. The only hope for Antigemination would be to assume that Hindi is like Akkadian: vowels and consonants are on separate tiers and Syncope precedes Tier Conflation.



The only motivation for this assumption is saving the Antigemination constraint.

A second counterexample to Antigemination is the Syncope rule of Klamath (Barker (1963; 1964)). As in Syrian Arabic, differences in laryngeal features (voicing, glottalization) should not influence the identity calculations performed by the OCP/Antigemination constraint, since laryngeal features are separate from supralaryngeal features (see Clements (1985)). As Antigemination computes identity, then, vowels in Klamath delete between identical consonants.

(21)	Root	Syncopated	Underlying	Gloss
	čič'	č'li-čč'-a	č'IV-čič'-a	'strip tules with nails'
	kek'	ne-kk'-a	nV-kek'-a	'burns through (intr.)'
	gog	hos-qg-a	hVs-gog-a	'puts a dress on someone'
	goge	go-qq'-a:k	CV-goge-ʔa:k	'distrib. little rivers'

A third counterexample comes from Maltese Arabic (Brame (1974), Schabert (1976)), which deletes an unstressed vowel in an open syllable.<sup>9</sup>

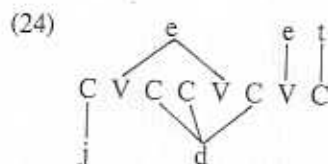
(22)	Syncope
	$V \rightarrow \emptyset / \text{---} CV$
	[ -stress]

This rule violates Antigemination.

(23)	kines	'he swept'	kins-et	'she swept'
	tkaškar	'he was taken'	tkaškr-et	'she was taken'
	jedded	'he renewed'	jedd-et	'she renewed' (< jedddet)

Since Syncope is blind to Antigemination in Maltese as it is in Akkadian, vowel melodies and subject markers must be added at the same stratum, without intervening application of Tier Conflation. The input to Syncope in the case of *jeddet* would be the following.

<sup>9</sup> I have resolved the orthographic differences between Brame (1974) and Schabert (1976) by representing Schabert's *ġ* as *j* and *æ* as *e*.



This is insufficient. We find the same violation of Antigemination when the conditioning vowel is the imperfective plural affix *u*, as in  $[[y + jedded] + u]$ , which becomes *yjeddu* 'they renew' (Schabert (1976, 120)). Brame (1974) shows from the interaction of Stress and Syncope that the object clitic *-u* constitutes a different cycle from *-at*. The object clitic *-u* and the plural marker *-u* provide the same evidence for an inner cycle (*nitilfu* from  $[ni-tlif] + u$  is either 'we lose' or 'I lose it'), so Tier Conflation will have folded together the consonant and vowel tiers on an earlier cycle in  $/yjedded + u/$ . Antigemination should have blocked Syncope in *yjeddu*, which would require applying Tier Conflation after all lexical rules. Ordering Tier Conflation after all lexical rule applications, perhaps by putting it in the postlexical phonology, does not work in Syrian Arabic or in Hebrew and would refute the conjecture that it is the same as Bracket Erasure. Ordering Tier Conflation relative to Syncope would be just another option in the face of counter-examples to Antigemination.

It can be argued that two of the examples presented in support of Antigemination instead disconfirm it. One of these examples is Syncope in Syrian Arabic. In McCarthy's analysis, schwa deletes in an open syllable unless the surrounding consonants have the same place of articulation. Thus, *btaskani* becomes *btaskni*, but *bihaažəžu* fails to undergo Syncope. Since Syrian Arabic puts vowels and consonants on separate tiers, Syncope must follow Tier Conflation for Antigemination to be explained. Therefore, schwa flanked by homorganic consonants in separate morphemes should also be subject to Antigemination, as exemplified by forms like *fədd + et* 'silver of', which alternates with *fəddəto* 'his silver'.<sup>10</sup> This example illustrates Antigemination between morphemes; it also illustrates that Syrian Arabic requires a representation with place of articulation on one tier and manner features elsewhere, so that differences in manner do not interfere with the identity calculation performed by the OCP.

