Lexical insertion occurs in the phonological component*

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1 Introduction

A morpheme (or a collection of morphological features) may be pronounced in different ways when it appears in different contexts. The term 'allomorphy' in the broadest sense refers to any instance where this occurs. Some cases of allomorphy involve purely morphosyntactic suppletion, a parade example being the English irregular verb which is pronounced [gow] in the present tense and [wɛnt] in the past tense. While the grammar must choose between these pronunciations, the choice is not made on the basis of any phonological information; knowing the morphosyntactic tense of the verb is sufficient to make the right choice. At another extreme lie cases of allomorphy which arise solely from phonological alternations. In such cases, the morphology consistently selects a single underlying pronunciation for some morphological object, and this undergoes different phonological changes in different phonological contexts where it may be found.

This paper is concerned with systems of allomorphy which fall in the territory between these two extremes. Since the work of Carstairs(-McCarthy) (1987, 1988, 1990), it has been widely familiar that there are systems of allomorphy where the allomorphs are distributed according to a phonological generalization, but where we could not derive the different surface allomorphs from a single underlying form via plausible phonological processes. What these cases demand is that there be a selection between multiple different listed pronunciations (like the first type), but that this selection make reference to information about the phonological context in which the chosen pronunciation will appear (like the second type). A fairly well-known example is that of the 3rd person masculine singular possessive/direct object enclitic in Moroccan Arabic (Heath 1987: 34, 238; Mascaró 1996b), which is /-u/ after a consonant-final base, but /-h/ after a vowel-final one:

(1) a. [ktab-u] 'his book'
b. [xtˤa-h] 'his error'

Following Paster (2005, 2006, 2009, this volume), I will refer to this phenomenon as 'phonologically conditioned suppletive allomorphy', or PCSA for short.

A longstanding question in phonological and morphological theory is that of how these different kinds of allomorphy are distributed in the grammar. A relatively traditional response would go something like this. There is a module of grammar, which we may call the morphological component, in which non-phonologically-conditoned suppletion like that involving *go ~ went* is handled. This component takes abstract morphological structure and consults the list of arbitrary sound-meaning pairs stored in the language's lexicon to decide which collection of sounds is appropriate for expressing which bit of morphological structure. When this is finished, the output of the morphology—a collection of phonological underlying representations—becomes the input to the phonological component. The phonology takes this string of underlying forms and maps it onto the phonological surface form. The second type of allomorphy thus arises in the phonological component.

So far all this is relatively straightforward, perhaps even banal. The trickier (and thus more interesting) matter, under the standard assumptions just laid out, is that of where in the grammar PCSA arises. It is with this question that the present chapter is concerned. In the existing literature, three general responses to this question can be identified.

The first answer is that PCSA arises in the phonological component. This view has become widespread since the appearance of Optimality Theory (Prince & Smolensky 2004 [1993]). In parallel Optimality-Theoretic models of phonology, the selection of the surface pronunciation of some form results from considering various candidate pronunciations and determining which best satisfies a set of ranked and violable constraints. It is easy to see the intuitive appeal of treating PCSA in such a framework, since PCSA seems by definition to involve using phonological criteria to choose between competing alternative pronunciations. It is thus not surprising that in the first few years of OT, a number of different researchers (Mester 1994; Hargus 1995; Tranel 1995, 1996, 1998; Drachman, Kager, & Malikouti-Drachman 1996; Kager 1996a; Mascaró 1996a,b) proposed OT analyses of PCSA effects in a variety of languages. Many works since these (far too numerous to list) have pursued this same line of analysis.

The second response is that some cases of PCSA happen in the phonology component and others in the morphology component. Lapointe & Sells (1996), Dolbey (1997), and Lapointe (1999) note that there are at least some attested PCSA systems in which typologically-plausible and strictly *phonological* OT constraints are not available which will produce the correct distribution of allomorphs. If PCSA is to be kept in the phonology component, these cases seem to require that the phonological constraints be augmented with additional constraints which impose preferences which are, from a phonological standpoint, arbitrary (Kager 1996a; Bonet 2004; Mascaró 2007; Bonet, Lloret & Mascaró 2007; Trommer 2008). An alternative suggestion, put forth by the authors cited at the beginning of this paragraph, is that the cases of PCSA which are not clearly phonologically optimizing are not really part of the phonology at all, but are instead like English *go*/*went*: they involve arbitrary subcategorization for features of the environment in which each allomorph appears, and it simply happens that some of the features subcategorized for are phonological.

The third response goes further. If some cases of PCSA need to be chalked up to arbitrary preferences imposed by nonphonological constraints, then this seems to vitiate the argument for PCSA ever representing optimization according to phonological criteria. If arbitrary morphological subcategorization frames are needed in order to cope with some cases of PCSA (as well as with nonphonological suppletion like *go~went*), then, the argument goes, it is most economical to assign all suppletion to the morphology component. Versions of this position are staked out, notably, by Paster (2005, 2006, 2009, this volume), Bye (2008), and Embick (2010).

This paper suggests that a different response is in order. Perhaps, if there are systems of suppletive allomorphy which seem to show the mixed influence of phonological criteria and morpho-lexical, non-phonological ones, this is because the two kinds of criteria are enforced by constraints which belong to a single component of the grammar, meaning that it is unsurprising that they should interact. That is, perhaps there is no crisp dividing line between cases of allomorphy which seem to belong to the morphological module and cases which seem to belong to the phonological module because *these are not in fact separate modules*. Instead, I would like to suggest, there is a single module of grammar in which all lexical insertion occurs, along with all phonological operations.

The argument is developed as follows. In section 2 I present the structure of the standard approach to PCSA in OT, taking as a central illustration Mascaró's (1996b) analysis of the Moroccan Arabic example mentioned above. Having seen how this mode of analysis works, we will then consider a well-known case in which arbitrary preferences seem to be required, namely that of the Ergative suffix in the Pama-Nyungan language Dyirbal. Section 3 lays out an analysis of the Dyirbal facts cast within a theoretical framework which assumes that phonology and lexical insertion occupy a single module of grammar, namely Optimal Interleaving (OI: Wolf 2008). This section also compares the OI analysis to an alternative approach to arbitrary preference based on the constraint PRIORITY (Bonet 2004; Bonet, Lloret & Mascaró 2007). Comparison with approaches which remove PCSA from the phonology entirely is made in section 4. Section 5 discusses some additional types of interactions between phonological and morphological constraints which are expected if the two constraints belong to the same component and are freely re-rankable with respect to one another. Section 6 gives a concluding summary.

2. PCSA as phonological optimization: The standard treatment, and its limits

The idea that PCSA occurs in the phonological component has been implemented in a variety of different ways, but to the extent that a 'standard' implementation of this idea exists, it is probably the one presented by Mascaró (1996a,b). The analysis of the Moroccan Arabic 3rd person masculine singular possessive/direct object enclitic in Mascaró (1996b) assumes that this morpheme has two underlying forms, /-u/ and /-h/[1], and that the following convention (originally stated in explicit form in Mascaró 1996a) is applicable in such cases:

(2) For a lexical item L such that Φ = a, b:
Eval(Gen (a, b)) = Eval(Gen(a) ∪ Gen(b))

That is: when a morph L's phonological representation Φ consists of two underlying forms *a* and *b*, the candidate set evaluated when L is in the input is defined as the union of two candidate sets: Gen(a), the candidate set produced with just *a* in the input, and Gen(b), the candidate set produced with just *b* in the input[2]. When some morphs in the input have multiple underlying forms, candidates thus differ not only in what surface form they contain, but also in which underlying form they select for those morphemes which have multiple disjunctive URs.

When the Moroccan Arabic 3rd person masculine singular enclitic is added to a vowel-final base, a candidate using the /-h/ allomorph will win, provided that having an onsetless syllable, as using /-u/ would give rise to, is a more serious problem than having a coda in the word-final syllable, as using /-h/ would give rise to. Mascaró's (1996b) analysis expresses this idea via the OT constraint ranking ONSET » NOCODA:[3]

(3)

/xtˤa – {h, u}/ Inputs:	Outputs:	ONSET	NOCODA
/xtˤa-h/	a. ☞ [xtˤah]		1
/xtˤa-u/	b. [xtˤa.u]	W1	L

For consonant-final bases, the same ranking will result in the selection of a candidate that uses /-u/:

(4)

/ktab – {h, u}/ Inputs:	Outputs:	ONSET	NOCODA
/ktab-u/	a. ☞ [kta.bu]		
/ktab-h/	b. [ktabh]		W1

Let us now consider the general requirements that must hold for an instance of PCSA to be analyzable under these assumptions. Suppose that a morpheme is realized, depending on its context, by one of two listed allomorphs X and Y, which appear respectively in the phonological contexts A_B and C_D. If the choice between X and Y is made by an OT grammar in the manner illustrated for Moroccan Arabic, then two things must be the case:

(5) a. Some (markedness) constraint M_1 that exerts the preference AXB ≻ AYB must dominate all constraints that exert the preference AYB ≻ AXB.

b. Some other (markedness) constraint M_2 that exerts the preference CYD ≻ CXD must dominate all constraints that exert the preference CXD ≻ CYD.

These requirements result directly from the basic logic of constraint ranking in OT. For a pair of competing options like AXB and AYB, the highest-ranked constraint which prefers one over the other must prefer AXB, since otherwise unattested *AYB would be chosen instead.[4] In some allmorphy systems, like /–h/ ~ /-u/ in Moroccan Arabic, it is easy to find the required M_1 and M_2 among markedness constraints which are well motivated by phonological typology. In Mascaró's (1996b) analysis of Moroccan Arabic depicted in (2)-(3), for instance, we can call on standard, widely-used, not-especially-controversial constraints like ONSET and NOCODA.

