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1 Introduction

Many cases are known of phonological processes which fail to apply in environments which are created by morpheme concatenation. A famous example (Harris, 1990; Borowsky, 1993; Benua, 1997) is found in many English dialects of Northern Ireland. Here, the coronal consonants /t d l/ normally have alveolar place of articulation, except before a rhotic, where they are instead dental:

(1) *ladder* [læd̪ɚ],*[lædɚ] *pillar* [pɪl̪ɚ], *[pɪlɚ]

However, when the following rhotic is the *–er* of the agentive or comparative suffixes, dentalization does not apply, and /t d l/ appear as alveolar:

(2) *waiter* [wetɚ], *[wet̪ɚ] *louder* [laʊdɚ], *[laʊd̪ɚ]

This paper is about how facts like those in (2) are expressed in a grammar. On a derivational view of word-formation, in which morphemes are introduced gradually beginning with the root and proceeding outwards through successively more and more peripheral affixes, the most common way of understanding such effects is to attribute them to some grammatical principle or constraint which forbids material that has 'already been dealt with' from undergoing further changes. In models of phonological cyclicity (Marvin, 2002 *et seq.*) based on phase theory (Chomsky, 1999), this principle is the Phase Impenetrability Condition. In the example in (2), assuming the roots to be in different phases than the suffixes, the PIC will make the roots inaccessible to changes conditioned by the presence of material introduced on the higher, suffix-level phase.

The same basic idea—junctural underapplication results from 'inner' material being protected from alteration—also lies behind the theory of transderivational base-identity proposed by Benua (1997). This approach, cast within Optimality Theory's (Prince and Smolensky, 2004 [1993]) architecture of constraint interaction, holds that, in affixed words like those in (2) where the base of affixation is a freestanding word, there are two recursions of constraint evaluation. First, the surface form of the base ([wet, laʊd]) is computed. Second, the surface form of the affixed word is computed, and among the constraints that determine the outcome of this computation are output-output faithfulness constraints which demand that the surface form of the affixed word resemble the surface form of the base along some particular phonological dimension. In Benua's (1997) analysis of (1)-(2), for instance, an output-output faithfulness constraint OO-IDENT(distributed) is proposed to outrank the markedness constraint responsible for dentalization. By assumption, alveolars and dentals differ in their specifications for the feature [±distributed], so a candidate like *[wet̪ɚ] for *waiter* would violate OO-IDENT(distributed) due to its root-final consonant mismatching the corresponding final consonant in the base *wait* [wet] in that feature.

This paper explores one of the consequences of a different way of looking at junctural underapplication, namely to treat it as a form of counterfeeding opacity. (The observation that we can look at it this way is made by Blumenfeld (2003)). In a case like (1)-(2), the underapplying process (here, dentalization) would be extrinsically constrained by the grammar to apply only before and never after the relevant morphological processes (here, comparative and agentive suffixation). A counterfeeding approach is more typologically lenient than a 'don't alter the base' approach. This is because a counterfeeding approach allows for there to be cases of junctural underapplication in which the process that would have applied is one which would have produced a

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change to the phonological contents of the affix, rather than a phonological change to the base. While it has been claimed that this does not happen (Benua, 1997:ch. 6), it turns out that a reasonably broad range of examples are reported. Elsewhere, I have argued (Wolf, 2008) that there are desirable consequences to implementing derivational phonology-morphology interleaving in Optimality Theory with Candidate Chains (OT-CC), a version of OT proposed by McCarthy (2007) in which multi-step derivations compete as candidates, rather than direct input-output mappings as in classic OT. If morphological spell-out occurs within these candidate derivations, then it is possible for affixation to counterfeed a phonological process, resulting in affix-protecting underapplication. The goal of this paper is to show that that prediction is empirically borne out.

