REDUPLICATION AND MORPHOLOGICAL LOCALITY*

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Recent studies within Distributed Morphology (DM; Halle and Marantz 1993; 1994) have argued that contextual allomorphy is morpho-syntactically local: allomorphic dependencies can only hold between morphemes within the same cyclic domain, where 'cyclic' is defined in terms of functional syntactic heads like *n* and C (e.g. Marantz 2007; Embick 2010). In this paper I argue that reduplication poses a serious problem for this view of allomorphic locality. Two widely attested patterns of reduplication — category-changing reduplication and aspectual reduplication — are shown to be non-local under the proposals set out in Embick (2010), given that they involve dependencies across two cyclic heads. Further, an amended theory allowing for such interactions makes incorrect predictions about the range of possible allomorphic dependencies. Theories of locality relying on cyclic syntactic heads are thus either too restrictive, or not restrictive enough. I conclude that phonological adjacency, rather than morpho-syntactic locality, is the relevant constraint on allomorphic locality.

Keywords: reduplication, locality, cyclicity, allomorphy

1 Overview

In Distributed Morphology (DM; Halle and Marantz 1993; 1994; Harley and Noyer 1999, and others), word formation involves the manipulation of terminal nodes (as bundles of abstract features) that lack phonological content. Though morphology can be phonologically conditioned in DM (e.g. Noyer 1997; Embick and Noyer 2001; Chung 2007; Embick 2010), such phonological sensitivity enters the picture at a relatively late stage in the derivation of words. In particular, contextual allomorphy — phonologically conditioned or otherwise — is determined post-syntactically, in the PF component of the grammar (Embick and Noyer, 2001).

A number of recent proposals have attempted to constrain the predictions that DM makes about possible patterns of contextual allomorphy. These proposals focus on either the direction of allomorphic sensitivities (e.g. Bobaljik 2000) or the locality of allomorphic dependencies (e.g. Marantz 2007; Embick 2010). This paper will be concerned with the latter issue, arguing *contra* Embick (2010) that morphological locality cannot be defined in terms of cyclic syntactic heads.

Reduplication sits squarely at the intersection of morphology and phonology. Any adequate theory of contextual allomorphy will thus have to account for attested (and unattested) patterns of reduplication. This paper argues that the theory of locality developed in Embick (2010), which relies on a syntactic notion of 'cyclic domain', is too restrictive to account for attested cases of category-changing and aspectual reduplication. While an expanded definition of 'cyclic domain' could allow for such patterns of reduplication, it would wrongly permit a range of unattested and implausible patterns of contextual allomorphy. This result is independent of the formal mechanism used to generate reduplication in DM: as long as reduplication is triggered by a syntactic head, allomorphic locality cannot be determined on the basis of cyclic syntactic nodes.

The conclusion of this paper is that possible allomorphic dependencies are restricted by a criterion of phonological adjacency, and not by morpho-syntactic notions of structural locality. Though some alternative analyses are briefly sketched, the aim here is not to evaluate approaches to reduplication outside of DM.

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There are plenty of alternative accounts of reduplication already on the market, and all of the phenomena discussed here have received plausible treatments within generative phonology, especially in the Optimality Theory literature (e.g. McCarthy and Prince 1986/1996; Spaelti 1997; McCarthy and Prince 1999; Alderete, Beckman, Benua, Gnanadesikan, McCarthy, and Urbanczyk 1999; Gouskova 2004; Shaw 2005, etc.).

Finally, I do not provide an exhaustive (or even thorough) exposition of the architecture of DM. Core properties of the framework — late insertion, syntax-all-the-way-down, acategorial roots, etc. (Harley and Noyer 1999) — are simply assumed without discussion.

The paper is organized as follows. Section 2 considers the role that locality plays in constraining allomorphy in DM, as articulated by Embick (2010). Section 3 argues that the conception of locality developed in Embick (2010) is too restrictive to account for cases of category-changing reduplication. In section 4 I show that aspectual reduplication presents similar problems for that notion of locality; and in section 4.1 I argue that backcopying in aspectual reduplication provides further evidence against a syntactic definition of morphological opacity. Section 5 discusses the relevance of phonological adjacency and concludes.

2 DM and the locality of allomorphic dependencies

Reduplication represents the quintessential case of dependent allomorphy: the phonological content of a reduplicative affix is at least partially derived from the phonology of its base. We should ask, then, under what conditions DM predicts that such inter-morphemic dependencies should be possible.

Early formulations of DM (e.g. Halle and Marantz 1993; 1994) assumed that government was the only condition on contextual allomorphy. With the growth of Minimalism (Chomsky 2000; 2001), government has essentially disappeared from modern syntactic explanation. Nevertheless, the component parts of government are still central to how DM constrains possible interactions between morphemes.[1] The core elements of government are *c-command* and the *absence of syntactically opaque domains*. These two notions comprise the basic conditions on contextual allomorphy in DM:

(1) *Conditions on contextual allomorphy in DM* (Halle and Marantz 1993; 1994)
Morpheme X may influence the form of morpheme Y iff:

a. A c-command relation holds between X and Y (in either direction).[2]

b. No syntactic node or domain intervenes between X and Y that would render the lower morpheme opaque for morpho-syntactic processes.

A major project in DM, and in syntax more generally, has been determining what constitutes an opaque domain for morpho-syntactic relations. Recent work by Embick (2010) has converged on the notion of a *cyclic domain*. Embick (2010) assumes a cyclic spell-out model of word formation, in which a given cyclic domain defines a PF cycle, and thus specifies which morphemes may interact in patterns of contextual allomorphy. In this model, cyclic domains can be induced by two different sorts of syntactic nodes.

[1] I use 'morpheme' as a cover term for bundles of syntactic features that constitute terminal nodes. Importantly, 'morphemes' in this sense may have a null exponence in DM.