For other allomorphy systems, it is not apparent that the required M_1 and M_2 can be found. The system that arises most frequently in discussions of this issue (McCarthy & Prince 1990, 1993: ch. 7; Bonet 2004; McCarthy & Wolf 2005; Paster 2005, 2006, this volume; Bye 2008; Trommer 2008) involves the marking of Ergative case on vowel-final stems in the Pama-Nyungan language Dyirbal (Dixon 1972)[5]:

(6) jaɽa-ŋku ‘man-ERG’
jamani-ku ‘rainbow-ERG’
palakara-ku ‘they-ERG’

As the data illustrate, disyllabic vowel-final stems are suffixed with /ŋku/ in the Ergative, while longer stems are suffixed with /ku/.[6] (Stems ending in a nasal or [j] mark the Ergative with [Tu], where [T] is a stop homorganic with the stem-final consonant; with stems ending in a liquid, the final liquid is deleted, and the Ergative is marked with [-ɽu].) It is reasonably clear that there will be constraints that prefer /ku/ over /ŋku/, regardless of context, since nasals, velars, and consonant clusters are all marked. However, given that /ku/ and /ŋku/ resemble each other so much, it is not so obvious that we would be able to find a typologically-plausible universal constraint which could prefer /ŋku/ over /ku/ just in case the stem were disyllabic.

If we can’t, then it seems that in addition to substantively phonological preferences among allomorphs like those imposed by constraints like ONSET and NOCODA, at least some cases of PCSA require a role for *arbitrary* preferences among allomorphs, in the Dyirbal case in favor of /-ŋku/. Some authors have retained the same sort of OT framework illustrated for Moroccan Arabic while adding constraints that impose arbitrary, lexically-specified preferences (Kager 1996a; Kenstowicz 2005; Mascaró 2007; Bonet, Lloret & Mascaró 2007; Trommer 2008). Others have drawn a different lesson, concluding that if PCSA cannot be adequately treated without recourse to arbitrary preferences, there is nothing conceptually gained by treating PCSA as involving phonological optimization at all (Paster 2005, 2006, 2009, this volume; Bye 2008; Embick 2010). That is, the preference-relations among allomorphs which have been understood as being exercised by substantively phonological constraints could be replaced by arbitrary statements expressing the same preferences. In this way, non-phonological selection criteria would do all the work, and there would be no need to have both phonological and morpholexical constraints on allomorph selection.

As mentioned, this chapter will argue for a quite different conclusion: that allomorph selection is governed by both phonological and morphological constraints, and that these constraints occupy one and the same OT grammar and are freely re-rankable with respect to one another. The next section presents the assumptions of the framework being argued for here.

3. Optimal Interleaving theory and its treatment of arbitrary preference in allomorph selection

The framework in which I will present my analysis of Dyirbal is called Optimal Interleaving (OI: Wolf 2008, 2009, 2010, to appear a,b; Kimper 2009; Staubs 2011; McCarthy 2012; McQuaid 2012). OI, in brief, assumes (a) a realizational view of morphology, and (b) that morphological realization occurs together with phonology in a single OT grammar, specifically one with the serial architecture of OT-CC (McCarthy 2007) or Harmonic Serialism (Prince & Smolensky 2004 [1993]: §5.2.3.3). As it happens, serialism is not logically necessary to the analysis of Dyirbal I will present, but I will couch the analysis in HS terms for ease of comparison with existing discussions of OI. First let us briefly explicate these two basic assumptions of OI.

3.1 Realizational morphology

Stump (2001) presents a taxonomy of morphological theories which distinguishes between *incremental* theories and *realizational* ones. In an incremental theory, morphemes are regarded as meaningful collections of phonological material, which are assembled together to make words. That is, the construction of the abstract semantico-syntactic structure of words and the construction of the words' (underlying) phonological form proceed hand-in-hand. On the other hand, *realizational* theories assume that a purely abstract morphological structure is built first, and then at a later step, this structure is 'realized' or 'spelled out' by associating units of the abstract structure with collections of phonological material (and possibly also by applying phonological process like truncation, feature changes, etc.). Rules or constraints of one sort or another are responsible for dictating which abstract morphological features can be paired with which collections of phonological structure.

On a realizational view, the derivation of the English word *cats* will proceed something like this: first an abstract structure which we may represent as CAT+PLURAL is built. The process of spell-out then associates the abstract unit CAT with the underlying phonological string /kæt/ and PLURAL with the underlying string /z/. The collection of underlying forms /kætz/ then undergoes voicing assimilation to yield the surface form [kæts]. Within this general picture, there is substantial room for disagreement, for instance with regard to the extent to which words do or don't contain internal syntax-like structure organizing their abstract features; Distributed Morphology (Halle & Marantz 1993) and A-Morphous Morphology (Anderson 1992) are prominent realizational theories which take markedly different positions on this issue. In this paper, I will attempt to remain agnostic about such issues to the extent possible. I will use the term "morpheme" to refer to structures at the abstract level of morphological structure and the term "morph" to refer to the bundles of phonological material which are used to spell out morphemes (i.e., what is known in Distributed Morphology as a "vocabulary item"). My use of the term "morpheme" in this way should not be taken as indicating disagreement with frameworks like A-Morphous Morphology which reject the classical morpheme; rather, it should be taken as referring to any structural positions or layers within the abstract representation of a word which are smaller than the whole word but (potentially) larger than an individual morphosyntactic feature.

At least two general theoretical arguments can be given for a realizational view.[7] First, it is generally assumed that it is only the abstract morphological structures, and not their spell-out, which are built in or interact with syntax; spell-out, in derivational terms, occurs after syntax is done. This predicts that the syntax will be insensitive to the phonological composition of words, which seems to be right; this prediction is dubbed 'Feature Disjointness' in Distributed Morphology (Marantz 1995), and similar empirical conclusions are argued for (though from a standpoint quite different from DM's) under the rubric of the Principle of Phonology-Free Syntax (Zwicky 1969; Zwicky & Pullum 1986a,b; Pullum & Zwicky 1988; Miller, Pullum & Zwicky 1992, 1997).

The other argument in favor of a realizational view is that it permits us to analyze at least some morphological syncretisms without having to resort to accidental homophony. A straightforward illustration involves adjective inflection in Dutch (Saulerland 1995). Neuter singular strong adjectives have no overt inflectional ending; strong adjectives of other number-gender combinations carry an ending /-ə/:

(7) *Number/gender endings in Dutch strong adjectives*

	[+neuter]	[−neuter]
[+plural]	-ə	-ə
[−plural]	Ø	-ə

On an incremental view of morphology, this would require us to posit three accidentally-homophonous /-ə/ suffixes, with the meanings "neuter plural", "non-neuter plural", and "non-neuter singular". This is because in an incremental theory, morphological features inhere in and are introduced by the formatives which represent them, and so the observed formatives must carry all of the features which are possessed by the word which they appear in. Realizational theories are different, because while all the required dimensions of morphosyntactic feature contrast exist at the level of abstract morphological structure, it is possible that some of these contrasts may be neutralized in the mapping from morphemes to morphs—that is, a single morph of the language may be used to express multiple distinct morphemes.

Following Sauerland (1995)'s Distributed Morphology analysis, in a rule-based realizational framework we might set up the following two rules for Dutch:

(8) a. Spell out the inflectional ending as /Ø/ if it contains the features [−plural, +neuter].

b. Spell out the inflectional ending as /-ə/.

Since rule (8a) is applicable in a proper subset of the places where rule (8b) is, the rules will effectively apply in the order shown if they are disjunctively ordered in accordance with the Elsewhere Condition (Pāṇini, by way of Anderson [1969], Kiparsky [1973], and others). In other words, the null form of the inflectional ending is the default, but when the feature-combination required for the use of this form is absent, the elsewhere form /-ə/ is used instead. In Distributed Morphology, such default/elsewhere relationships between morphs (or “vocabulary items” in DM parlance) is generally taken to be expressed via the Subset Principle (Halle 1997):

(9) *Subset Principle*
The phonological exponent of a Vocabulary item is inserted into a morpheme in the terminal string if the item matches all or a subset of the grammatical features specified in the terminal morpheme. Insertion does not take place if the vocabulary item contains features not present in the morpheme. Where several Vocabulary items meet the conditions for insertion, the item matching the greatest number of features specified in the terminal morpheme must be chosen.

On this view, morphs (vocabulary items) can be thought of as ordered pairs consisting of a bundle of morphological features and a bundle of phonological material. When determining which morph to pair up with a particular morpheme, the grammar compares the features of the morpheme with the features of each morph in the language’s lexicon. The morph which is chosen is the one which matches the greatest number of the features present in the abstract morpheme, provided that the morph does not contain any features which the morpheme lacks. Expressed in these terms, we can set up the following two morphs for Dutch (Sauerland 1995):

(10) a. <[−plural, +neuter], Ø>
b. <Ø, /ə/>

Couched in these theoretical terms, the default status of the phonologically-null morph is a consequence of the fact that its bundle of morphological features contains a proper superset of the morphological features of the /-ə/ morph. In a short while, we will see that a similar mode of analysis can be called on in order to implement the required arbitrary preference among the competing allomorphs of the Dyirbal Ergative. The main architectural innovation this will require, naturally, is that constraints on the goodness of feature-matching in morphological spell-out must be able to interact with phonological constraints. Before addressing either the Dyirbal Ergative or these broader theoretical questions, though, we need to consider how a Subset-Principle-like mechanism of morph selection could be set up using OT constraints.

3.2 Constraints on morpheme-morph correspondence

Let us suppose that the input to the phonology consists of an abstract morphological structure.[8] Let us assume that the abstract representation consists of a set of nodes called *morphemes*, and that individual morphosyntactic features are autosegmental dependents of these nodes. (In principle the features might not be direct dependents of morphemes, but instead arranged in a more elaborate multi-layered feature geometry, as in Harley & Ritter [1998].) To the extent possible, I will try to be neutral about what kind of superordinate structure the morphemes themselves may be organized into (e.g. whether the morphemes are terminal nodes of a syntactic tree, or slots in a morphological template, or something else.) Following Trommer (2001), I will refer to a morpheme together with its dependent morphological features as a *feature structure*, or FS.