2 Illustration: English Geminates

English does not have a singleton/geminate contrast; geminates are not allowed morpheme internally or at 'Level 1' morphological junctures. However, geminates are tolerated (Borowsky, 1986; Beňuš, Smorodinsky and Gafos, 2004; Martin, 2007) if they arise at 'Level 2' or compound junctures, and this can create singleton/geminate minimal pairs:

(3)	*unnatural*	[ʌn.nætʃɹəl]	(cf. *a natural*)
	solely	[sowl.lij]	
	cleanness	[klijn.nəs]	
	tailless	[teɪl.ləs]	
	sand dune	[sænd.duwn]	
	pine needle	[paɪn.nij.dl]	(cf. hypothetical *pie needle*)
	carp pool	[kɑɹp.puwl]	(cf. *car pool*)

The ban on geminates outside of these junctural contexts is arguably not just a morpheme structure constraint, since geminates created at 'Level 1' junctures are shortened (my intuitions):

(4)	*dis-*: *dissimilar*, *dispiriting*	[də.sɪ.mə.lɚ], [də.spɪ.ɹə.ɾɪŋ]
		*[dəs.sɪ.mə.lɚ], *[dəs.spɪ.ɹə.ɾɪŋ]
	in-: *innumerable*	[ɪ.nuw.mɚ.ə.bl], *[ɪn.nuw.mɚ.ə.bl]

In OT, to deal with the normal absence of geminates in English, we would say that a markedness constraint against geminates (*GEM) outranks a faithfulness constraint against consonant deletion (MAX-C):

/pɪl_1l_2ɚ/	*GEM	MAX-C
a. → [pɪl_2ɚ]		*
b. [pɪl_1l_2ɚ]	*!	

Table 1: OT analysis of overall ban on geminates.

Because geminates created by compounding and 'Level 2' affixation are allowed to surface intact, it must be the case that *GEM is outranked by some countervailing constraint which is active in those environments but not in morpheme-internal or 'Level 1' environments. Importantly, the constraint we need cannot be OO-MAX-C. This constraint will protect the consonant contributed by the *base* to the derived geminate from being deleted, but it will have no objection to deleting the *affix* consonant:

/ʌ$n_1n_2$ætʃɹəl/ *Base of OO-correspondence*: [$n_2$ætʃɹəl]	OO-MAX-C	*GEM	IO-MAX-C

a. *(attested winner)* [ʌ$n_1$$n_2$ætʃɹəl]		*!	
b. [ʌ$n_1$ætʃɹəl]	*!		*
c. *(mistaken winner)* [ʌ$n_2$ætʃɹəl]			*

Table 2: Base-identity fails to protect affix consonant from deletion.

Similarly, under a phase-based analysis, if the stem and prefix are in separate phases, phase impenetrability might protect the stem's /n_2/ from deletion by the time the prefix is introduced, but the prefix's /n_1/ should still be liable for deletion on the phase where the prefix is introduced.

As mentioned earlier, we can try to understand these effects in a different way, namely as counterfeeding: degemination cannot occur when its environment has been created by previous application of 'Level 2' affixation. I will now present such an analysis cast in terms of a particular theory of counterfeeding (and counterbleeding) opacity, namely OT-CC.

In classic OT, each candidate is a direct mapping from the input onto some surface form, with no intermediate steps. The input and the candidate output may differ to an arbitrarily great extent ('Freedom of Analysis'). In OT-CC, by contrast, each candidate is a gradual, multi-step mapping from the input to some output—a *chain* of intermediate forms. As in classic OT, it is only the surface part of each candidate (the last link of the chain) that is evaluated by markedness constraints when candidates are being compared. The succession of intermediate forms in each chain, however, is subject to two universal and inviolable conditions:

(5) *Gradualness*: Each form in the chain may differ from the preceding one via the application of only a single basic operation.
(6) *Harmonic improvement*: Each form must be more harmonic than the previous one, given the ranking of markedness and faithfulness constraints in the language in question.

Within these general premises, we can consider multiple hypotheses about what does and what does not count as a 'single basic operation'. In McCarthy (2007), the set of basic operations consists of: deletion of one segment; epenthesis of one segment; changing one distinctive feature-value of one segment; or metathesis of two adjacent segments. But other hypotheses can be proposed: Walker (2008), for instance, argues that it is necessary to allow multiple segments to undergo the same feature-change in one step of a chain.