[2] This is not to say that inwardly sensitive allomorphy ('X c-commands Y') should be conditioned by the same features that determine outwardly sensitive allomorphy ('X is c-commanded by Y'). Given the cyclic, syntactic architecture of DM, the two directions of allomorphic dependency would be expected to evince different properties, especially if Vocabulary Insertion proceeds 'upward' (Bobaljik 2000).

(2) *Cyclic domains* (after Embick 2010)

a. Category-defining heads *n*, *v*, *a*, etc. are cyclic heads.

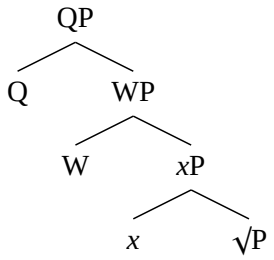
b. Some syntactic heads are cyclic heads: definitely C; and possibly *v*/Voice, D, and P.

c. When a cyclic head *y* is merged above a cyclic head *x*:
   (i) All material between *y* and *x* undergoes Vocabulary Insertion (VI), including *x* itself, elements within its maximal projection *x*P, and the complement of *x*.
   (ii) *y* does *not* undergo VI.
   (iii) The complement of *x* undergoes spell-out.

The separation of Vocabulary Insertion and spell-out in (2c) is crucial. VI is simply the addition of phonological material to a syntactic node.[3] Spell-out, on the other hand, renders nodes morpho-syntactically inactive, but only after those nodes have phonological content. Morpho-syntactic opacity is thus defined by the conditions in (2c).

By way of illustration, consider the structure in (3).

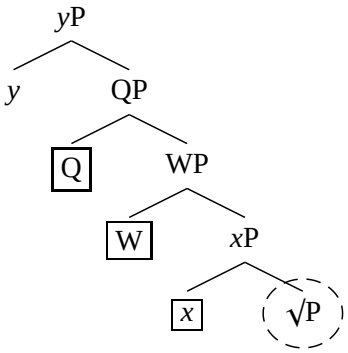
(3) First cyclic head merged



The syntactic structure (3) contains only a single cyclic head, *x*. Here *x* is the category-defining head that undergoes first merge with √P. A cyclic head defines a cyclic domain, which is taken to be the complement of that head, along with any material between that head and the next-highest cyclic head (see (4) below). In (3), the cyclic domain of *x* encompasses all of the material currently present in the tree, including non-cyclic Q and W.

As outlined in (2), neither VI nor spell-out will occur until another cyclic head is merged higher in the structure. Now consider what happens when such a head, *y*, is merged.

(4) Second cyclic head merged (VI marked by boxes)



[3]It is an open question in DM whether or not syntactic structure, and thus formal syntactic features, are present after VI (Halle and Marantz 1993; 1994; Noyer 1997; Bobaljik 2000; Embick and Noyer 2001; Embick 2007; Pak 2008). I do not address this issue here.

When *y* is merged, everything in its complement — cyclic *x*, non-cyclic Q and W, and possibly the root (see Embick 2010:53) — undergoes VI. This is equivalent to saying that *y* triggers VI in the the next-lowest cyclic domain, i.e. the cyclic domain headed by *x*.

The process of VI can be contextually sensitive, under two conditions:

(5) *Conditions on context-sensitive VI*
Morpheme X can influence VI at morpheme Y iff:

a. No (overt) material intervenes between X and Y.

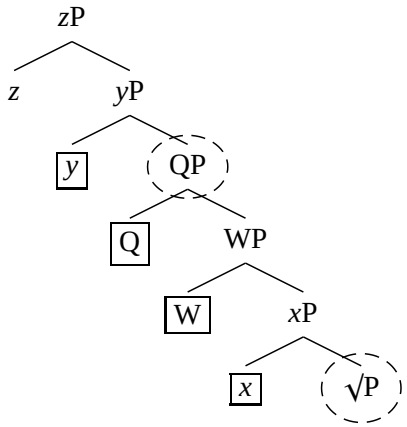
b. Neither X nor Y has been spelled out.

Given these conditions, in (4) VI of *x* can be conditioned by W, or vice-versa. On the other hand, VI of *x* can only be conditioned by Q if the intervening head W is phonologically null — in other words, contextual allomorphy under VI requires strict phonological adjacency. Importantly, VI of Q *cannot* be determined by *y*, because Q and *y* are in different cyclic domains.

Since *x* and the root √P are contained within the same cyclic domain (i.e. the cycle triggered by merger of *y*), VI of *x* can be sensitive to properties of √P. However, merger of *y* also triggers spell-out of the complement of the next-lowest cyclic head, here *x*. Since the complement of *x* is √P, from this point on √P will be inert to all morpho-syntactic relations, including contextual allomorphy. In (4), the fact that √P constitutes an opaque domain is indicated by the dashed oval surrounding it.

Finally, consider what happens when a third cyclic head, *z*, is merged with the structure in (4).

(6) Third cyclic head merged



The merger of *z* triggers VI of everything between *z* and the next cyclic head, *y*. In this case, the only node undergoing VI is *y* itself. VI of *y* can be sensitive to Q, W or *x* (as long as phonological adjacency is respected), but *not* to the root, which was spelled out when *y* was merged.[4] Stated a bit more directly, if "there are two cyclic heads *x* and *y* in a structure like [[$\sqrt{\text{ROOT}}$ *x*] *y*]. . . *y* cannot see the Root" (Embick, 2010:48). The claim that roots should be opaque to 'outer' category-defining heads like *y* will be central to the discussion of category-changing reduplication in section 3.

Lastly, merger of *z* induces spell-out of the complement of *y*, here QP. Thus QP and everything it dominates become opaque for further morpho-syntactic operations. The cyclic head *y*, however, does not undergo spell-out, and can play an active role in contextual allomorphy at later stages of the derivation.

[4]Note that there is an interesting asymmetry here: VI of *y* can be sensitive to Q, even though VI of Q could not have been sensitive to *y* earlier in the derivation (Embick 2010:67).