As before, let us suppose that a language's lexicon contains a list of *morphs*, and that morphs are ordered pairs consisting of an FS and an underlying phonological material. Under these assumptions, a candidate in the phonology will consist of:

- A set of morphs;
- A surface phonological representation;
- An input-output Correspondence relation (McCarthy & Prince 1995) between the surface phonological representation and the underlying phonological representations contained in the morphs;
- A Correspondence relation between the FSes of the morphs and the FSes of the morphemes in the input. (Call this the MM correspondence relation.)

For the English word *cats*, the winning candidate will then look something like this (coindexation indicates that two elements stand in Correspondence with one another; to emphasize the existence of distinct Correspondence relations, Greek letters indicate MM correspondence, and Arabic numerals indicate IO correspondence):

(11)

input	*morphs*	*surface form*
CAT_α-PLURAL_β	<CAT_α, /$k_1æ_2t_3$/>, <PLURAL_β, /-z_4/>	[$k_1æ_2t_3s_4$]

Similar assumptions about the nature of candidates can be found in Zuraw (2000) and Walker & Feng (2004), as well as in much recent work in the Bidrectional Phonology and Phonetics program making use of 'lexical' or 'M-Phon' constraints, including Boersma (2001, 2011), Escudero (2005), Apoussidou (2007), Eisenstat (2009), Hamann, Apoussidou & Boersma (2009), Jesney (2009), Jesney, Pater & Staubs (2010), Pater, Smith, Staubs, Jesney & Mettu (2010), Pater & Smith (2011), Pater, Staubs, Jesney & Smith (2012), Smith (2012), and Staubs & Pater (to appear).[9]

As in standard OT, phonological markedness constraints will evaluate the surface phonological representation, and phonological IO-faithfulness constraints will evaluate the Correspondence relation between the underlying and surface phonological structures. One thing which will be new is that there will be faithfulness constraints on the morpheme-morph dimension of Correspondence which assess the 'goodness of fit' between the input FSes and the FSes of the morphs employed in a given candidate.

Let us now return DM's Subset Principle. Given the assumptions and terminology just laid out, we can rephrase the Subset Principle as follows:

(12) a. If F is a feature-structure of a morpheme and *F′* is a feature structure of a morph that it corresponds to, *F′* must not contain any features which are not

present in F.

b. If F is a feature-structure of a morpheme and *F′* is a feature-structure of a morph that it corresponds to, *F′* must contain as many of F's features as possible.

c. In case of conflict between them, satisfying requirement (a) takes priority over satisfying requirement (b). However, requirement (b) must still be satisfied to the fullest extent possible, without violating requirement (a).

Once it's rephrased in this way, it becomes clearer that the Subset Principle contains an implicit OT-type constraint ranking: constraint (12a) dominates (12b). That ranking means that (12a) will be obeyed in case of conflict, but even then (12b) is satisfied to the fullest extent that it can be. The minimal violation of disobeyed constraints forms the core argument for OT's assumption that constraints are ranked, rather than being parameterized as on or off (Prince & Smolensky 2004 [1993]; see also McCarthy & Prince's [1994] discussion of The Emergence of the Unmarked, which is a case of this minimal-violation effect). Therefore, it seems fruitful to reformulate (12a-b) as OT constraints.

Requirement (12a) can be stated as a constraint of the DEP family, which on the IO dimension of correspondence serve to militate against epenthesis[10]: the introduction of items in the output representation which lack correspondents in the input representation. Specifically, let us assume that for every morphosyntactic feature *F*, there is a constraint of the following form[11]:

(13) DEP-M(F)
Let φ′ be an instance of the feature F at the morph level. Assign one violation-mark if there does not exist some φ at the morpheme level, such that φ and φ′ stand in MM-correspondence.

In addition to the DEP-M constraints for features, there will also presumably be DEP-M(FS) constraints, requiring that every feature structure at the morph level have a corresponding FS at the morpheme level.

Similarly, requirement (12b) can be stated as a constraint of the MAX family, which in IO correspondence militate against deletion: the presence of items in the input which lack correspondents in the output. On the MM dimension of Correspondence there will exist constraints of the following form for every feature F (as well as for FSes)[12]:

(14) MAX-M(F)
Let φ be an instance of the feature F at the morpheme level. Assign one violation-mark if there does not exist some φ′ at the morph level, such that φ and φ′ stand in MM-correspondence.

To show these constraints put to analytic use, let's return for one last time to the Dutch example. Recall that the two morphs we posited were:

(15) a. <[−plural, +neuter], Ø>
b. <Ø, /ə/>

When the morpheme containing an adjective's inflectional features has any person/number feature combination besides [-plural, +neuter], it will be the <Ø, /ə/> allomorph which is used. This creates a conflict between DEP-M and MAX-M constraints for feature-combinations like [+plural, +neuter] and [−plural, −neuter]. For the latter of these, the question is, is it more important to give a correspondent to the morpheme's [−plural] feature or to avoid using a morph containing a token of [+neuter] which isn't present at the morpheme level? The attested result follows if DEP-M(+neuter) outranks MAX-M(-plural) (in (16), MM-correspondence is indicated by Greek-letter co-indices):

(16)

FS_α / \\ [−plural]$_\beta$ [−neuter]$_\gamma$	DEP- M(+neuter)	MAX- M(−plural)
a. ☞ |FS_α| /ə$_1$/ [ə$_1$]		1
b. |FS_α| / \\ [−plural]$_\beta$ [+neuter]$_\delta$ *(no phonological material)*	W1	L

By an exactly analogous argument, DEP-M(−plural) must outrank MAX-M(+neuter) in order to get the /ə/ morph to win with adjectives which are [+plural, +neuter].[13]

3.3 Harmonic Serialism

The original OI proposal in Wolf (2008) is cast within an OT architecture called OT with Candidate Chains (McCarthy 2007). In OT-CC, each candidate is (approximately) a chain of successively more harmonic forms, each differing from the last by only one of some hypothesized set of minimal changes. OT-CC is an elaboration on Harmonic Serialism (Prince & Smolensky 2004 [1993]: §5.2.3.3) designed to cope with counterfeeding and counterbleeding opacity. As mentioned, serialism is not actually required to cope with the Dyirbal facts in the analysis which will follow, but I will present the analysis in HS terms both in order to facilitate comparison with other literature in and about OI; in addition, the one-step-at-a-time character of the derivational HS presentation will make it easier to isolate and explain the individual pieces of the analysis.[14]

In HS, the candidate-generating function GEN is taken to consist of some particular set of basic operations. At the beginning of a derivation, the input is presented to GEN, and the candidate set consists of every form which can be produced from the input by performing one of these operations, as well as the fully-faithful candidate identical to the input. If the winner from this candidate set is anything other than the fully-faithful candidate, the output of the current round of optimization is returned to GEN as an input, with the process continuing until a fully-faithful candidate is chosen (*convergence*).

The overall HS framework is compatible with any number of different hypotheses about what exactly the set of basic operations in GEN consists of. The goal of this paper is to advance one such hypothesis: that "insert one morph" is amongst the operations of the GEN of the phonological component.

3.4 Analysis of the Dyirbal Ergative

In Dyirbal, the competing ergative morphs /-ŋku/ and /-ku/ stand in a special-general relationship: /ŋku/ appears in one specific context (after a disyllabic stem), and /ku/ appears elsewhere. In this case, the context of the special morph is phonologically defined. As we have already seen, special-general relations of the same sort also exist in systems of suppletive allomorphy in which there is no evidence of phonological conditioning. The inflection of Dutch strong adjectives discussed earlier in this chapter is just such an example: null inflection is used with neuter singular adjectives (the special case) and /–ə/ is used otherwise (the general case).

In order for the general case to emerge, the preference for the special case has to be overruled in certain contexts. In OT terms, this means that in the contexts where the general case appears, the relevant MAX-M(F) constraints are dominated by a constraint which, in just those contexts, prefers the use of the general case over the use of the special case. As we saw in (16), in the case of Dutch, the relevant constraints are DEP-M(+neuter) and MAX-M(-plural).

For Dyirbal, the analytic strategy will be the same. The arbitrary preference for /ŋku/ over /ku/ can be derived from the assumption that /ŋku/ spells out more features than /ku/ does. The main difference between Dutch and Dyirbal will be in the nature of the constraint that dominates MAX-M(F) and which triggers use of the general case. For Dutch, these were morpheme/morph faithfulness constraints, but for Dyirbal, the constraint will have to involve phonology, since a phonological generalization is at work.

In order to justify the particular assumptions that I'll make about the morphosyntax of /ŋku/ and /ku/, we need to consider one further fact about the Dyirbal case system. This is that Locative case shows a pattern of allomorphy which is identical to that of that of the Ergative, except that the Locative has [a] where the Ergative has [u]. So, among V-final stems, disyllabic stems take [ŋka] in the Locative, whereas longer stems take [ka] (Dixon 1972):

(17)	jaɽa-ŋka	'man-LOC'
	jamani-ka	'rainbow-LOC'

That there should be this kind of partial syncretism between the Ergative and Locative is unsurprising in light of proposals about case features. Specifically, Halle & Vaux (1998) have proposed that Ergative and Locative share a feature [−free], which designates 'nominals with a consistent role in argument structure.' The other two cases which have this feature under Halle & Vaux's proposal are Instrumental (whose phonological realization is identical to that of Ergative in Dyirbal) and Accusative, which Dyirbal doesn't have.[15,16]

We can therefore make the following generalization about Dyirbal:

(18) a. The feature [−free] is marked by /ŋ/ on disyllabic roots, but receives no overt phonological realization with longer roots.

b. In the [−free] cases, the other case features besides [−free] may be spelled out by other morphs, i.e. /ku/ in the Ergative and Instrumental or /ka/ in the Locative.