This example of Antigemination is not entirely straightforward. Antigemination is not automatic, as it should be if a universal principle were at work. According to Cowell (p. 80), forms exhibiting Antigemination such as *bihaažəžu* 'he argues with' exist alongside forms such as *bihaažžu* in which schwa deletes. Elsewhere (p. 197) Cowell suggests that Syncope is possible in forms like *bisabbabu*, noting that "If the *a* is lost in such a case, a theoretical triple-consonant cluster ('bisabbbu') is normally reduced to a double consonant." Regarding the failure of Syncope to apply between heteromorphemic homorganic consonants in forms like *madd-at-o* 'she stretched it', Cowell (pp. 163–167) gives

<sup>10</sup> McCarthy gives the surface form *fəddəto* and the gloss 'your (fem. sg.) silver'. The gloss is mistaken—the 2sg. fem. poss. ending is *-ak*. I have not located the form *fəddəto*, which would mean 'your (masc. sg.) silver', in Cowell (1964), but Cowell (p. 164) gives the form *fəddətak* 'your silver' with pharyngealization of the affixal consonant, assimilated from the stem-final consonant.

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forms such as *ʔuud-eʔ* 'room of' alternating with *ʔuud-t-i* 'my room' from *ʔuud-əʔ-i*, and *nəʔ-t-əʔ* 'point of' alternating with *nəʔ-əʔ-t-o* 'its point' from *nəʔ-t-əʔ-o*, where Antigemination is violated. Cowell's statement of the antigemination restriction (p. 166) clarifies this data conflict. He states that "nouns that have a double dental stop (*tt*, *dd*, *ʔʔ*, *dd*) before the *-e/-a* suffix have *a* before the connective *t* . . ." Antigemination between morphemes does not appear to be found after single dentals.

Cowell gives additional violations of Antigemination. Syncope applies to prefixes, regardless of the place of articulation of the stem-initial consonant. Underlying *nə-naam* 'we sleep' becomes *n-naam* and *tə-tamm* 'she remains' becomes *ttamm*. The prefix schwa is stressable (*tə-ʔbalu* 'you pl. accept'), and epenthesis follows stress assignment (epenthetic schwa is not stressed, as in *bətʔasalmi* 'you fem. become a Muslim', and does not cause stress to shift away from underlying heavy syllables, as in *ʔaamánət* 'I became Muslim' from *ʔaamánt*); hence, the prefix vowel cannot be epenthetic. Application of Syncope in *n-naam* and *t-tamm* thus violates Antigemination.

Tiberian Hebrew can also be argued to disconfirm Antigemination, rather than exemplifying it. The syncope rule that supposedly obeys Antigemination is given in (25).

(25)  $a \rightarrow \emptyset / VC \text{ — } CV$

This rule turns *ʔaaxər-uu* into *ʔaaxru* 'they recalled', but because of the Antigemination constraint, *ʔaaxər-uu* 'they surrounded' putatively remains unchanged.<sup>11</sup>

Since Tiberian Hebrew exhibits morpheme-internal Antigemination, Syncope must follow Tier Conflation. Syncope should be blocked when schwa is surrounded by heteromorphemic identical consonants. This does not happen in Tiberian Hebrew; */hinn-enii/* becomes *hinnii* 'behold me', not *hinnənii*. McCarthy explains this difference by applying Syncope after Tier Conflation has applied to the cyclically subjacent verb stem composed of root consonants and a nonconcatenative vowel melody, but before it folds together the segments of adjacent concatenative morphemes. When the vocalic and consonantal tiers are folded together at the end of the first cycle by Tier Conflation, the two stem occurrences of *b* in *ʔaaxər-uu* become separate segments. Syncope is blocked on the second cycle in *ʔaaxər-uu*, since the identical consonants are on the same tier, but not in *hinn-enii*, since the heteromorphemic occurrences of *n* are still on separate tiers. This explanation works only if Syncope is cyclic; if Syncope is postlexical, the derivation of *hinnii* from *hinnənii* violates Antigemination.