2.1 Readjustment rules

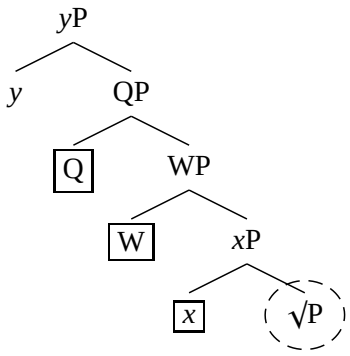
Along with contextually sensitive Vocabulary Insertion, there exists another mechanism for deriving allomorphy in DM: so-called 'readjustment rules' (Halle and Marantz 1993; 1994; Embick 2010). Readjustment rules can alter the phonological content of morphemes when they appear in particular environments, and can also manipulate syntactic features.

As unrestricted rewrite operations, readjustment rules have a striking degree of expressive power. This point is underscored by the fact that readjustment rules can simultaneously refer to both phonological material and syntactic features (Halle and Marantz 1993; Embick and Halle 2005). For DM to make contentful predictions about allomorphy, the application of readjustment rules must be constrained in some way (see also Siddiqi 2009:Ch.5 on eliminating readjustment rules from DM).

As hypothesized by Embick (2010:98), readjustment rules are not subject to the phonological adjacency requirement imposed on contextually determined VI (see (5) above). Within this system a readjustment rule must be triggered by the merger of a morpheme (as Frampton 2009 also assumes).[5] Since spell-out can render syntactic domains opaque before such a triggering morpheme is inserted, the triggering and target morphemes must be contained within the same cyclic domain. This restriction on readjustment rules, which Embick (2010) dubs the *Readjustment Activity Hypothesis*, imposes a limited sort of locality on the application of readjustment rules.

To illustrate, we return to the structure in (4).

(7) Conditions on readjustment rules



In (7), the merger of *y* creates a cyclic domain consisting of Q, W, *x*, and √P. After VI has occured (indicated by boxing), readjustment rules may apply.[6] If the non-cyclic head Q triggers a readjustment rule, that rule may target any of W, *x*, or √P, since those nodes are contained within the same cyclic domain as Q (and are also c-commanded by Q). In contrast, if the cyclic head *y* triggers a readjustment rule, it may not target the root √P, because the two heads are in different cyclic domains and √P has been spelled out.[7] As Embick (2010:101) puts it, "the 'activity' of elements should be the same. . . for contextual allomorphy [as VI] or for readjustment rules".

[5] As long as the Extension Condition holds, the morpheme triggering a readjustment rule will always c-command the morpheme targeted by that rule (see Chomsky 1995; Matushansky 2006).

[6] Strictly speaking, purely syntactic readjustment rules (e.g. impoverishment) can apply before VI (Halle and Marantz 1994). Since reduplication doesn't instantiate the sort of 'retreat to the general case' allomorphy normally associated with impoverishment (Halle and Marantz 1993; 1994; Harley and Noyer 1999), I abstract away from non-phonological readjustment rules throughout the discussion.

[7] It is not clear to me from Embick's exposition of $\mathbb{C}_1$-LIN whether a readjustment rule triggered by *y* could target Q, W, or *x* in (7).

In summary, there are two ways that contextual allomorphy can occur in DM (as developed by Embick 2010):

(8) *Modes of contextual allomorphy in DM*
For morpheme X to induce contextual allomorphy of morpheme Y:
a. X and Y must be in the same cyclic domain (Embick 2010:48-56,66,101), and

b. If triggered under…
(i) **VI**: X and Y must be phonologically adjacent.
(ii) **Readjustment rules**: c-command must hold between the two morphemes.

Following Embick (2010), I will refer to this set of assumptions as the '$\mathbb{C}_1$-LIN' theory: '$\mathbb{C}_1$' because contextual allomorphy may be conditioned across a single cyclic head; and LIN because contextual allomorphy under VI requires linear adjacency between the conditioning and affected morphemes.[8]

3 Category-changing reduplication and opaque domains

This section argues that the $\mathbb{C}_1$-LIN theory of Embick (2010) cannot account for the existence of category-changing reduplication. Under the assumptions (i) that category-changing morphology involves merger of a category-defining syntactic head *x*, and (ii) that category-defining heads are cyclic heads, the $\mathbb{C}_1$-LIN theory wrongly predicts the non-existence of category-changing reduplication.

Section 3.1 illustrates the argument with data from the Austronesian language West Tarangan. West Tarangan is a valuable test case, because (i) the relevant category-defining heads are overtly realized, and (ii) the reduplicative affix in West Tarangan is non-templatic, and thus cannot be analyzed as the insertion of an empty prosodic or segmental template in the morphology (section 3.1.1). Section 3.2 presents similar data from Yoruba, a Niger-Congo language, which argues for the relevance of phonological adjacency for determining contextual allomorphy.

3.1 Nominalizing reduplication I: West Tarangan

West Tarangan (Nivens 1992; 1993) provides an example of reduplication that straightforwardly refutes the predictions of the $\mathbb{C}_1$-LIN system regarding the distribution of reduplicants (henceforth RED).[9] In West Tarangan, reduplication is used to derive nouns from verbal stems.[10]

(9) West Tarangan nominalizing reduplication (Nivens 1993:375)
a. ba-bayil ina
RED-be.flexible.3s one
'a flexible one'

b. jan-jinin-ay ir
RED-big.3p-3p DEF
'those important people'

[8]This contrasts with the '$\mathbb{C}_0$' theory of Marantz (2007).

[9]I intend no theoretical commitment by the use of 'RED'. It serves only as shorthand here, not as a meaningful formal unit (as in McCarthy and Prince 1995, for example).

[10]West Tarangan data is cited as it appears in Nivens (1992; 1993), and does not conform to IPA conventions.

Nominalizing reduplication is not limited to deverbal nouns. For example, reduplication can form nominalizations of existing nouns.

(10) Nouns formed from other nouns via reduplication

a. ga-gaka
RED-swamp
'mangrove'

b. nɛl-nɛla
RED-waist
'lower back'

These nominalizations can also have adjective-like semantics, as in (11) (Nivens 1993:376).