Before showing the analysis, one bit of preview on the phonological constraints to be employed. As in most previous analyses of the Dyirbal Ergative (and indeed as with most phonological analyses of syllable-counting PCSA), the constraint lying behind the non-use of /-ŋ/ with longer-than-disyllabic stems will be one involving foot structure. Dyirbal has left-to-right trochaic stress (Dixon 1972: §7.2.2; McCarthy & Prince 1990): the initial syllable and all non-final odd-numbered syllables get stress. Dixon (1972: 275) reports that there are no phonetic differences between stressed syllables that would permit us to identify one particular stress as the primary stress. However, he says so after mentioning that one could conceivably posit that the initial syllable bore primary stress. (Dixon himself rejects this as "a mere analytic ploy", due to the just-mentioned lack of phonetic distinctions between degrees of stress.) The basis for this possibility is that there are a number of morphemes in Dyirbal (not just the Ergative) which show one allomorph with two-syllable bases and a different allomorph with longer bases. Transitive verbalizations of nouns (Dixon 1972: 86) are formed by adding /-mal/ to a two-syllable stem, and /-(m)bal/ to a longer stem. Second, reflexive forms of [j]-final verbs are formed by adding /-márij/ to disyllabic stems, and /-(m)bárij/ to longer stems.[17] There are other allomorphic processes which refer to proximity to *any* stress (e.g. the reflexives of [l]-final roots: Dixon 1972, p. 89), but there are no allomorphic alternations which are conditioned by proximity to any *particular* non-initial stress (to the exclusion of other stresses). This might be seen as evidence that all word-initial stresses in Dyirbal have a property which no medial stresses have. If that's right, the obvious candidate for this property is that initial stresses are primary stresses, while medial stresses are all secondary.

Assuming that primary stress in Dyirbal is indeed word-initial, we may attribute the blocking of /-ŋ/-affixation on greater-than-disyllabic stems to the following constraint:

(19) COINCIDE(ŋ, head ft)$_{ŋ}$

Assign one violation-mark for every instance of the segment /-ŋ/ which is not in the head foot. (Due to indexed nature of constraint, only evaluate instances of /-ŋ/ which belong to the morph that spells out the feature [-free].[18])

This constraint is a member of the COINCIDE family of positional markedness constraints introduced by Zoll (1998). These constraints impose requirements to the effect that marked structures are allowed only when affiliated with certain prominent positions. In the present case, this constraint will discourage introducing an [-ŋ] if that segment would not fall in the head foot, which by hypothesis is coextensive in Dyirbal with the first two syllables of a word. This requirement, it can be noted, is quite similar to the restriction in Guugu Yimidhirr (Haviland 1979; Kager 1996b) that long vowels are permitted only in the first two syllables of a word; it is this pattern which is one of the empirical bases upon which Zoll (1998) argues for the existence of licensing constraints like (19).

Now, to see how the analysis of Dyirbal works, let us begin by considering the derivation of [jaɽaŋku], 'man-ERGATIVE'. I will assume that the input to the phonology for this word contains two abstract morphemes: a root morpheme MAN, and a Case morpheme having as its dependents the features [−free, −oblique, +structural, +superior] (i.e., the full composition of Ergative case in the theory of case features in Halle & Vaux [1998]). I will assume that the insertion of any one morph from the language's lexicon can occur as a single step in the Harmonic-Serialist derivation. Additionally, I will assume that the construction of prosodic structure—syllables and feet, for present purposes—can occur simultaneously with any operation that occurs on a single step. (This is assumed strictly for purposes of expositional simplicity, and should not be taken as a rejection of proposals that construction of syllables [Pater 2012] and/or feet [Pruitt 2010] are derivational steps of their own.)

Supposing that MAX-M(root) is undominated in Dyirbal, the first thing to occur will be the insertion of the root morph /jaɽa/. (For visual simplicity in the tableaux illustrating the analysis of Dyirbal, I will depict direct co-indexation between phonological surface forms and the FSes of the input; it should be understood that the link between these two representations is mediated by MM-correspondence between the morpheme and morph levels, and by IO-correspondence between the phonological portion of those morphs, and the phonological surface form):

(20)

MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$}	MAX-M (root)	MAX-IO (seg)	COINCIDE (ŋ, head ft)$_ŋ$	MAX-M (−free)	MAX-M (−obl)	MAX-M (+struc)	MAX-M (+sup)
a. ☞ MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(jaɽa$_1$)$_{Ft}$]$_{PWd}$				1	1	1	1
b. MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} ŋ$_2$	W1			L	1	1	1
c. MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} ku$_{3,4,5}$	W1			1	L	L	L
d. MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$}	W1			1	1	1	1

On the second pass, our choices are either to insert /-ŋ/, whose feature structure contains the feature [−free], or to insert /-ku/, whose feature structure contains [−oblique, +structural, +superior]. Assuming that MAX-M(-free) is higher ranked than the MAX-M constraints for the other three features, the candidate which inserts /-ŋ/ will beat the one that inserts /-ku/:

(21)

MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(jaɽa$_1$)$_{Ft}$]$_{PWd}$	MAX-M (root)	MAX-IO (seg)	COINCIDE (ŋ, head ft)$_ŋ$	MAX-M (−free)	MAX-M (−obl)	MAX-M (+struc)	MAX-M (+sup)
a. ☞ MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(jaɽa$_1$ŋ$_2$)$_{Ft}$]$_{PWd}$					1	1	1
b. MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(jaɽa$_1$)$_{Ft}$ ku$_{3,4,5}$]$_{PWd}$				W1	L	L	L
c. MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(jaɽa$_1$)$_{Ft}$]$_{PWd}$				W1	1	1	1

As can be seen, I'm assuming here that upon being inserted, the suffix /-ŋ/ is immediately incorporated into a foot. Because the root is disyllabic, the foot which /-ŋ/ becomes part of is the head foot of the word, and so the indexed constraint COINCIDE(ŋ, head ft)$_ŋ$ is not violated.

On the next and, for our purposes, final pass, /-ku/ is inserted:

(22)

MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(jaɽa$_1$ŋ$_2$)$_{Ft}$]$_{PWd}$	MAX-M (root)	MAX-IO (seg)	COINCIDE (ŋ, head ft)$_ŋ$	MAX-M (−free)	MAX-M (−obl)	MAX-M (+struc)	MAX-M (+sup)
a. ☞ MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(jaɽa$_1$ŋ$_2$)$_{Ft}$ ku$_{3,4,5}$]$_{PWd}$							
b. MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(jaɽa$_1$ŋ$_2$)$_{Ft}$]$_{PWd}$					W1	W1	W1

Now let us consider longer bases, with which /ŋ/ will not appear. On the assumptions that Dyirbal foot structure is left-to-right trochaic, and that the [ŋ] of an intervocalic [ŋk] cluster is parsed as a coda (the justification for which will be discussed shortly), we may propose that the spell-out of [−free] by the /ŋ/ morph is blocked because MAX-M(−free) is outranked by the indexed positional licensing constraint which requires instances of the segment /-ŋ/ to coincide with the head foot:

(23)

THEY$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(ˈpa.la)$_{Ft}$ (ˌka.ra$_1$)$_{Ft}$]$_{PWd}$	MAX-M (root)	MAX-IO (seg)	COINCIDE (ŋ, head ft)$_{ŋ}$	MAX-M (−free)	MAX-M (−obl)	MAX-M (+struc)	MAX-M (+sup)
a. ☞ THEY$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(ˈpa.la)$_{Ft}$(ˌka.ra$_1$)$_{Ft}$ ku$_{3,4,5}$]$_{PWd}$				1			
b. THEY$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(ˈpala)$_{Ft}$ (ˌkara$_1$ŋ$_2$)$_{Ft}$]$_{PWd}$			W1	L	W1	W1	W1
c. THEY$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(ˈpa.la)$_{Ft}$ (ˌka.ra$_1$)$_{Ft}$]$_{PWd}$				1	W1	W1	W1

At this point we can see why assumptions about the syllabification of [VŋkV] sequences as [Vŋ.kV] is essential to the success of the analysis of the disyllabic stems. We assumed that /-ŋ/ is inserted before /-ku/, which requires that MAX-M(-free) outrank the MAX-M constraints for the other three features making up Ergative case. If COINCIDE(ŋ, head ft)$_{ŋ}$ dominates MAX-M(−free), the former constraint will by transitivity also dominate the MAX-M constraints for the three features spelled out by /-ku/. If adding /-ku/ would cause /-ŋ/ to resyllabify as an onset, then it follows that adding /-ku/ will create a new violation of COINCIDE(ŋ, head ft)$_{ŋ}$. Given the constraint rankings just adduced, insertion of /-ku/ would then be blocked, which obviously is not what we want:[19]

(24)

MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(jaɽa$_1$ŋ$_2$)$_{Ft}$]$_{PWd}$	MAX-M (root)	MAX-IO (seg)	COINCIDE (ŋ, head ft)$_ŋ$	MAX-M (−free)	MAX-M (−obl)	MAX-M (+struc)	MAX-M (+sup)
a. ☞ MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(ja.ɽa$_1$)$_{Ft}$ ŋ$_2$ku$_{3,4,5}$]$_{PWd}$			W1		L	L	L
b. 💣 MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(jaɽa$_1$ŋ$_2$)$_{Ft}$]$_{PWd}$					1	1	1

The same assumption about syllabification will be necessary if we alternatively assumed that /-ku/ were inserted earlier in the derivation than /-ŋ/ (meaning that /-ŋ/ would be a kind of infix). This is because /-ŋ/ would end up in onset position to begin with, again resulting in a new violation of COINCIDE(ŋ, head ft)$_ŋ$:

(25)

MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(jaɽa$_1$)$_{Ft}$ ku$_{3,4,5}$]$_{PWd}$	MAX-M (root)	MAX-IO (seg)	COINCIDE (ŋ, head ft)$_ŋ$	MAX-M (−free)	MAX-M (−obl)	MAX-M (+struc)	MAX-M (+sup)
a. ☞ MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(ja.ɽa$_1$)$_{Ft}$ ŋ$_2$ku$_{3,4,5}$]$_{PWd}$			W1	L			
b. 💣 MAN$_1$- {−fr$_2$, −obl$_3$, +str$_4$, +sup$_5$} [(jaɽa$_1$ŋ$_2$)$_{Ft}$ku$_{3,4,5}$]$_{PWd}$				1			

Is this assumption about syllabification justified? Dixon (1972: 274) states that "[i]t is not easy to formulate a criterion for dividing up Dyirbal words into syllables", but there are a couple of pieces of evidence hinting that [Vŋ.kV] is the right syllabification for intervocalic nasal-stop clusters. First, these clusters occur only word-medially in

Dyirbal, never as word-initial onsets or word-final codas (Dixon 1972: 272-273). Second, there is at least one other case in the language where the choice of [VŋkV] versus [VkV] is sensitive to the degree of prosodic prominence of the material *preceding* the intervocalic consonants. This involves the Dative marker, which is generally [-ku], but which appears as [-ŋku] when it immediately follows a stressed syllable (Dixon 1972: 284).[20] In any case, there does not appear to be any evidence which would argue in favor of [V.ŋkV] being the correct syllabification.