There is evidence that Syncope is not a lexical but a postlexical rule. McCarthy (1979) and Prince (1975) establish a chain of rule orderings of considerable depth ter-

<sup>11</sup> The entire argument based on Tiberian Hebrew rests on the phonetic interpretation of the symbol *shewa*, which can be realized as *a* or *ə*; the assumed contrast between *ʔaaxər-uu* and *ʔaaxər-u* falls into the most controversial environment for choosing between *a* and *ə* as the correct phonetic value. Malone (1986) points out that the lack of the grapheme "metheg," often taken as support for *ə* over *a*, is not reliable, since the grapheme is nonmandatory. He also points out that all of the cited examples of Antigemination in Tiberian Hebrew contain metheg, irrespective of the surrounding consonants. Since McCarthy does not explain how the interpretation of *shewa* was arrived at, it is not obvious that there is any problematic alternation to account for.



(28) /dabar/	
dabár	(Main Stress)
daabár	(Pretonic Lengthening)
<hr/>	
daabár-iim	(Affixation)
daabariim	(Main Stress)
*daabaariim	(Pretonic Lengthening)

If Main Stress and Pretonic Lengthening are postlexical (or last-cyclic), then so are all the rules after them, including Vowel Reduction and Syncope.

Dresher (1983) argues that virtually all of Tiberian Hebrew phonology must be postlexical. Most rules of the language follow construction of rho-feet, including Vowel Reduction and Syncope. Construction of rho-feet is sensitive to syntactic structure: it cannot override a final stress foot in "pausal" position, which corresponds to a strong branch of a prosodic tree constructed over the entire utterance. Thus, we find the pausal form *kaaθáaβuu* 'they wrote' and the "contextual" form *kaaθβúu* where Syncope deletes the penultimate vowel. The requisite rho-structures must be in place prior to Syncope, since Syncope is sensitive to rho-structure. Since rho-structure is sensitive to syntactic structure, it must be postlexical; hence, Syncope must be postlexical.

A final argument shows that ordering Syncope before Tier Conflation does not work. We know that Syncope applies before Spirantization. Note that underlying *karat + ti* appears as *karatti* 'I cut', not \**karaθti*. Spirantization is blocked from applying to geminates, and the heteromorphemic sequence of *t*'s has previously fused into a geminate as a result of Tier Conflation, which is claimed to cause geminate fusion. Therefore, Spirantization of stem consonants must be delayed until after Tier Conflation has folded together roots and inflectional affixes. However, if Tier Conflation precedes Spirantization and Spirantization precedes Syncope, then Syncope cannot precede Tier Conflation, as was required to explain the failure of Antigemination to take over in *hinn-enii*.<sup>12</sup>

We come to the following conclusions regarding Antigemination and the problem of reference to identical segments in rules. First, it is impossible to predict whether a rule will exhibit Antigemination, so whatever explanation underlies Antigemination cannot be universal. Second, Antigemination is not the only manifestation of reference to the identity of matrices—certain syncope rules directly require flanking identical consonants, as do certain epenthesis rules. Even if Antigemination were to be a universal, an explanation would still be needed for the remaining set of identity references.

Regardless of how we formally represent identity references in phonology, we are

<sup>12</sup> A counterargument would be that geminate integrity in *karatti* results from an assimilation rule that, as a side effect, fuses *t + t* into a geminate. It is not obvious what assimilation rule could be assumed. One candidate might be voicing assimilation, but there is no voicing assimilation in Biblical Hebrew, as shown by forms such as *lamað + ti* 'I learned', not \**lamatti*.



still left with the problem of explaining the asymmetry between vowels and consonants in identity references, namely, that although there are numerous rules that insert or delete vowels between explicitly identical (or explicitly nonidentical) consonants, there are no rules that insert or delete consonants between explicitly identical (or nonidentical) vowels or between segments with explicitly identical (or nonidentical) laryngeal or manner features. It is conceivable that some theory of phonological representation and rule formulation will make the reason for this asymmetry obvious on formal grounds. It is also possible that the explanation (if not the formal representation) for Antigemination and Antiantigemination lies in phonetics.