In Wolf (2008), I propose an addition to McCarthy's (2007) original hypothesis about the set of operations, while also changing the assumptions about the input that were adhered to in the original OT-CC proposal. Drawing on realizational theories of morphology such as Distributed Morphology (Halle and Marantz, 1993), I propose that the input to the phonology consists not of a collection of phonological underlying forms but instead of a collection of abstract morphemes occupying the terminal nodes of a morphosyntactic tree structure. One of the operations which can occur as a single step of the candidate chains beginning from such an input is to draw a morph (or in DM parlance a 'Vocabulary Item') from the lexicon and place it in Correspondence (McCarthy and Prince, 1995) with one of the abstract morphemes. The insertion of one affix (such as English *un-* in the example above) occurs, under this proposal, as a single step in a candidate chain. I refer to this proposed version of OT-CC, with morph-insertion occurring in the same chains as phonological operations, as *Optimal Interleaving* theory, or OI. (Further explorations of the OI proposal can be found in McCarthy (to appear) and Kimper (2009).)

In OT-CC, chains with opaque orderings of derivational steps can be made to win by virtue of adding to the markedness and faithfulness constraints a third type of constraint, called PREC(EDENCE) constraints. Unlike markedness constraints (which make demands about the phonological shape of the surface form at the end of each chain) and faithfulness constraints (which militate against the presence of certain kinds of dissimilarity between successive steps of the chain), PREC constraints make demands about the order in which operations occur in the chain. The canonical schema of a PREC constraint is shown in (7):

(7) PREC(X,Y)
Assign a violation-mark for every time that:
a. Operation Y occurs but is not preceded by an occurrence of operation X.
b. Operation Y occurs and is followed by an occurrence of operation X.

The clause relevant to counterfeeding interactions is (7b): if PREC(X,Y) is ranked above the markedness constraint that motivates process X, then X will be blocked from applying in environments where the conditions for X to apply were created by prior application of process Y. For the failure of English degemination to occur in ‘Level 2’-derived environments, then, the specific PREC constraint we need can be stated as in (8):

(8) PREC(delete-C, insert-L2)[1]
Assign a violation-mark for every time that:
a. Insertion of a Level 2 morph occurs and is not preceded by deletion of a consonant.
b. Insertion of a Level 2 morph occurs and is followed by the deletion of a consonant.

One note about this constraint: because I am not operating in a Lexical Phonology or Stratal OT framework with level-ordered morphology, the notation ‘Level 2’ should be understood simply as a diacritic feature that picks out a certain arbitrary class of affixes which share certain phonological and morphological behaviors (in this case, with respect to degemination). No prediction that, for instance, ‘Level 2’ affixes cannot appear inside of ‘Level 1’ affixes should be drawn from my use of this terminology to refer to the set of affixes involved.

Given the constraint in (8), the constraint ranking relevant to the *unnatural* example is:

(9) PREC(delete-C, insert-L2) » *GEM » MAX-C » *n

Given this ranking and the abstract-morphological input which we can abbreviate as NOT-√NATURAL, the harmonically-improving chains that we need to consider are the following:

(10) a. Insert root morph, insert prefix morph:
<NOT-√NATURAL, NOT-n$_2$ætʃ.ɹəl, ʌn$_1$.n$_2$ætʃ.ɹəl>
b. Insert root morph, insert prefix morph, delete prefix /n/:
<NOT-√NATURAL, NOT- n$_2$ætʃ.ɹəl, ʌn$_1$.n$_2$ætʃ.ɹəl, ʌ.n$_2$ætʃ.ɹəl>
c. Insert root morph, insert prefix morph, delete root /n/:
<NOT-√NATURAL, NOT-n$_2$ætʃ.ɹəl, ʌn$_1$.n$_2$ætʃ.ɹəl, ʌ.n$_1$ætʃ.ɹəl>

I assume that a top-ranked constraint requiring every morpheme to have a corresponding morph rules out all chains where either the root or affix has not been spelled out. (Having such a constraint ranked above *GEM is also necessary in order for insertion of /ʌn$_1$/ to be harmonically improving, since inserting the prefix morph creates a new *GEM violation.)