3.5 Comparison with the PRIORITY approach to arbitrary preference

The line of analysis pursued here is that arbitrary preference amongst phonologically-conditioned allomorphs arises because (a) realization of abstract morphosyntactic structure occurs in the same component as the phonology, and (b) allomorphs may differ in how fully they express the features of the abstract structure. A different strategy—probably the most prominent one in the OT literature—is proposed by Bonet & Mascaró (2006), Bonet, Lloret, and Mascaró (2007), Mascaró (2007), and Bonet (2004), the last of whom presents an analysis of the Dyirbal ergative in terms of this approach. It involves the following constraint:

(26) PRIORITY. Respect lexical priority (ordering) of allomorphs.
Given an input containing allomorphs m_1, m_2, …, m_n, and a candidate m_i', where m_i' is in correspondence with m_i, PRIORITY assigns as many violation marks as the depth of ordering between m_i and the highest dominating morph(s).
(Definition from Mascaró 2007)

PRIORITY-based analyses are architecturally identical in form to multiple-underlying-form analyses like the one presented earlier for Moroccan Arabic: there is only one pass of constraint evaluation, and all of the competing allomorphs are in the input at once. The following tableaux, adapted from Bonet (2004), illustrate how the PRIORITY approach handles the Dyirbal facts:

(27) Dyirbal 'man.ERG' with PRIORITY

/jaɽa -{ŋku > ku}/	RESPECT	PRIORITY
a. ☞ [(ˈja.ɽa)$_{HeadFt}$ ŋku]$_{Wd}$		
b. [(ˈja.ɽa)$_{HeadFt}$ ku$_{Ft}$]$_{Wd}$		W1

Ranked above PRIORITY is a constraint RESPECT, which is violated if a candidate uses a certain allomorph but does comply with the that allomorph's lexically-specified subcategorization requirements, in this case [-ŋku]'s requirement to be suffixed to the head foot. (RESPECT thus does the same work as COINCIDE(ŋ, head ft)$_ŋ$ did in the OI analysis, and in principle the PRIORITY analysis could use that licensing constraint in place of RESPECT.) With a disyllabic stem, as in (27), /-ŋku/ and /-ku/ can both be suffixed to the head foot. Candidate (27a) thus satisfies RESPECT and (27b) satisfies the same constraint, vacuously because /-ku/ has no subcategorization requirements. Since AFFIX-TO-FOOT is indifferent as to the choice of allomorphs, the choice is made by the lower-ranked constraint PRIORITY. The winning candidate chooses the first-listed underlying form /-ŋku/ and thus gets no marks from PRIORITY. By contrast, candidate (27b) chooses the second-listed underlying form /-ku/. It therefore gets one mark from PRIORITY, and thus loses.

Now consider what happens with a greater-than-disyllabic stem:

(28) Dyirbal 'rainbow.ERG' with PRIORITY

/jamani-{ŋku > ku}/	RESPECT	PRIORITY
a. ☞ $[(\text{ˈja.ma})_{\text{HdFt}}(\text{ˌni.ku})_{\text{Ft}}]_{\text{Wd}}$		1
b. $[(\text{ˈja.ma})_{\text{HdFt}}(\text{ˌni.ŋku})_{\text{Ft}}]_{\text{Wd}}$	W1	L

Because, when the stem is more than two syllables long, the head foot is no longer at the right edge of the Prosodic Word, neither allomorph of the ergative suffix can be suffixed to the head foot. As a result, the candidate that chooses the first-listed underlying form /-ŋku/ incurs a violation from RESPECT. The candidate that chooses /-ku/ gets no such violation (again vacuously because /-ku/ has no subcategorization requirements), and so the /-ku/-selecting candidate now emerges as the winner, because RESPECT is higher-ranked than PRIORITY.

The PRIORITY model is conceptually extremely similar to the OI-based one in how it handles this or any other specific example. The difference between them, and the likeliest basis for preferring one over the other, lies in exactly *how* arbitrary preference relations are encoded in the lexicon. In the OI approach, arbitrary preference relations have an epiphenomenal status; they arise from the way that the grammar seeks to pair the feature-structures of abstract morphemes with those of morphs, and are necessarily encoded in the morphosyntactic feature specifications of the competing morphs.

For the OI framework, this means that the analyst's ability to posit arbitrary preferences in any given case is constrained by the need to be consistent with overall patterns of morphological exponence in the language as a whole. As we saw in the proposed analysis of Dyirbal, separating out /-ŋ/ as an independent affix expressing one of the features making up Ergative creates the possibility that /-ŋ/ could also be used in expressing other cases involving that same feature. As we saw, /-ŋ/ indeed does surface under the same phonological conditions with the Locative, permitting us to identify the feature it expresses as [−free].

By contrast, in a PRIORITY account, no particular predictions of this sort will arise, since this approach does not attribute arbitrary-preference effects to the competition of *separate* morphs to realize morphosyntactic structure: the alternative allomorphs are simply packaged together as part of a single lexical entry, possibly with priority relations specified amongst them. Setting up, for instance, {-ŋku > -ku} as the lexical entry for Ergative in Dyirbal commits us to no particular expectations about how the realization of Locative or any other case should look like. The OI approach is different because it relies on the mechanics of a DM-type realizational system in which, in principle, every morph of the language competes for insertion onto every morpheme. Claims about arbitrary preference among certain morphs, and hence about their FSes' content, thus potentially give rise to consequences which reverberate throughout the language as a whole. The PRIORITY approach is more permissive in that it takes the pairing of morphological functions to lexical entries (such as [Ergative] to {-ŋku > -ku}) as given, and treats arbitrary preference as wholly internal to each such entry.

The greater flexibility allowed by PRIORITY might arguably be necessary in a case where the morphosyntactic features involved did not give us ‘room’ to make the higher-priority allomorph spell out more features than the lower-priority one. For example, Bonet & Mascaró (2006; see also Mascaró 2007, Bonet & Harbour 2012) discuss the Spanish conjunction meaning ‘and’, which is *y* [i] everywhere except when followed by [i], where it is [e]; they analyze this using PRIORITY with a lexical representation of {i > e} for the conjunction. Assuming that this case must be attributed to listed allomorphy rather than a phonological alternation caused by indexed constraints, the worry for an OI-type analysis like the one presented for Dyribal is: just how do the feature specifications of the /i/ and /e/ differ? How much they *could* differ depends on how many morphosyntactic features the ‘and’ morpheme consists of. If it’s just one feature |AND|, the simplest analysis would be that the allomorphs have the representations <AND, i> and <Ø, e>. (This would resemble the analysis of Dutch earlier, where the lower-priority ‘elsewhere’ form has an empty FS.) What we would need to ensure in such an analysis is that the empty FS of the <Ø, e> allomorph does not allow it to be used for morphemes other than the conjunction. This may well be achievable, say if high-ranked MAX-M constraints compel the use of more-specified morphs everywhere that <Ø, e> might otherwise show up. But difficulties might arise in cases where we need some *other* morph with an empty FS to be used rather than <Ø, e>. For instance, the conjunction meaning ‘or’ is [o] everywhere except before [o], where it is [u]; for this case Bonet & Mascaró (2006) propose a lexical representation {o > u}. If, in an OI analysus, the Spanish lexicon contained both <Ø, e> and <Ø, u>, what would ensure that the former is used for ‘and’ but the latter for ‘or’? Any worries about these specific examples might well be moot if we were to have a reason to think that the morphemes meaning ‘and’ and ‘or’ consist of multiple morphosyntactic features—in that case we could assume that /e/ and /u/ realize smaller, but still non-empty, subsets of those features than /i/ and /o/ do—but this discussion hopefully serves to illustrate the kind of situation in which PRIORITY would arguably have an advantage.

To whatever extent empirical considerations do not resolve the choice, it could be argued that the OI type of approach is preferable to PRIORITY on grounds of parsimony. To the extent that the DM-style feature-based system of realizational morphology is independently motivated (see discussion in section 3.1 earlier), Occam’s Razor would seem to recommend that we call upon this same machinery to handle arbitrary-preference PCSA, rather than invoking the additional innovations in the structure of lexical entries assumed by the PRIORITY model. Similarly, OI is also arguably at an advantage in that its account of how phonological constraints can compel the use of non-default allomorphs relies on the same machinery used to account for other types of phonologically-induced mismatches in morphological spell-out (which we will consider in section 5); PRIORITY, by contrast, is a single-purpose device which deals only with the phenomenon of arbitrary preference.