The phonetic explanation for identical place-of-articulation effects that I propose runs as follows. The production of a consonant involves (among other things) a set of neural instructions that result in the vocal tract configuration appropriate for a particular place of articulation, followed by a set of neural instructions to release that place gesture. Given a sequence of two consonants with a different place of articulation, involving relatively disjoint sets of articulators, the initiation of the second consonant gesture may temporally precede the release of the first consonant. However, in a sequence of consonants with the same place of articulation (possibly separated by a vowel), the instruction to reform the second token of the consonant cannot precede the instruction to release the place of articulation of the first consonant. The conflicting effects of Antigemination and Antiantigemination, or geminate epenthesis and geminate fusion, could be explained as phonologized alternative resolutions of this neural timing problem. If syncope is phonetically the result of radical shortening of a vowel (down to the point of elimination), then Antigemination could be induced by preserving the distinct release of the first consonant, at the expense of lessening or blocking vowel shortening. Antiantigemination could be induced by maintaining the reduced timing of the vowel, at the expense of maintaining separate consonant gestures (specifically, inducing loss of the first release gesture), resulting in the vowel's gesture being entirely covered up by the consonant gestures. Geminate epenthesis would be explained as the insertion of a vocalic buffer to separate colliding identical consonant gestures, and geminate fusion would result from eliminating the second gesture. The phonological effects manifested in, say, Syrian Arabic and Telugu are then the grammaticalization of problems in consonant timing.<sup>13</sup>

<sup>13</sup> McCarthy (p. 257, fn. 19) rejects a phonetic explanation for Antigemination, since tongue twisters like *Peter Piper picked* . . . with identical consonants are less difficult than tongue twisters like *She sells sea shells* . . . with different place of articulation. The fact that *She sells sea shells* . . . strictly speaking involves consonants at different places of articulation is irrelevant in that the same articulators are involved in production of *s* and *ʃ*. Furthermore, *Peter Piper* . . . does not involve the same iterated consonant gestures found in *She sells* . . . Successive labial gestures in the former appear in alternating rhythmic positions and are interrupted by gestures for *D* and *k*. The extraordinary difficulty of *She sells* . . . is due to the fact that it involves a mirror image sequence of consonants (*ʃ* . . . *s* . . . *s* . . . *ʃ*) in monosyllables; see Schourup (1973) for discussion. The point is that tongue twisters involve consonants of similar place. This does not mean that absolutely identical consonants in succession are the maximally difficult tongue twisters.

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### 3. The Lexical OCP

The failure of universal Antigemination does not refute the universality of the lexical OCP. However, languages can violate even the most restricted version of the lexical OCP, one stated in terms of complete segmental identity. The primary diagnostic for OCP violations in these cases is violation of geminate inseparability.

The first case comes from Chukchi (Krause (1980)), which has an epenthesis rule splitting geminates. Krause shows (chapter 2) that Chukchi prohibits clusters of more than three consonants (word-final and -initial clusters of two consonants are also prohibited) and inserts schwa into improper clusters when created by morphological processes. The inserted vowel appears at the seam of the adjoining morphemes. Krause gives the following rules (pp. 42, 99).

$$(29) \quad \emptyset \rightarrow \text{ə} / \left\{ \begin{array}{l} C + \text{---} C C \\ C C + \text{---} C \end{array} \right\}$$

$$\emptyset \rightarrow \text{ə} / \begin{array}{c} C \text{---} C \# \\ [-\text{glott}] \end{array}$$

$$\emptyset \rightarrow \text{ə} / \# C \text{---} \begin{array}{c} C \\ [-\text{glott}] \end{array}$$

The following data illustrate epenthesis.