(11) gar jɔ-jɔir
water RED-cold.3s
'cold water'

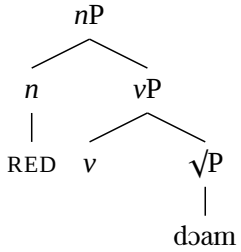
Indeed, reduplication serves a variety of functions in West Tarangan, interacting with negation, aspect, relative clause formation, and prepositional morphology. Despite this multiplicity of functions, Nivens (1993) argues that reduplication is nominalization in most (though not all) of the contexts in which it appears. One argument is that reduplicated forms lacking corresponding non-reduplicated forms (i.e. reduplicants with a 'dummy' base) are always nouns.

(12) tun-tun (*cf.* *tun)
'mosquito'

It remains to be seen whether this unified analysis of West Tarangan reduplication can withstand further scrutiny. The important point for this discussion is that reduplication clearly *can* serve a nominalizing function in West Tarangan, as evidenced by (9) and (10).

In DM, verbal nominalizations like those in (9) would be formed by merger of a category-defining *n* head with a verbal base *v*P, as in (13).

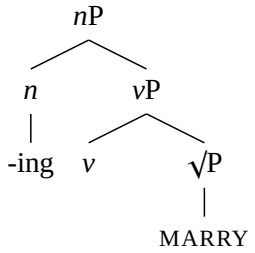
(13) Structure for West Tarangan nominalizing reduplication



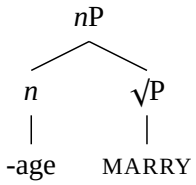
This is exactly the structure that Embick (2010) proposes for English deverbal nouns within his $\mathbb{C}_1$-LIN system. For example, the nominalization *marrying* differs from the related noun *marriage* in that a verbal head *v* intervenes between *n* and the root.

(14) English nominalizations (Embick 2010:15-16, 56-8)

a. ‘marrying’



b. ‘marriage’



The morphological differences between *marriage* and *marrying* are then attributed to the presence or absence of cyclic *v*. In the absence of an intervening *v*, both nominalizing *n* and the root can show idiosyncratic allomorphy, e.g. [$\sqrt{\text{LAUGH}}$ *n*] → *laugh-**ter***, [$\sqrt{\text{DESTROY}}$ *n*] → ***destruct-ion***, etc. The context-specific realization of *n* as *-age* in *marriage* follows analogously.

What about the regular form *marrying*? The basic idea is that the presence of cyclic *v* prevents the root from influencing the realization of outer *n* (and vice-versa). Both *n* and *v* are cyclic heads in the $\mathbb{C}_1$-LIN system. Since merging a second cyclic head triggers spell-out of any lower cyclic domains, *n* should induce an opaque domain consisting of the complement of *v*, here √P. Once the root is rendered opaque in (14a) by the insertion of *n*, no morpheme above *v* can show root-sensitive allomorphy. Indeed, as Embick writes:

(15) “Cyclic *y* may not have its allomorphy determined by α in the complement of cyclic *x* in $\ldots \alpha$] *x*] *y*] under any circumstances.” (Embick 2010:67)

Or more specifically:

(16) “*n* could never show allomorphy conditioned by the Root in this type of formation [as in (14a)]” (Embick 2010:58)

The fact that *v* intervenes between *n* and the root thus captures the generalization that in English deverbal nominalizations, neither the root nor *n* evince contextual allomorphy; i.e. *n* is always realized as *-ing*.

The problem here should be plain: *v* needs to render the root opaque for English nominalizations, but *not* for West Tarangan nominalizations, since the shape of the nominalizing head *n*, a reduplicant, is formed by copying phonological material from the root.[11]

One could respond to this apparent paradox by denying that a *v* head intervenes between the stem and RED in West Tarangan nominalizations. If that were the case, the root would still be accessible to the nominalizer [$_n$ RED], and West Tarangan would no longer constitute a counterexample to the predictions of $\mathbb{C}_1$-LIN. However, in some West Tarangan nominalizations *v* appears to be overtly realized. Nivens (1993)

[11] In the system developed in Frampton (2009), *n* wouldn’t actually host RED, but would simply trigger copying of the root. Since the problem posed by West Tarangan regards the locality of reduplication, and not the mechanism of reduplication *per se*, the arguments presented in this section would remain valid under Frampton’s approach.

notes that the meaning of deverbal nominalizations varies depending on whether the nominalization appears with verbal morphology.

(17) Nominalizations can bear verbal morphology in West Tarangan[12]

a. dɔ-dɔam
RED-pound
'sago pounder (an instrument used for pounding)'

b. ɛ-r-dɔ-dɔam
3s-verbal.prefix-RED-pound
'sago pounder (the person pounding)'

c. ɛ-r-sir
3s-verbal.prefix-speak
'he/she speaks'

One possiblity is that the verbal prefixes /ɛ-r-/ are in fact hosted on *v*. This seems especially plausible given that this verbal morphology contributes agentive semantics, which are often associated with the argument structure properties of *v* (e.g. Arad 2005).[13]

Some readers might object that the verbal prefixes /ɛ-r-/ appear outside of the reduplicant in (17b), and thus do not conform to the syntactic structure proposed for deverbal nominalizing reduplication in (13). Here it becomes relevant that the nominalizing reduplicant in West Tarangan is a prosodically placed infix: it must appear adjacent to the foot bearing main stress (Nivens 1993:356, Gouskova 2004). As long as infixation is post-syntactic (e.g. Embick and Noyer 2001), the assumption that /ɛ-r-/ is a *v* head is still consistent with the claim that nominalizing RED appears outside of *v* in the syntax, as in (13) (see also Embick 2010:3.4.3 on infixal tense in Palauan).