Notice that, in both of the chains (10b) and (10c) in which one of the /n/s is deleted, deletion does not take place until after the prefix morph has been inserted, creating an /nn/ sequence and therefore a violation of *GEM. Once the /nn/ sequence has been created, it will be harmonically improving to delete one of the /n/s, given the ranking *GEM » MAX-C. Prior to the insertion of the prefix, there is only the single root-initial /n/, and it would not be harmonically-improving to delete it, since any and all markedness constraints which might disfavor the presence of this singleton /n/—for which *n serves as an abbreviatory stand-in in the ranking in (9)—are ranked below MAX-C. This, really, is just another way of saying that English tolerates word-initial singleton /n/, meaning that in OT terms it cannot improve harmony relative to the constraint ranking of English to delete such an /n/.

Because there is, therefore, no chain of the form **<NOT-√NATURAL, NOT-n$_2$ætʃ.ɹəl, NOT-ætʃ.ɹəl, ʌ.n$_1$ætʃ.ɹəl>, with deletion of the root /n/ prior to insertion of the prefix morph, the only available candidates that end with a singleton [n] on the surface are (10b-c), and these violate the second clause of PREC(delete-C, insert-L2). Ranking that constraint above *GEM will therefore

[1]In hypothesizing that at least some morphological influence on phonology occurs through constraints that refer to the derivational history of phonological strings, rather than via some direct representational mechanism such as boundary markers, OI bears a close resemblance to the proposal in Pyle (1972).

result in (10a), with the geminate [nn] on the surface, as the winner:

/NOT-√NATURAL/	PREC (delete-C, insert-L2)	*GEMINATE	MAX-C
a. → <NOT-√NATURAL, NOT-$n_2$ætʃ.ɹəl, ʌn_1.$n_2$ætʃ.ɹəl>	*	*	
b. <NOT-√NATURAL, NOT- $n_2$ætʃ.ɹəl, ʌn_1.$n_2$ætʃ.ɹəl, ʌ.$n_2$ætʃ.ɹəl>	**!		*
c. <NOT-√NATURAL, NOT-$n_2$ætʃ.ɹəl, ʌn_1.$n_2$ætʃ.ɹəl, ʌ.$n_1$ætʃ.ɹəl>	**!		*

Table 3: OT analysis of ranking in (9).

(A remark: all of the candidates depicted get one violation-mark from the first clause of PREC(delete-C, insert-L2), because in none of them is insertion of the prefix *preceded* by consonant deletion. All share this violation equally, though, so it is irrelevant to determining the winner.)

Root-internal or Level 1-derived geminates, by contrast to what we just saw, will still be able to undergo shortening. Consider what happens if we have a Level 2 prefix attached to a root which contains a hypothetical underlying geminate, say /ʌn-səllɛkt/. Because the geminate is root-internal, the conditions required for consonant-deletion to be harmonically-improving (i.e., the presence of the geminate), exist before the prefix morph is inserted. As such, the following will be a valid, harmonically-improving chain:

(11) <NOT-√SELECT, NOT-səllɛkt, NOT-səlɛkt, ʌnsəlɛkt>

In chain (11), because we did not have to wait until after Level 2 prefixation had occurred in order for it to be harmonically-improving to delete one of the consonants making up the geminate, the clause of PREC(delete-C, insert-L2) that forbids consonant deletion following Level 2 affix insertion is not violated, making (11), unlike (10b-c), able to win.[2] Geminates created at Level 1 junctures will also be able to reduce, for similar reasons.

3 Attested Examples of Affix-Protecting Underapplication

In the preceding section we saw that a version of OT-CC in which morph-insertion occurs in the chains is capable of modeling affix-protecting junctural underapplication. The question of whether or not such underapplication exists is therefore an important empirical test of the viability of this theory. In this section, I will review reported examples of affix-protecting junctural underapplication. As we shall see, enough examples are reported that we can be optimistic that OI's predictions on this front are correct. The reported examples of affix-protecting underapplication can be taxonomically grouped into three types, each of which will now be considered in turn.