(30)	Abs. Sg.	Abs. Pl.	Gloss
	miməl	miml-ət	'water'
	wiwər	wiwri-t	'board'
	ekək	ekke-t	'son'
	Infinitive	Preterite	
	ɣət-ək	ge-nt-ə-lin	'he has cut off'
	təm-ək	ga-nm-ə-len	'he has killed'

The alternation *ekək/ekke-t* is problematic for the OCP. If the underlying representation is /ekke/, then *ekək* derives (via the stage *ekk* due to apocope in the absolutive) from regular epenthesis. This possibility is open only if we violate the OCP.

An alternative is to assume the stem for 'son' to be /ekəke/ and to derive [ekket] via a rule of syncope. Clearly, this rule would be a counterexample to Antigemination. The problem with a syncope analysis is that although it is possible to predict where schwa is inserted, it is not possible to predict where it is deleted. Schwa is a regular vowel in the language, and there are forms whose schwa cannot be derived by insertion, such as *kəɾəŋew-ək* 'he grew up' (contrast *ʔəlqam-ma* 'to hammer' with no schwa between the medial consonants).

Syncope cannot handle all ə/∅ alternations. A number of stems begin with consonant clusters, and initial epenthesis splits the first and following consonants. When prefixed with a vowel-final suffix, the three-consonant cluster does not stand in the requisite environment for epenthesis (word-medial consonant clusters are split only if a mor-

pHEME boundary stands in the consonant string), so a rule of Cluster Simplification applies (Krause (1980, 101)).

(31) 3Sg. Pret. (simplification)	Infinitive (epenthesis)	Stem	Gloss
ge-pju-lin	pəju-k	pju	'wander in water'
ge-lgə-lin	təlge-k	tlg	'melt'
ga-mŋəltet-lin	ləmŋəltel-ək	lmŋəltel	'tell a story'
ge-trit-lin	rətril-ək	rtril	'melt'
ge-ttet-lin	təttet-ək	tttet	'climb'

There is no plausible account of these stems that relies wholly on syncope, since in (31) schwa would delete in closed syllables, but putative syncope does not apply in a form like *ga-rarka-ta* 'with a knife'. The last form in (31) also shows a further violation of the OCP: epenthesis splits putative geminate consonants, as in *təttetək* from /ttetk/. The underlying form of the stem must be either /təttet/ or /tttet/. If the stem contains underlying schwa, it is a counterexample to Antigemination. The epenthesis analysis has a ready explanation for the failure of syncope here: there is no syncope rule.

A second case of epenthesis into geminates comes from Hua (Haiman (1980; personal communication)). All consonant clusters except sonorant + glottal stop are separated by epenthetic schwa; schwa arises only from epenthesis. Haiman provides the following rule (p. 30).

- (32)  $\emptyset \rightarrow \text{ə} / C_1 \text{ — } C_2$  unless  $C_1 = /' /$  and  $C_2 = [+ \text{sonorant}]$

By (32), underlying /dtú/ becomes [dʰtú] 'lowlands softwood tree' and /kvrǵi'a/ becomes [kʰvʰrǵi'a] 'Job's tears'. (Schwa assimilates to a reduced version of the following full vowel across *r* and *γ*, as in /okruma/ → [okʰruma] 'sky'.)