4. Comparison with subcategorization-only approaches

All cases of ‘arbitrary preference’ PCSA are recognizable as such, and are theoretically challenging, because the distribution of allomorphs involves preferences which could not be exerted by any plausible constraint we’d expect to be part of the phonology on strictly phonological grounds (e.g. as a motivator of processes like deletion or epenthesis). Both OI and the PRIORITY approach deal with this problem by adding to the phonology additional constraint types which will exert the necessary preferences, but only in relation to allomorph choice. Essentially the opposite response is to remove PCSA from the purview of the phonology, placing it in a separate morphology component where arbitrary subcategorization frames enforce all selectional restrictions of affixes, including selection for phonological properties. Versions of this general stance can be found in Paster (2005, 2006, 2009, this volume), Bye (2008), and Embick (2010), amongst others.

The strongest argument for adopting the first rather than the second type of solution (Mester 1994; Tranel 1996; González 2005; Itô & Mester 2006; Wolf 2008: 101-108; Alber 2011) is based on cases where there is a conspiracy (Kisseberth 1970) between a PCSA system and phonological processes or restrictions in the same language. In these cases, the suppletive allomorphs are distributed in such a way as to avoid some phonological configuration X, and the phonology of the language (segmental alternations, static phonotactic restictions, syllabification, stress placement, etc.) independently prohibits, avoids, or eliminates other instances of the same configuration X. If PCSA is not part of the phonology, then the dispreference for X would have to be enforced at two separate places in the grammar: in the morphological component and the phonological one. This would exactly parallel the Duplication Problem (Clayton 1976; Kenstowicz & Kisseberth 1977; Prince & Smolensky 2004 [1993]) faced by theories of phonology which make use of morpheme structure constraints: restrictions defining the phonological form of inputs to the phonology often duplicate restrictions which are active in the phonology itself (see also Cook 1971; Kiparsky 1972: 216; and Ross 1973 for early suggestions that syntactic or morphological rules, or MSCs, could participate in a conspiracy alongside phonological rules).

Examples of conspiracies in PCSA are numerous. For instance, in the analysis of Moroccan Arabic /-u/~/-h/ suppletion which we adopted from Mascaró (1996b), the use of /-h/ rather than /-u/ after a vowel-final stem was attributed to the constraint ONSET. This constraint makes itself felt in numerous other places in the language. Heath’s (1987) study of colloquial Moroccan Arabic phonology reports all of the following strategies for avoiding onsetless syllables. First, stems cannot begin with a short vowel; this is rectified through epenthesis of glottal stop (p. 19). Second, vowel-initial loan verbs from French and Spanish undergo either initial glottal-stop epenthesis or deletion of the initial vowel. Third, borrowed vowel-initial nouns can also undergo glottal-stop epenthesis, though “there are indications that speakers find the glottal-initial form awkward” (p. 19), and as an alternative they will use the noun with the definite prefix /l-/, even in morphosyntactically non-definite contexts (pp. 19, 38):

(29) /ʃi l-anˤanˤasˤ/ 'some pineapples'
some DEFINITE-pineapples

For some nouns this has progressed to full re-analysis of definite /l-/ as part of the stem, as indicated by the presence of a double lateral in the definite form: /l-lasˤ/ 'the ace [playing card]'.[21] Finally, there are also alternations involving devocalization of suffixal high vowels following a vowel-final stem (pp. 199, 237)[22] and deletion of suffixal short vowels following a vowel-final stem, and indeed short vowels never appear on the surface adjacent to another vowel (p. 252).

A comparable argument involving constraints on segmental features is made by Alber (2011) for the realization of the past participle prefix in Mòcheno, which alternates between a prefix [ga-] and a floating-feature bundle [-cont, -voice]. The latter is used on verbs beginning with a fricative, which consequently changes to a voiceless affricate; voiceless stops, however, take the [ga-] allomorph:

(30)	a. [zuaxən]	'to look for'	~	[tsuaxt]	'look for-P.PPL.'
	b. [drukʰən]	'to press'	~	[gadrukʰt] (*[trukʰt])	'press- P.PPL.'

Alber connects this asymmetry with the fact that voicing in this language is contrastive in stops but not in fricatives. (In words like (30a), fricatives are normally voiced word-initially before a vowel or sonorant.) High-ranked faithfulness to voicing in stops both accounts for their supporting a voicing contrast as well as their resistance to realizing the participle through a devoicing mutation. For a subcategorization-based approach, however, there is no connection between these facts.

5. Other predicted forms of phonological interference with morphology

Our analysis of the Dyirbal ergative posits that satisfaction of a phonological constraint COINCIDE(ŋ, head ft)$_ŋ$ results in violation of a lower-ranked morphological constraint of the MAX-M(feature) family.[23] If phonological constraints are freely re-rankable with constraints on morpheme/morph correspondence, then we expect that there should also be effects where satisfaction of a phonological constraint forces violation of a conflicting DEP-M constraint. In the case of DEP-M(feature) constraints, this would mean that the phonology forced insertion of a morph which bore grammatical features that were not present in the morpheme to which it corresponded. In the case of DEP-M(FS) constraints, this would mean that the phonology was forcing insertion of an entire morph which didn't correspond to any morpheme—a kind of 'dummy affix' which was there for solely phonological reasons, but which did not express any of the grammatical features of the word it appeared in.

One of the best-known phenomena which has been analyzed as morphological feature mismatch induced by a phonological requirement occurs in French. A number of adjectives and determiners have a masculine form ending in a vowel and a feminine form ending in a consonant, with the C-final feminine form (or at least an allomorph homophonous with it) also being used pre-vocalically in *liaison* environments, even when the word is morphosyntactically masculine:

(31) *Masculine* liaison *form homophonous with feminine form*:

	Citation masc.	Citation fem.	Masc. liaison form	
'new'	[nuvo]	[nuvɛl]	[nuvelã]	
	nouveau	*nouvelle*	*nouvel an*	'new year'
'beautiful'	[bo]	[bɛl]	[bɛ.lɔm]	
	beau	*belle*	*bel homme*	'handsome man'
'this'	[sœ]	[sɛt]	[sɛ.ta.mi]	
	ce	*cette*	*cet ami*	'this friend'

A number of different analyses of these facts have been given. Some have proposed that this in fact involves the use of feminine morphs in morphosyntactically masculine contexts (Tranel 1995; Perlmutter 1998; Steriade 1999), which in OI terms would mean violation of Dep-M(feminine) as well as Max-M(masculine).

(32)

{THIS$_1$ [masc]$_2$} {FRIEND$_3$, [masc]$_4$}	Onset	Dep-M (fem)	Max-M (masc)
a. ☞ *morphs*: <{THIS$_1$ [fem]$_5$}, /sɛt/> <{FRIEND$_3$, [masc]$_4$}, /ami/> *surface phonology*: [sɛ.ta.mi]		1	1
b. *morphs*: <{THIS$_1$, [masc]$_2$} /sœ/> <{FRIEND$_3$, [masc]$_4$}, /ami/> *surface phonology*: [sœ.a.mi]	W1	L	L

Other analyses have argued that the apparent feminine allomorphs in these examples are not really morphologically specified as feminine; however, even under these analyses, the phonology can be seen to be forcing morphological defectiveness of one sort or another. For example, Lapointe & Sells (1996) and Tranel (1998) propose that in a pair like *ce*/*cet(te)*, [sœ] is indeed [masculine], but [sɛt], which can appear in both masculine and feminine contexts, is unspecified for gender. In OI terms, this means that forms like *cet ami* do not violate Dep-M(feminine), but they would still involve violation of Max-M(masculine). An analysis conceptually similar to this one is found in Lamarche (1995), who proposes that lexical items like *ce*/*cet(te)* have two listed allomorphs, neither of which is specified for gender, and which are ordered, [sœ] being the default form and [sɛt] the elsewhere form; use of the default form is proposed to be blocked before a vowel and in morphosyntactically feminine contexts. On a view of this kind, forms like *cet ami* would involve phonologically-motivated violation of arbitrary preferences among allomorphs, just like the one in Dyirbal which was discussed earlier.

Another example of gender mismatch which appears to be phonologically motivated occurs with the plural suffix in Modern Hebrew. This language has two plural suffixes: [-im], which for the most part is used with masculine nouns, and [-ot], which for the most part is used with feminines. There are exceptions with both suffixes, though: there are masculine nouns which take [-ot] and feminines which take [-im]. A phonological tendency underlies the use of [-ot] with masculines: Bolozky & Becker (2006) found that of 230 native masculine nouns which take [-ot], 146 have [o] as the rightmost stem vowel. The tendency of such masculine nouns to be more likely to take [-ot] has been found to manifest in experimental tasks with nonce forms (Berent, Pinker & Shimron 1999, 2002; Becker 2009).

An OT analysis of this pattern is given by Becker (2009: ch. 3). His proposal begins with the fact that with most native nouns in Hebrew, as well as all deverbal nouns, suffixes attract stress off of the stem (Bat-El 1993; Becker 2003). This means that using [-im] when the stem's rightmost vowel is [o] results in the configuration [$\ldots C_0oC_0$ím], as opposed to [$\ldots C_0oC_0$ót] which would result from using [-ot]. Becker proposes that the first structure is dispreferred relative to the second by a constraint which requires that the mid-vowel features of [o] must be licensed by being linked to a stressed nucleus. In [$\ldots C_0oC_0$ím] the [o] is unstressed, but in [$\ldots C_0oC_0$ót], assuming that the two [o]s share place features, these features will be linked to the second, stressed [o], licensing them and avoiding violation of the constraint. Assuming that this constraint is variably ranked above MAX-M(masculine) and DEP-M(feminine), we get the observed pattern of a tendency towards the use of gender-mismatched [-ot] with masculine nouns having [o] as their rightmost vowel. For further details and discussion of this phenomenon, see Becker (2009: ch. 3) and Wolf (2008: §2.4.2).

A third and final possible example of a phonologically-driven feature mismatch, again involving gender, is the Spanish 'feminine *el*'; see Wolf (2008: §2.4.1) for an OI analysis, and Bonet, Lloret and Mascaró's paper in this volume for another perspective.