3.1 Type 1: Underapplication at Juncture of Base and Segmental Affix

This first type is the one to which the English derived geminates example above belongs to. Here, both an affix and its base contribute segments to creating a segmental string that the language

[2] Strictly speaking, before candidate comparison this chain will be *merged* with another chain <NOT-√SELECT, NOT-səllɛkt, ʌnsəllɛkt, ʌnsəlɛkt> which converges on the same final form. This chain features C-deletion after Level 2-prefix insertion, whereas the chain in (11) features the opposite order of these two processes. In OT-CC, merged chains retain only those ordering relations common to all of the chains that are merged together, so the merged chain in this example will contain *no* assertion about the relative order of C-deletion and Level 2 prefixation. Therefore, the merged chain does not violate the second clause of constraint (8), though it will still violate the first clause (since, unlike unmerged (11), it will not assert that prefixation is preceded by C-deletion).

normally does not allow, and which normally would be 'repaired' by altering or deleting segments in the part of the marked string which, in the junctural context, is contributed by the affix. Besides the example of derived geminates, one other pattern of this kind has been reported in English, namely that of nasal place assimilation (Kiparsky, 1985; Borowsky, 1986; Coetzee and Pater, to appear). Place assimilation is obligatory and categorical at Level 1 junctures, but is optional and applies gradiently at Level 2 junctures, a form of variable protection of the prefix's nasal:

(12) a. Level 1 *in-*: *impossible* /ɪn-pɑsəbl/ → [ɪmpɑsəbl], *[ɪnpɑsəbl]
b. Level 2 *un-*: *unbelievable* /ʌn-bəlijvəbl/ → [ʌnbəlijvəbl] ~ [ʌmbəlijvəbl]

Another example which has generated considerable debate (Bloomfield, 1930; Hall, 1989, 2006; Macfarland and Pierrehumbert, 1992; Iverson and Salmons, 1992; Borowsky, 1993; Merchant, 1996; Benua, 1997) involves [x]~[ç] allophony in German. These two fricatives are in near-complementary distribution in the language: generally, [ç] is found after front vowels, and [x] otherwise. However, [ç] can be found after a back vowel if they are separated by a Level 2 (Hall, 1989) or Word-level (Borowsky, 1993) morph boundary, as can be seen with the diminutive suffix:

(13) frau-chen	[fraʊçən]	'little woman' / 'animal's mistress'
tau-chen	[taʊçən]	'little rope'
kuh-chen	[kuːçən]	'little cow'

A third possible example involves obstruent/noncoronal-obstruent clusters in Ancient Greek (Blumenfeld, 2003, citing Smyth, 1956). Morpheme-internally, obstruent-obstruent clusters are allowed only if the second member is coronal. However, obstruent-obstruent clusters with a non-coronal second member are tolerated if the cluster is created through morph concatenation:

(14) /ek-bainō/ → [ekbainō] 'walk out'

This is arguably a case of affix-protecting underapplication because, cross-linguistically, when VCCV clusters are reduced, this is always done by deleting the first rather than the second C (Wilson, 2000, 2001; McCarthy, 2003, 2008). Cases where the second consonant deletes may exist at root-suffix junctures, owing to special faithfulness protection (McCarthy and Prince, 1995; Beckman, 1998) to the first, root-affiliated consonant (Wilson (2001):§3.3.1 suggests the Ibibio negative suffix as a possible example); the datum in (14) is obviously not such a case, involving as it does a prefix rather than a suffix. Therefore, for (14), the theoretical challenge is to explain why [ekbainō], with retention of the prefixal /k/, beats the competing candidate *[ebainō].

An example from Modern Greek is mentioned by Kaisse (1976:325&ff.). Nearly all modern dialects have a rule of Height Dissimilation which raises mid vowels to their high counterparts when they are either preceded or followed by /a/; the mid vowel /e/ also raises to [i] when it is either preceded or followed by /o/. However, in the southeastern dialects discussed in Kaisse (1976), raising of /e/ next to /o/ fails to apply to affixes, for instance the suffix in [ro-es] 'grape-NOM/ACC.FEM.PL', which always surfaces as [-es]. Citing Andriotis (1939), Kaisse (335:fn. 2) describes this as being 'part of a general tendency to preserve grammatical morphemes unaltered'. In addition to this example, Andritotis (1939:168) reports that, in the Karpathos dialect, Height Dissimilation systematically fails to affect an /o/ belonging to a grammatical morpheme, including the masculine singular nominative /-os/ and the neuter nominative singular /-o/, which we would otherwise have expected to undergo Height Dissimilation when attached to an /a/-final base.