(18) RED must appear adjacent to head foot (Nivens 1992; 1993; RED is in boldface)

a. ma(ˈ**ŋɛy**)(ˈŋɛy-di)
leaf.RED-3p

b. (ˌɛ-la)(ˈ**jir**)(ˈjir)
3s-white.RED

c. (ˌka.**nɔ**)(ˈnɔ.ur)-ŋa
hungry.RED-1s

d. (ˌɛ-ta)(ˈ**nir**)(ˈni.ra)
3s-have.diarrhea.RED

[12]The status of the morpheme *r*-, glossed here as 'verbal.prefix', is somewhat unclear. Nivens (1993:383) writes that *r*- "signals the derivation of of grammatically intransitive verbs when the object is 'nonindividuated'." In this respect, *r*- resembles antipassive morphology; and indeed, Nivens (1992) provides many glosses for forms containing *r*- that suggest antipassive-like semantics. At any rate, *r*- is clearly verbal morphology, and is almost certainly derivational.

[13]There is some ambiguity here as to whether the category-defining *v* head is identical to the head that introduces external arguments (see section 4). I assume that at least some argument structure properties must be encoded on the category-defining head *v*, since e.g. the head introducing external arguments should only select verbs that are compatible with a transitive interpretation (see also Kratzer 1996). The point still stands if /r-/ is taken to be a Voice head rather than *v*, at least under the reasonable assumption that Voice only appears above *v*P complexes.

West Tarangan, then, presents a valid counterexample to the predictions of $\mathbb{C}_1$-LIN.

The phenomenon of nominalizing reduplication is not restricted to West Tarangan. Whisler (1992) and Spaelti (1997) discuss data from Sawai, an Austronesian language spoken in Indonesia. In Sawai, reduplication is also productively used to nominalize verbs.

(19) Sawai nominalizing reduplication (Whisler 1992; Spaelti 1997)

a. lɛs-lɛsɛn
RED-to.sweep
'broom'

b. tɛl-tolɛn
RED-to.sit
'chair'

c. gɛs-gɔs
RED-to.scratch
'line, scratch'

The existence of nominalizing reduplication in another (though typologically related) language confirms that the problem isn't isolated to West Tarangan. It should also be stressed that *any* case of category-changing reduplication would present the same difficulties, since all category-defining heads (and not just *n* and *v*) are cyclic heads in the $\mathbb{C}_1$-LIN system.[14] Potentially problematic examples of category-changing reduplication can be found in such genetically and geographically disparate languages as Kayardild (Tangkic; Australia), Khoekhoe (Khoisan; Namibia), and Luiseño (Uto-Aztecan; California) (Rubino 2009; see also section 4.1). I therefore conclude that the $\mathbb{C}_1$-LIN model is too restrictive to account for cross-linguistic patterns of reduplication.

3.1.1 West Tarangan reduplication is non-templatic

In order to reconcile the West Tarangan data discussed above with the $\mathbb{C}_1$-LIN theory, one might argue that VI at [$_n$ RED] simply inserts an empty prosodic template, in the spirit of McCarthy and Prince (1986/1996) and related work.

(20) Templatic Vocabulary Item for West Tarangan RED

[$_n$ RED] $\leftrightarrow$ /σ/

On this approach, RED would lack segmental content throughout the morpho-syntactic component of the grammar. The 'filling-in' of segmental material could occur later, via some phonological copying process that need not be sensitive to the same locality domains as morpho-syntactic operations (see e.g. Skinner 2008). It would then be unproblematic for $\mathbb{C}_1$-LIN if category-changing reduplication copied segmental material from the root, as in West Tarangan.

The problem with a template-based approach to West Tarangan nominalizing reduplication is that the reduplicant is demonstrably non-templatic. Though all of the preceding examples involve copying of a CV(C) syllable, in some dialects reduplication can also copy a single consonant.

[14] Here I intend 'category-changing' in the structural sense: the reduplicant must be separated from the root by a category-defining *x* head.

(21) a. ta.ˈkur ‘coconut shell’
b. ta**r**.ˈkur ‘coconut/sage mixture’

c. da-ˈta.lar ‘3p-sit’
d. da**l**.ˈta.lar ‘???’ (Nivens, 1993:373)

The basic generalization is that “for roots with an open syllable prior to the stressed syllable, the reduplicative prefix consists of a single consonant prior to the stressed syllable, and the consonant reduplicated is the one following the stressed vowel” (Nivens, 1993:373). As argued in Nivens (1993) and Gouskova (2004), purely templatic approaches to West Tarangan reduplication wrongly predict that a full syllable should *always* be copied in order to maximally satisfy the syllabic template (see e.g. Marantz 1982, McCarthy and Prince 1986/1996 on template satisfaction).

(22) Syllable template incorrectly predicts uniform full syllable reduplication
a. *ta.**kur**.ˈkur
b. *da.**tal**.ˈta.lar

The essential problem with the templatic approach is that copying a single consonant will never be preferable to copying a full CVC syllable that better matches the syllabic template. Importantly, there is no independent phonological process of /C_1VC_2/ → [C_2] reduction in West Tarangan, so the [CVC] ~ [C] allomorphy found in reduplication must be morphological in character (see Nivens 1993:370-1 for discussion).

A more refined templatic account of West Tarangan reduplication might assume two distinct templates: a single C template, inserted when the root contains a [CV.ˈCV] sequence; and a syllabic CV(C) template inserted otherwise. But this approach recapitulates the same basic locality problem: template selection would boil down to root-sensitive contextual allomorphy, of exactly the sort predicted to be impossible by $\mathbb{C}_1$-LIN (see (13), (16)). Consequently, templatic approaches to nominalizing reduplication are not empirically adequate, and do not solve the problems that West Tarangan poses for the $\mathbb{C}_1$-LIN theory.

3.2 Nominalizing reduplication II: Yoruba

There is at least one case of nominalizing reduplication that superficially accords with the predictions made by the $\mathbb{C}_1$-LIN system. In Yoruba, as in West Tarangan and Sawai, nouns can be formed by reduplicating part of a verbal base.