Now let us turn to violation of DEP-M(FS): cases in which phonological constraints force insertion of an entire 'dummy' affix. Perhaps the best-known case of this comes from the Western Desert language Pitjantjatjara. Hale (1973) argues that Pitjantjatjara has the following word-final augmentation rule:

(33) ∅→ pa / C_#

The process is clearly conditioned by the presence of what would otherwise be a word-final consonant. When the stem is followed by a V-final suffix, the augmentative /pa/ doesn't show up:

(34)

uninflected	*ergative*	*dative*	
man'kurpa	man'kur-tu	man'kur-ku	'three'
punpunpa	punpun-tu	punpun-ku	'fly'

The /pa/ also appears after certain verbal suffixes: /-n, -n'in, -ŋin, -nin/ ~ /-npa, -n'inpa, -ŋinpa, -ninpa/.

This augmentation process is theoretically challenging because the marked status of [labial] place means that epenthesis of [labial] consonants should be impossible. The tableau below illustrates the analysis that I propose for Pitjantjatjara, and the markedness problem that would arise for the assumption that the augmentative [-pa] were epenthetic. For the sake of brevity and to avoid enmeshing the argument in potentially distracting HS-specific considerations, the tableau shows a parallel analysis, with insertion of one or more morphs and epenthesis of one or more segments possible in a single direct mapping. Subscripts on root and affix substrings indicate morpheme-morph correspondence; the lack of an index on a word-final substring therefore indicates that it is phonologically epenthetic (as such strings do not belong to morphs and cannot bear an MM-correspondence relation). For visual emphasis, epenthetic segments are also italicized.

(35)

$\vert$THREE$_1\vert$	DEP-IO	*C]$_{PWd}$	DEP-M(FS)	*[labial]
a. ☞ mankur$_1$-pa$_2$			1	2
b. mankur$_1$		W1	L	1
c. mankur$_1$-*ta*	W2		L	1
d. mankur$_1$-*pa*	W2		L	2

The markedness constraint responsible for /pa/-insertion is what we can call *C]$_{PWd}$, which bans Prosodic Words from ending in a consonant (see Flack [2007, 2009] for extensive typological justification of this constraint). For the input $\vert$THREE$_1\vert$, i.e. the root meaning 'three' alone, with no inflection, the winning candidate is [mankurpa]. This candidate has inserted the root morpheme /mankur/, as well as the semantically-empty affix /pa/. The presence of /pa/ means that the winning candidate satisfies *C]$_{PWd}$, but it also means that the candidate incurs an extra violation of *[labial], by virtue of containing the segment /p/.

One competitor of the observed winner is (35b), which inserts only the root morpheme /mankur/. This candidate does better than the winner on *[labial], due to the absence of [-pa], but it loses by virtue of violating the higher-ranked constraint *C]$_{PWd}$. Of greater interest are the competitors (35c-d), with epenthesis. Both of these candidates violate the anti-epenthesis constraint DEP-IO, by virtue of epenthesizing the sequences [ta] or [pa]. By contrast, the winner does not violate DEP-IO, because all of its surface segments—including the [pa]—stand in correspondence with the segments in the underlying form of some morph.

Crucially for my argument, (35d), which is surface-homophonous with the winner, is harmonically bounded by (35c), which epenthesizes [ta] rather than [pa]. The two perform identically on DEP-IO and *C]$_{PWd}$, but (35b) is more harmonic than (35c) because the coronal [t] is less marked than the labial [p]. This means that if morph insertion were not available as a 'repair' in the phonological component of the grammar—that is, if the depicted winner in tableau (35) were not a possible candidate—there would be no way for *C]$_{PWd}$ –violation to be avoided by insertion of [pa], since [pa]-epenthesis should always be harmonically bounded by [ta]-epenthesis (except in specific contexts that might favor the presence of a labial, e.g. adjacent to another labial).

The prediction of markedness theory that marked segment types like labials can never be epenthetic is largely supported by typological surveys (e.g. de Lacy 2002). The analysis that I offer thus somewhat complicates the status of epenthetic quality as evidence about markedness, since any segment, no matter how marked, could in principle belong to the UR of a morph inserted for phonological reasons. This does not seem tremendously worrisome, though, as there are various diagnostics that will often be available to distinguish epenthetic segments from affix segments. In some cases, it might be possible to identify the inserted string as an affix based purely on its length. Epenthetic alternations typically involve only one segment, which in OT we can understand as an effect of DEP-IO: even when outranked by a markedness constraint, DEP-IO still favors inserting as few segments as possible. As such, when the inserted string is longer than necessary to resolve the markedness violation(s) that are plausibly at issue (say, inserting /-ʔaʔaʔa/ rather than simply /-ʔa/ at the end of C-final words), it would be easier to say with confidence we are looking at a dummy affix and not at true epenthesis.[24]

Another possible diagnositic is that dummy affixes may be subject to morphotactic restrictions limiting where they can appear. De Lacy (2002) notes that apparent epenthetic round vowels in Seri, Hungarian and Icelandic are restricted to particular morphological contexts, and suggests that these segments are therefore likely to be affixes of some kind rather than true epenthetic segments. Hale (1973) identifies similar conditions on the distribution of augmentative /-pa/ in Pitjantjatjara —it does not appear with vocatives or after the 2nd person singular clitic /-n/—and argues on this basis that /-pa/ is an affix. Similar arguments for the morph(eme)-hood of apparent epenthetic segments have been put forth by Cardinaletti & Repetti (2007) regarding vowel epenthesis in standard and dialectal varieties of Italian (see also Tranel & Del Gobbo 2001: 198) and by Kager (1999: 130) in relation to vowel epenthesis in Mohawk.[25] Looking beyond surface evidence, there are also likely to be experimental means for disentangling the epenthetic vs. affixal status of segments. For example, lexical and epenthetic segments may be acoustically different, i.e. epenthesis is at least sometimes incompletely neutralizing (Gouskova & Hall 2010); we might also ask whether speakers display 'perceptual epenthesis' of the inserted material (Dupoux *et al*. 1999).

Now let's consider the MAX-M family. We've already dealt with cases like the Dyirbal ergative which arguably involve MAX-M(feature) violation. What about violation of MAX-M(FS)? This would involve entire morphemes failing to be spelled out by any morph at all.

A familiar and typologically common way in which consecutive identical or near-identical morphs are avoided is via haplology—i.e., omitting one of them (Stemberger 1981; Menn & MacWhinney 1984; de Lacy 2000). A simple example from English is discussed by Jaeger (to appear) and Walter & Jaeger (2005). In English, use of the overt complementizer *that* is normally optional:

(36) a. She said you left.
b. She said that you left.

In the studies just cited, it was found that omission of complementizer *that* was significantly more likely when the complementizer would have appeared adjacent to demonstrative *that*, as in *She said (that) that inspector visited yesterday*. Cases like this can be analyzed by assuming that a phonological OCP constraint (perhaps variably) dominates the MAX-M constraints that favor spelling out one of the two relevant morphemes (see Golston 1995, Yip 1998 for proposals in this direction)[26]:

(37)

COMP$_1$ DEMONST$_2$	OCP	MAX-M(complementizer)
a.☞ ðæt$_2$		1
b. ðæt$_1$ ðæt$_2$	W1	L

Evidence has also been reported of *that*-omission being sensitive to rhythmic factors. Jaeger (to appear: §5) and Lee & Gibbons (2007) found that the complementizer was less likely to be omitted before stressed than before unstressed syllables. Since the complementizer itself is generally unstressed, this makes sense in terms of pressure to avoid stress clashes and lapses.

Another well-known case of phonologically-motivated morph omission occurs in the pausal phonology of Classical Arabic, of which McCarthy (2012) gives an OI analysis. Bonet, Lloret & Mascaró (this volume) (see also Bonet 2012 and Wolf 2008: 110-115 for OI-specific discussion) present an example from North-Eastern Central Catalan in which the plural suffix /-s/ is omitted in inter-consonantal position in the pre-nominal portion of a DP. Selkirk (2002) discusses an example from Hausa, where general constraints on the size and layering of prosodic constituents compel the non-realization of the focus particle /fa/ in certain environments. Another proposed example comes from Tohono O'odham (Fitzgerald 1994) where the presence or absence of the *g*-determiner is attributable to a requirement that utterances begin with a trochaic foot.

All in all, it seems reasonable to conclude that both DEP-M and MAX-M constraints can be violated for phonological reasons. This suggests that we are on the right track in assuming that phonological constraints and constraints on spell-out reside in a single module of the grammar, and can be freely re-ranked with respect to one another.

6. Conclusion

Some types of suppletive allomorphy make reference to phonological properties of the environments in which the allomorphs appear, but at the same time seem to show the influence of arbitrary and non-phonological preferences. These cases have been the subject of much debate regarding whether they should be treated as arising in the phonology or in the morphology. Here I have argued that the answer to that question is, effectively, "both"—that phonology and morphological spell-out occur in one and the same grammar. This permits an analysis of cases like the Dyirbal Ergative which avoids difficulties for various proposals about how to incorporate arbitrary-preference constraints into the phonology, as well as letting us deal with the wide range of attested cases in which satisfaction of morphological constraints on spell-out is sacrificed in order to ensure satisfaction of phonological constraints.

The same theoretical conclusion is pointed to by facts, beyond the scope of this paper, which bear on the *interleaving* part of Optimal Interleaving. The implementation of phonology and spell-out in a single OT-CC grammar lets us use OT-CC's opacity-handling machinery to model serial interactions between phonological and morphological processes. Elsewhere I have argued that with respect to several such types of interaction, the OT-CC approach gives rise to desirable results. These include cyclic effects (Wolf 2008: ch. 5), non-derived environment blocking (Wolf 2008: ch. 4), underapplication in derived environments (Wolf 2008: ch. 5; 2010), 'local ordering' interactions (Anderson 1969, 1972, 1974) between phonological and morphological processes (Wolf 2009, to appear b), and the conditions under which PCSA can be phonologically transparent and 'outwards looking' as opposed to opaque and 'inwards looking' (Wolf to appear a). To the extent that OT-CC gives us the results we want regarding phonology/morphology derivational interactions, this is a strong hint that phonology and morphology belong in one and the same OT-CC grammar, consistent with the conclusion argued for in the present chapter, namely that lexical insertion occurs in the phonological component of the grammar.