There are a number of arguments that schwa is inserted by (32) rather than being present in underlying representations (Haiman (1980, 23)). Schwa is entirely predictable by (32): (32) correctly predicts that schwa cannot appear immediately before or after a vowel or at the beginning or end of a word. Underlying consonant clusters are subject to reduction in fast speech; hence, /dti/ (careful speech [dʰti]) reduces to [dɪ] 'morning'. If ə is inserted, then this fast-speech reduction is an instance of consonant-cluster simplification. On the other hand, if the schwa appearing in the careful speech form is present in underlying representations, then there is no motivation for reduction. Finally, Haiman (1980, 86) notes a number of restrictions on underlying consonant clusters. The consonants *h* and ' cannot appear in clusters at all; *d*, *b*, and *f* cannot be the second member of a cluster. Only *g* and *r* can be the third member of a three-consonant cluster. Constraints on syllable onsets are to be expected. However, stated as constraints on possible successions of syllables separated by ə, these constraints are inexplicable: sequences of syllables containing full vowels are not restricted. The crucial fact for the OCP is that epenthesis applies between any two consonants, including ones that happen to be iden-

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tical. Haiman (personal communication) confirms that insertion applies between identical consonants within the same morpheme: for example, *fzzepzzefu* 'notch, striate', *krrupai* 'crash down' (Haiman (1980, 125–126)).

Yokuts also violates the OCP, since stems may contain adjacent identical consonants that are separable by epenthetic *i* (*u* by Vowel Harmony) into three-consonant clusters (Newman (1944)).

- |                 |                                |                 |  |
|-----------------|--------------------------------|-----------------|--|
| (33) do:lul-hun | '(he) climbed a tree' (p. 106) | dul'l-e:xo:-hin | 'he was up in a tree' (p. 106) <sup>14</sup> |
| mullil-ši?      | 'deceived' (p. 124)            | moll-onit       | 'you are being duped' (p. 102)               |
| şulil-ši?       | '(he) choked him' (p. 44)      | şull-išta       | 'choke (him) for me!' (p. 87)                |

The epenthetic vowel on the left cannot be underlying; in all disyllabic stems in the aorist (suffix *-hin*, *-iš*) the second vowel is a copy of the first stem vowel (see Archangeli (1985)).

Yet another counterexample to the OCP is mentioned by McCarthy: Southern Paiute, a classic example of a language where long vowels are to be treated as identical vowel sequences. McCarthy notes (p. 252) that devoicing affects only one mora of a long vowel, in apparent violation of geminate integrity. He argues that this example is irrelevant on the grounds that devoicing is a rule of phonetic implementation (hence subject to different principles), since it creates a segment not found in the underlying representation of any language.

Devoicing is not the only evidence bearing on the representation of putative long vowels. Hayes (1981) argues for a bisyllabic bisegmental analysis of long vowels on the basis of the stress system. This argument is further supported by two rules that alter one half of putative long vowels. First, *a* rounds to *ω* after *ɔ*, affecting only one mora of the long vowel in *ayɔ'ŋ-qwampits* 'fir-grouse' (compare *qaa'mpits*) = 'grouse' (Sapir (1930, 8)). Second, *i* assimilates to a following or preceding *i* (Sapir (1930, 10)), and again one mora of a long vowel can be affected, as in *yni'k-aŋu-mīi-ts* 'after they had done so' from *yni'k-aŋu-mīi-ts-i* (compare *yni'k-aŋu-m-i-q-a-mī* 'after they had all done so'). This rule is not likely to be phonetic, since it is neutralizing (there is an *i* phoneme) and the conditioning vowel can later be deleted, as it is in this example.

#### 4. Conclusions

We have seen that the major novel argument for the OCP from Antigemination does not provide strong evidence for the OCP. The attempt to deduce examples of the lexical OCP constraining segments that are not adjacent at the surface is less than successful. Moreover, strictly adjacent segments are not universally constrained by a lexical OCP.

<sup>14</sup> The consequent suffix *e:xo* glottalizes the penultimate stem consonant.

In short, the OCP in segmental phonology has precisely the same status as the OCP in tonal phonology: it is not part of formal linguistic theory but is the surface manifestation of a more general problem in language learning and grammar selection, namely, the problem of selecting between competing analyses that are consistent with general linguistic theory and cover the same range of data.

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