(23) Yoruba nominalizing reduplication (Bòdé 1999:50)
a. rí-rà
RED-to.buy
‘act of buying’

b. sí-sun
RED-to.roast
‘roasted one’

c. gbí-gbàdúrà
RED-to.pray
‘act of praying’

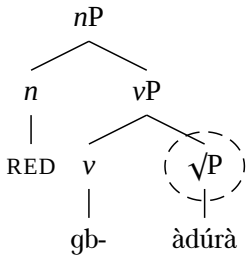
Yoruba nominalizing reduplication is extremely productive. As Bòdé (1999) writes, "one can derive a noun from any verb" with this pattern of reduplication. Though the form of the reduplicant appears to be [Cí-], McCarthy and Prince (1986/1996), Pulleyblank (1988), and Alderete et al. (1999) argue convincingly that the [í] is in fact epenthetic, and the form of RED is simply [C-] (though *cf.* Frampton 2009:54).

The verbal base that RED attaches to can be morphologically complex itself. For example, one of the verbal bases in (23) has a corresponding simplex noun.

(24) àdúrà 'prayer' (*cf.* gbàdúrà 'to pray') (Church Missionary Society 1913)

One possible analysis would be to treat *gb-* as the phonological realization of the verbalizing head *v* (see also doublets like *àgbé* 'forgetfulness' ~ *gbagbé* 'forget', *èdè* 'language' ~ *gbedè* 'understand a language', *ogun* 'army, war' ~ *gbogun* 'start warfare', etc.; Church Missionary Society 1913). If this line of analysis is correct, then nominalizing reduplication in Yoruba might only target *v*, rather than the root.

(25) Structure for Yoruba nominalizing reduplication: [gbí-gbàdúrà]



Such an analysis of deverbal nouns in Yoruba would be consistent with the claim that the nominalizing head RED does not copy material from the root, in line with the prediction of $\mathbb{C}_1$-LIN that the root should be opaque to *n* in such structures.

However, this analysis of Yoruba nominalizing reduplication is untenable. For one, it would require positing a multitude of phonological realizations for *v* — [r-] as in [rí-**r**à] 'act of buying', [ş-] as in [şí-**ş**e] 'doing', [l-] as in [lí-**l**o] 'act of going', etc. (Bòdé 1999:50) — in fact, as many realizations of *v* as there are consonants in the language.[15] This approach would then further require an idiosyncratic rule for each root specifying which consonant *v* should be realized as. A simpler explanation, of course, is that Yoruba nominalizing reduplication simply copies the first consonant of the verbal stem, regardless of its morphological affiliation. Sometimes this consonant will belong to a root, and sometimes to a category-defining head or other prefix. This pattern of reduplication, then, is essentially blind to internal morpho-syntactic structure.

To complete the argument, there is good evidence that Yoruba nominalizing reduplication involves a verbal layer even when *v* is not overtly realized. These nominalized forms are very frequently (though not always) gerunds. They have eventive semantics; they cannot be pluralized; they can include an internal argument (26b); and they can include some verbal auxiliaries (26c) (Ajíbóyè, Déchaine, and Stewart, 2004).

[15] Yoruba has eighteen phonemic consonants, all of which can appear word-initially (Akinlabi 2004; Przezdziecki 2005). There are no vowel-initial verbs in Yoruba (only nouns may begin with a vowel), and monomorphemic verbs are generally CV in form (Pulleyblank 1988; Akinlabi 2001).

(26) a. **Rí-rà** ni Jímò ó ra ìwé
RED-buy FOC Jímò AGR buy book.
'*Buying* is what Jímò did to a book/books.'

b. **Rí-ràwé** ni Jímò ó ra ìwé
RED-buy.book FOC Jímò AGR buy book.
'*Book-buying* is what Jímò did.'

c. **Gbí-gbodò-fò** ni okò ó gbodò fò.
RED-OBLIGATIVE-jump FOC vehicle AGR OBLIGATIVE jump
'The craft *should* fly.'

(Ajíbóyè et al., 2004:33-4)

All of these properties are characteristic of verbal projections (see also Kratzer 1996, Embick 2010:94-6 on English gerunds). I take this constellation of facts as indicative of a *v*P layer intervening between [$_n$ RED] and the root, even when category-defining *v* is phonologically null (see (23)). Furthermore, in those cases where *v* is null, [$_n$ RED] looks across *v* to copy an adjacent root-initial consonant. Yoruba nominalizing reduplication thus provides another counterexample to the predictions of the $\mathbb{C}_1$-LIN theory.

4 RED and aspect

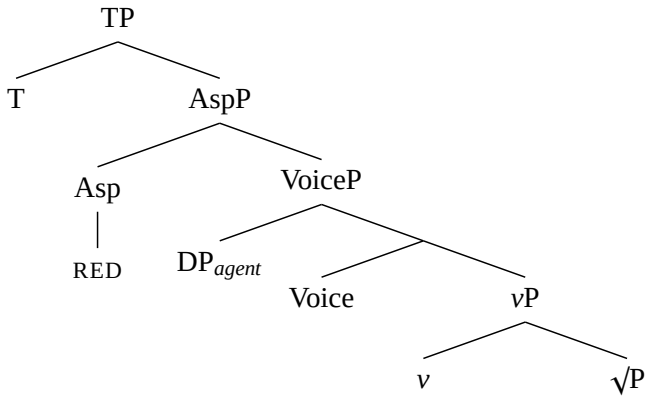
One of the most frequent functions of reduplication is to indicate aspectual distinctions (Marantz and Wiltshire 2000; Rubino 2009). Under the $\mathbb{C}_1$-LIN system, then, it is crucial that verbal roots be visible to the syntactic head that realizes aspect, since those verbal roots can be targeted by aspectual reduplication.

(27) Tübatulabal perfective reduplication (Swadesh and Voegelin, 1939)
a. puw 'to irrigate'
b. ʔ**u:**-buw 'he irrigated'

c. kami:ǯa-n 'to catch it for him'
d. ʔ**a**-kami:č 'he caught it'

In one plausible syntactic structure for verbal complexes, the aspectual head Asp sits above a Voice head (Kratzer 1996), which introduces an agentive external argument and selects a verb as its complement.