A final example, this time from child English, is discussed by Jesney (2009). Between 2;3 and 2;5, Trevor (Compton and Streeter, 1977; Pater, 1997) systematically realized the English past-tense suffix /-d/ as voiced (15a,b), even after a voiceless root consonant. However, morph-internal consonant clusters consistently agreed in voicing (15c):

(15) a. [sniːðd] 'sneezed'
b. [fɪnɪʃd] 'finished'

c. [twɪst] ‘twist’

The existence of this stage complements known cases of emergent, non-target-like *base*-protecting underapplication in child phonology (Dinnsen and McGarrity, 2004; Hayes, 2004; Tessier, 2007).

3.2 Type 2: Phonology Counterfed by ‘Process’ Morphology

In type 1 underapplication, a structure normally not permitted in the language is tolerated if it is created via concatenation of segmental morphs. In underapplication of the second type, a structure normally not allowed in the language is tolerated if it is created through ‘process’ morphology like ablaut, consonant mutation, or morphological lengthening. If this type of morphology is treated as the docking of floating features or moras belonging to an affix (Goldsmith, 1976; Lieber, 1987; Zoll, 1996; Gnanadesikan, 1997; Wolf, 2007), then these are also cases of affix-protecting underapplication, as the features introduced by the affix in question are not deleted.

In unaffixed roots, Agar Dinka (Andersen, 1995; Flack, 2007) has a two-way length contrast: vowels may be either monomoraic or bimoraic. The language also has a number of grammatical morphemes which are realized through a variety of stem changes, including vowel lengthening. Certain of the lengthening affixes, including the 3rd person singular and the centrifugal (motion away from), when attached to a verb root with a bimoraic vowel, lengthen the vowel to trimoraic:

(16)	[wḛ̀c]	‘kick’	[wḛ̀ːc]	‘kick-3.SG’	[wéːc]	‘kick away’
	[lḛ̀ːr]	‘roll’	[lḛ̀ːːr]	‘roll-3.SG’	[lḛ̂ːːr]	‘roll away’

Following the usual mode of analysis in floating-autosegment accounts of process morphology, we may assume that the 3rd.sg. and centrifugal morphs contain a floating mora which docks onto the root vowel, resulting in a trimoraic vowel if the root vowel was bimoraic underlyingly.

To account for the usual absence of trimoraic vowels in Agar Dinka, we can posit a ranking of *μμμ [‘no trimoraic vowels’] » IO-MAX-μ [‘no deletion of moras’] in order to filter underlying trimoraic vowels out of the rich base:

/le$^{\mu1\mu2\mu3}$r/	*μμμ	IO-MAX-μ
a. → [le$^{\mu1\mu2}$r]		*
b. [le$^{\mu1\mu2\mu3}$r]	*!	

Table 4: *μμμ [‘no trimoraic vowels’] » IO-MAX-μ [‘no deletion of moras’].

Now consider what happens when we have a derived trimoraic vowel created by adding the floating mora of the 3rd.sg. or centrifugal affixes to a root with a trimoraic vowel. Here, we have two root moras and one affix mora. Because the affixed verb surfaces with a trimoraic vowel in these cases, *μμμ must be dominated by one or more constraints which ensure that in the appropriate contexts *none* of the three moras are deleted. Much as we saw with English geminates above, an output-output faithfulness constraint which demands that moras present in the verb’s bimoraic citation form have correspondents in the 3rd.sg. or centrifugal forms will protect the two root moras from deletion, but it will have no objection to deleting the affix mora, since this mora has no correspondent in the citation form (since the citation form does not contain the 3rd.sg. or centrifugal morphemes). Just as with English geminates, it is more promising to handle this as a case of counterfeeding: shortening of trimoraic vowels to bimoraic is blocked when the trimoraic vowel arises through insertion of the 3rd.sg. or centrifugal marker.