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[1] The idea of a morpheme as having more than one UR—or, somewhat differently put, of the UR as a set of allomorphic alternants—has its roots in work by Hudson (1974) and Hooper (1976).

[2] An essentially identical formulation is also put forth by Perlmutter (1998: 319).

[3] Combination violation/comparative tableaux (Prince 2002, 2003) are used throughout this chapter. Numerals indicate the number of violation marks incurred from each constraint. In rows for losing candidates, W indicates that the constraint prefers the winner over that loser, and L that the constraint prefers that loser over the winner.

[4] See Prince (2002, 2003) for formal discussion in relation to this. The formulation that the highest-ranked constraint which distinguishes between a winning and a losing candidate must prefer the winner is originally due to Jane Grimshaw.

[5] Dyirbal has a single (voiceless unaspirated) stop series; to represent these I use IPA [p t k …] rather than [b d g…] as used by Dixon (1972) and others. Similarly, I use [j] rather than [y] to represent the glide used in Dyirbal.

[6] In their study of Dyirbal song, Dixon & Koch (1996: 44) report finding one instance of the /-ŋku/ allomorph being used with a trisyllabic base. They suggest that this may be an archaism, reflecting an earlier stage (retained in other Australian languages) where the /–ŋku/ form was used with all vowel-final stems.

[7] These are in addition to several lines of psycholinguistic evidence suggesting a separation in the mental lexicon between the morphosyntactic and phonological features of words; see Wolf (2008: 16-18) for some references and discussion.

[8] Zuraw (2000) makes the same assumption; she refers to the abstract semantic/morphosyntactic structure that forms the input to the phonology as the *intent*. That the input to the phonology may contain some not-yet-spelled-out morphosyntactic features is also proposed by Yip (1998).

[9] See also the works cited in footnotes 11 and 12 for Correspondence-theoretic approaches to morphological selection (though which do not necessarily take the view that spell-out and phonology are in the same module of the grammar).

[10] See also Gouskova (2007) for discussion of other roles played by DEP constraints on various dimensions of correspondence.

[11] A non-exhaustive list of similar constraints in OT treatments of morphology includes Curnow's (1999) IDENT constraints, Ackema & Neeleman's (2004, 2005) FAITHFULNESS, Wunderlich's (2001) IDENT constraints, Xu's (2007) DEP constraints, and Aronoff & Xu's (2011) IDENT constraints.

[12] A non-exhaustive list of similar constraints includes Noyer's (1993) PARSE-PROPERTY, Bonet's (1994) ELSEWHERE, Kiparsky's (2005) EXPRESSIVENESS, Donohue's (1998) PARSE constraints, Curnow's (1999) MAX and IDENT constraints, Selkirk's (2002) REALIZE constraints, Trommer's (2001) PARSE constraints, Wunderlich's (2000, 2001, 2003) MAX constraints, Ackema & Neeleman's (2004, 2005) PARSE, Teeple's (2008a,b) FAITH-SM and EXPRESSIVENESS, Strigin's (2007) MAX-STRUCT, Xu's (2007) MAX constraints, and Aronoff & Xu's (2011) IDENT constraints.

[13] As an alternative (or perhaps in addition) to using faithfulness constraints to regulate morpheme/morph correspondents, it would be possible to propose constraints which directly stated "morphosyntactic feature *F* should be realized by underlying form *U*". The 'lexical' constraints of Bidirectional Phonology and Phonetics (see references below (11)) and the realization constraints of Realization OT (Xu 2007, Aronoff & Xu 2010, 2011) work this way. Constraints of the same form appear in several works in the OT literature on PCSA systems requiring arbitrary preference, for instance Kager (1996a).

[14] OT-CC is in certain respects more powerful than HS because in the former, rather than constructing just a single serial derivation, the grammar produces multiple derivations (chains), which then compete as candidates, thereby combining features of serialism and parallelism. Ultimately, adopting an OT-CC rather than HS version of OI is arguably necessary in order to deal with cases of allomorphy and cyclic process application which

involve outwards-sensitivity, which can arise under special conditions due to OT-CC's partly global character: for more details see Wolf (to appear a) on cyclicity, and Wolf (2008: 174-186; to appear b) on allomorph selection. For two interacting examples in Catalan which are problematic for HS-OI, see Bonet (2012), and see Wolf (2008: 110-115; to appear b: 15) for discussion of these in an OI context.

[15] Superficially, Dyirbal has a Nominative-Ergative system in nouns but a Nominative-Accusative system in pronouns. However, Dixon (1972: §5.2) argues that the pronouns too underlyingly pattern as Nominative-Ergative. In any case, if Accusative case does exist in Dyirbal, it and its morphosyntactic exponence is limited to a closed class of forms (the pronouns) and can probably be safely ignored when advancing a proposal about the phonological exponence of the case feature [−free].

[16] For an account of the gradual collapsing together of the various allomorphs of the Ergative and Locative by younger Dyirbal speakers as the language dies out, see Schmidt (1985: ch. 4). She finds that "reduction in the range of locative allomorphs operates on the same principles as ergative allomorph reduction" (p. 52).

[17] It might be taken as worrisome that the behavior of these two suffixes is the reverse of the Ergative: they *avoid* nasal-stop clusters after disyllabic bases, and allow them otherwise. (This also runs counter to the phonological tendency I mention below in note 20.) To the extent that the operative markedness constraints have to be morphologically indexed (as I will assume for the Ergative in a moment), there is probably no danger of analytic inconsistency. Nonetheless, the fact that all involve nasal-stop clusters does hint at the possibility of some synchronic or diachronic connection.

[18] I assume here that morphologically-indexed constraints operate as proposed in Pater (2010).

[19] An analysis of Dyirbal conceptually quite similar to the one in this paper is independently developed by Trommer (2008). In his analysis, the indexed constraint which bars using /-ŋ/ with long stems is $\text{PWD=BINFT}_{ŋ}$, which forbids the prosodic word to be longer than a binary foot. Cast within Stratal OT (Kiparsky [2000], amongst many others), adding /-ŋ/ to a greater-than-disyllabic base at the stem level is barred because it would create a violation of this constraint (the PWd to which /-ŋ/ would belong would be bigger than a foot). Crucially, this constraint (like $\text{COINCIDE}(ŋ, \text{head ft})_{ŋ}$ under the syllabification assumed in (24)), *will* be violated after adding /-ku/ to an intermediate form like $[(\text{jaɽaŋ})_{Ft}]_{PWd}$, since doing so adds a third syllable. The choice of $\text{PWD=BINFT}_{ŋ}$ as the constraint enforcing the base size requirement would therefore dictate against the use of HS and in favor of Stratal OT. I am not aware of any Dyirbal-specific empirical argument for using one constraint versus the other.

[20] Dixon discusses this (197: 283-286) as one reflex of a process of nasal insertion, whereby "the sooner a medial consonant cluster, C_2, comes after a stressed vowel the more tendency there is for it to include a nasal… [this process] involves the insertion of –*n*- at certain grammatical boundaries" (283). The fact that proximity to *preceding* stress is what makes conditions favorable for the insertion of the nasal seems to be consistent with the assumption being made here that nasals are syllabified as codas. Now, if there is such a general process, the reader may naturally wonder whether the [-ŋku] ~ [-ku] alternation is actually the result of a phonological rule, not a matter of listed allomorphy at all. The best response to this objection seems to be that insertion of nasals at morpheme

boundaries occurs at different degrees of proximity to stress for different suffixes: following the head foot for the Ergative and Locative, but immediately following stress for the Dative.

[21] The fact that in French the definite article is *l'* [l] before a vowel, and that in Spanish the masculine definite article is *el*, doubtless helps in causing V-initial nouns of these languages to be borrowed with an initial [l].

[22] This fact creates an apparent problem for the analysis shown in (3) wherein ONSET crucially prefers [xtˤah] over *[xtˤa.u]: what about a competitor [xtˤaw] which uses the /-u/ allomorph, devocalizes, and has no onsetless syllables? It is here that serial evaluation plays a critical role. In general, PCSA choices always interact opaquely with phonological processes (other than prosodification) that any of the allomorphs would trigger or undergo (Paster 2006, 2009: §5.2; Wolf 2008: §3.6), which is predicted in a derivational model like OI where allomorph choice, and phonological changes, occur as separate, successive steps (Wolf 2008: §3.4.2). If this is right, then the competition indeed is between [xtˤah] and *[xtˤa.u]; *[xtˤaw] is not even part of the candidate set at the point where allomorph choice is made. Thus, PCSA of the clitic bleeds devocalization of high vowels in hiatus, but both are driven by ONSET. (For a few possible examples of crucially-transparent PCSA, and a proposal about what special conditions are needed for this to happen, see Wolf [to appear b]).

[23] For another example of this, see McQuaid's (2012: ch. 5) OI analysis of Appalachian English *a*-prefixing.

[24] I am grateful to the editors for pointing this out.

[25] See Wolf (2008: 4) for references to additional proposed cases of 'dummy' affixes inserted for phonological reasons.

[26] The OCP effect on adjacent instances of *that* also seems to control allomorph choice in restrictive relative clauses. Normally there is optional variation between *that* and *which* to introduce a relative clause: *The book* {*which*/*that*} *I ordered arrived today*, though use of *which* is generally frowned upon by prescriptivists. Pullum (2010) points out that *which* becomes the only acceptable option when another *that* precedes: *That which/*that doesn't kill you might give you stomach trouble.* (The version of the example sentence with *which* is a caption from a cartoon in the July 5, 2010 issue of *The New Yorker*.) My intuitions are that *that* is not entirely ill-formed in this context, though it is clearly degraded relative to *which*. (The option of using *which* to avoid the OCP violation is also mentioned in passing by Walter & Jaeger [2005]).

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