(28) Possible syntax of the verbal complex



As Gribanova (2010) has pointed out, if the Voice head in (28) is cyclic or phasal, then root-Asp interactions are predicted to be impossible under the $\mathbb{C}_1$-LIN theory. If both *v* and Voice are cyclic, then merger of Voice will render the root opaque, and allomorphy at Asp — including reduplication — should be completely insensitive to properties of the root. Embick (2010:80) is clearly aware of this issue, and accordingly assumes that Voice is a non-cyclic head.

There is reason to believe that Voice is in fact a cyclic head, *contra* Embick (2010:80). In many current instantiations of Minimalism the phase head *v* (not to be confused with category-defining *v*) is identified as the head responsible for introducing external arguments, and is generally assumed to induce syntactic opacity for the operation of AGREE (Chomsky 2000; 2001). Baltin (2007) further argues that Voice is a phase head, and is distinct from the category-defining head *v*. Moreover, Michaels (to appear) shows that in Malayalam, the functional head that introduces external arguments must serve as a barrier for certain kinds of contextual allomorphy. If these analyses are on the right track, and Voice is indeed cyclic, then the $\mathbb{C}_1$-LIN system wrongly predicts that aspectual reduplication should be impossible. Thus, the exceedingly well-attested phenomenon of aspectual reduplication constitutes another potential counterexample to the $\mathbb{C}_1$-LIN theory of allomorphic locality.

To be sure, this argument hinges on at least three assumptions: (i) Voice is a cyclic head; (ii) the Asp head appears outside of the Voice head, and (iii) the Voice head is distinct from the category-defining head *v*. If any one of these assumptions is invalid, then aspectual reduplication ceases to pose a problem for the $\mathbb{C}_1$-LIN theory.

Beginning with the first point, it was already noted that Embick (2010) takes Voice to be non-cyclic, though the issue is far from resolved. Regarding the location of aspect, we might expect the relative positioning of Voice and Asp to vary cross-linguistically. For example, Travis (1999) claims that aspectual reduplication in Tagalog corresponds to a low Asp head below Voice (her *v*P). Under Travis' analysis, then, aspectual reduplication in Tagalog is consistent with the $\mathbb{C}_1$-LIN theory, though aspectual reduplication in other languages might still be troublesome for $\mathbb{C}_1$-LIN (see section 4.1 below). On the other hand, even the Tagalog facts aren't settled: Skinner (2008) argues that aspectual reduplication in Tagalog actually sits in a high Asp head above Voice/*v*P, thus reviving the locality problem for $\mathbb{C}_1$-LIN.

As for the third point, it seems rather unlikely that Voice is identical with category-defining *v*. For one, Johnson (1991) shows that main verbs in English must raise from their base-generated positions and adjoin to a higher verbal head, which Kratzer (1996) identifies as Voice. If Voice and *v* are the same head, the entire battery of syntactic and semantic arguments in favor of verb movement to Voice must be reanalyzed (see also Baltin 2007). Equating Voice with category-defining *v* also makes the strange prediction that root allomorphy could be conditioned by specific properties of a subject DP in the configuration [DP_{ag} [$_{v\text{P}}$ *v* $\sqrt{\text{P}}$]] (see also Embick 2010:65).[16] This prediction also follows if Voice is taken to be distinct from *v* but non-cyclic, since in either case only one cyclic head will intervene between the subject and the verb root.

The point of this excursus is simply to echo a sentiment expressed by Gribanova (2010): to a large degree, the predictions of $\mathbb{C}_1$-LIN will vary radically according to one's view of syntactic structure and the inventory of opacity-inducing heads. In the $\mathbb{C}_1$-LIN theory, a single assumption about syntax can lead to a web of complex predictions about allomorphy, not all of which will be reasonable. Since by definition reduplication must occur within a non-opaque domain, it can therefore be used as a diagnostic for probing the presence or absence of opacity-inducing nodes in syntactic structure. So far, reduplication has suggested the existence of fewer opaque domains than predicted by the $\mathbb{C}_1$-LIN theory.

[16] This assumes that allmorphic interactions can occur both within and across words. See Embick (2010:2.1.4) for suggestions that this assumption is valid within the $\mathbb{C}_1$-LIN theory.

4.1 Opacity and root inalterability

The $\mathbb{C}_1$-LIN theory assumes that spell-out renders morphemes completely inactive for further allomorphy, either as triggers or as targets. Another logical possibility is that spell-out simply fixes the phonological form of a node that has undergone VI, such that the phonological content of spelled out nodes cannot be altered at later stages in the derivation (e.g. Marvin 2002; Michaels to appear). On this view of morpho-syntactic opacity, category-changing and aspectual reduplication are unproblematic, since they only need to 'see' spelled out material rather than alter it. Call this the *weak cyclic opacity hypothesis*.

The existence of overapplication in reduplication — where a phonological change occurring in RED 'copies' back to the base of reduplication — provides counterevidence to this approach to morphological opacity.[17] Consider the (truly astounding) pattern of inceptive aspect reduplication in Guarijío (Uto-Aztecan; Miller 1996; Caballero 2006).[18]

(29) Inceptive aspect and overapplication in Guarijío (Caballero 2006)

a.	toní	'to boil'	to-tó	'to start boiling'
b.	sibá	'to scratch'	si-sí	'to start scratching'
c.	čonó	'to fry'	čo-čó	'to start frying'
d.	muhíba	'to throw'	mu-mú	'to start throwing'

In Guarijío inceptive reduplication, the prosodic requirement of the reduplicant — namely a CV size limit — appears to overapply to the base of reduplication, yielding truncation of one or more syllables in the verb stem. This pattern of reduplication is somewhat different from classic overapplication, in which a phonological process applying within the reduplicant unexpectedly occurs within the base as well (or vice-versa).[19]

Nevertheless, Guarijío inceptive reduplication is illustrative because it pairs two key properties: (i) reduplication serves an aspectual function, and (ii) when reduplication occurs, radical alteration of the base of reduplication occurs concomitantly. As discussed in section 4, aspectual reduplication arguably requires access to the phonological content of a root which should be spelled out, and thus inaccessible, according to the $\mathbb{C}_1$-LIN system. What Guarijío shows us is that it's not enough to allow spelled out material to be visible for later stages of the derivation: the root must also be permitted to undergo further morpho-phonological changes, despite the presence of opacity-inducing syntactic heads. Note that Guarijío inceptive reduplication is still problematic for $\mathbb{C}_1$-LIN if these alternations are taken to be root allomorphy rather than true phonological truncation, as aspect-triggered root allomorphy is also ruled out by the $\mathbb{C}_1$-LIN theory of morphological locality.