Numerous examples comparable to the Agar Dinka one are reported with morphology involving mutation of the features of stem segments. In Javanese (Dudas, 1976; Benua, 1999; Wolf, 2007, 2009), tense vowels are not permitted in closed syllables, resulting in alternations like these:

(17)	*root UR*	*unaffixed*	*affixed*	
	/apiʔ/	[a.pɪʔ]	[a.pi.ʔ-e]	‘good’
	/wiwit/	[wi.wɪt]	[wi.wi.t-an]	‘beginning’

In these data, the presence of a tense vowel in the open stem-final syllable of the affixed form and a lax vowel in the corresponding stem-final closed syllable of the unaffixed form can be accounted for by assuming that the vowels are underlyingly [+tense] and that the [+tense] feature is deleted in closed syllables (an analysis first put forth by Dudas, 1976).

Javanese also has a morphological ablaut process which is used to mark the elative form of adjectives: the rightmost vowel of the stem becomes [+tense, +high]. Crucially, the tensing part of the elative ablaut surfaces even if the rightmost vowel of the stem is in a closed syllable:

(18)	*plain form*		*elative form*	
	[alʊs]	'refined'	[alus]	'most refined'
	[aŋɛl]	'difficult'	[aŋil]	'most difficult'
	[abɔt]	'heavy'	[abut]	'most heavy'

This means that the usual deletion of instances of the feature [+tense] in the vowel of a closed syllable must be blocked from applying in environments derived by elative affixation. If the elative morph is analyzed as having an underlying form consisting of two floating features [+tense, +high] (Benua, 1999), then the [+tense] autosegment which is protected from deletion is one which is affiliated with the affix, not with the base.

Gnanadesikan (1997) discusses a number of very similar cases in the consonant mutation systems of the Celtic languages. Applecross Gaelic (Ternes, 1973) has no voiced stops, except when derived via Eclipsis. Hebridean Gaelic (Borgstrøm, 1940) has no prenasalized stops, except when derived via Eclipsis. Welsh (Kibre, 1997) has no aspirated nasals, except when derived via the nasal mutation. Irish (Ní Chiosáin, 1991) lacks word-initial [x, x^j, h^j, w, j], except when these are derived via Lenition; lacks word-initial [ŋ, $ŋ^j$], except when these are derived via Eclipsis; lacks word-initial [v, v^j], except as the result of either Lenition or Eclipsis; and lacks [ɣ, $ɣ^j$] entirely, except as the Lenition of initial /d, d^j/.

3.3 Type 3: Protection of Affix-Internal Marked Structure

The counterfeeding approach to junctural underapplication advocated here predicts the possibility of a third type of affix-protecting underapplication which is not really 'junctural'. If a phonological process that eliminates some marked structure [XY] can be counterfed by affix-insertion, we expect to find languages where /XY/ is exempted from change in cases where it is wholly contained within some affix (/XY-ABC/) in addition to languages where /XY/ is exempt from change just in case it straddles a root-affix boundary (/X-YAB/).

This would be a departure from the more familiar pattern where roots support a greater range of phonological contrasts than grammatical morphs (McCarthy and Prince, 1995; Beckman, 1998). Nevertheless, we do indeed find languages where some segment or other structure only occurs on the surface in affixes or in function words. Parker (to appear) provides a detailed discussion of one such example, namely that of [ð] in the Papuan language Arammba, which is found only in masculine tense/aspect and agreement portmanteau affixes (and in 'a few' proper names). Parker cites three other examples of this kind: Awara (Quigley, 2003) allows [ʃ] only in the 'specific' classifier suffix; Guambiano (Branks and Branks, 1973) allows [ʒ] only in the diminutive affix; and English allows initial [ð] only in function words.

4 Conclusion

OI predicts that languages may exhibit junctural underapplication of a phonological process where affix material, rather than root material, is protected against change. In this paper I have argued that this prediction is correct. OI's PREC-based approach to junctural underapplication therefore provides greater empirical coverage than either output-output base-identity constraints or the Phase Impenetrability Condition.

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