There are two potential objections to this account of Guarijío inceptive reduplication. First, truncation could conceivably occur in the post-syntactic, phonological component of the grammar, where morpho-syntactic opacity is no longer relevant (Embick and Noyer 2001).[20] Second, this account relies on the assumption that Asp sits above Voice and category-defining *v* in the morpho-syntax of the language. The first objection is not well-founded: as Miller (1996) and Caballero (2006) discuss, it is quite clear that trun-

[17] Overapplication (or 'back-copying') has been a contentious issue in the reduplication literature. Recommended reading includes Marantz (1982); McCarthy and Prince (1995); Pylkkänen (1999); Raimy (2000); Gouskova (2004; 2007); Inkelas and Zoll (2005), and Frampton (2009), among many others.

[18] Caballero (2006:279) suggests that inceptive aspect in Guarijío "has an iterative component", which may not be obvious from the glosses.

[19] Indeed, it has sometimes been claimed that the phenomenon instantiated by Guarijío inceptive reduplication, namely back-copying truncation, does not exist (e.g. McCarthy and Prince 1999, though *cf.* Downing 2002; Gouskova 2007).

[20] Raimy (2000) and Frampton (2009) present detailed accounts of backcopying phenomena in derivational frameworks. Since neither author is concerned with morpho-syntactic opacity, their systems allow for free access to the root throughout the derivation of words.

cation of this sort is not a general phonological phenomenon in Guarijío. As for the second objection, the position of aspect in Guarijío syntax remains an issue for further research.

There are many further examples of reduplication inducing some segmental or suprasegmental change in the reduplicative base (see e.g. McCarthy and Prince 1995). Though less dramatic than Guarijío inceptive reduplication, there are other cases where base-internal phonological effects are triggered by aspectual or category-changing reduplication.

(30) Accent shift in Yaqui aspectual reduplication (Demers, Escalante, and Jelinek, 1999)

a. táse ‘cough’
b. tá-tase ‘is coughing’

c. naáte ‘start’
d. na-náate ‘is starting’

(31) Accent shift in Luiseño adjectival reduplication (Munro and Benson, 1973)

a. sá:wa ‘to wheeze’
b. sawá-swa-š ‘hoarse’

c. máha ‘to stop’
d. mahá-mha-š ‘slow’

cf. Past habitual /-uk/
e. hédi ‘to open’
f. hédi-k ‘used to open’, *hedí-k

Accent shift in Yaqui and Luiseño provides evidence that root-level phonology is not fixed at the point of spell-out. Accent in Yaqui normally falls on the first mora (30a); second mora accent (30c) is the result of root-specific initial mora extrametricality (Demers et al., 1999). When such forms are reduplicated, however, accent can shift onto a root-intial mora, as in (30d). Though the resulting word inherits initial mora extrametricality from the root, extrametricality no longer holds within the root itself. Reduplication thus fundamentally alters the accentual phonology of Yaqui verb roots, despite the fact that aspect-triggered changes in root phonology are ruled out under the weak cyclic opacity hypothesis.

Accent shift in Luiseño is also morphologically conditioned, but with a greater degree of idiosyncracy. In Luiseño, default accent is root-initial, though it falls on the second syllable in [CV.CV:] roots (Munro and Benson, 1973). Accent on the second syllable of [CV.CV] roots is triggered only by an apparently arbitrary set of verbal suffixes. The category-changing adjectival reduplicant is one such accent-shifting suffix.[21] Under the weak cyclic opacity hypotheses, such accent shift should be impossible: merger of category-changing RED should have triggered spell-out, thereby fixing the phonological form of the verb root. The spelled out verb root is thus wrongly predicted to be impervious to idiosyncratic, reduplicant-triggered accent shift.

To summarize, we find again that reduplication can set off root-internal phonological changes, which may be morphologically or phonologically conditioned by the reduplicant itself. Importantly, the presence of higher cyclic syntactic structure does *not* block these changes, even though the weak cyclic opacity hypothesis predicts that the phonological form of the affected roots should have been fixed under cyclic spell-out (*cf.* Marvin 2002:56, who claims that spell-out doesn’t always preclude subsequent stress shift).

[21] As in Yoruba, category-changing reduplication in Luiseño “is very widespread; perhaps the majority of verbs have associated reduplicated adjectives” (Munro and Benson, 1973:18).

Though Guarijío, Yaqui, and Luiseño make the point for reduplication, the basic claim is more general: any instance of an aspectual (or category-changing) morpheme triggering a phonological change in the root will constitute a counterexample to the weak version of the cyclic opacity hypothesis of $\mathbb{C}_1$-LIN.[22]

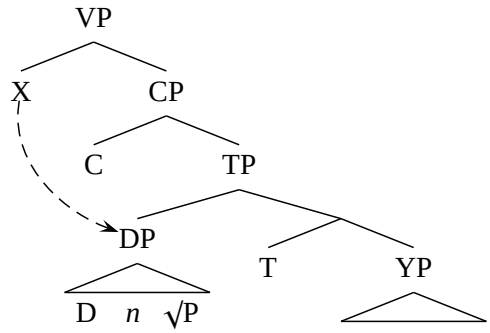
5 How local is allomorphy?

If the $\mathbb{C}_1$-LIN theory is too restrictive to account for cross-linguistic patterns of reduplication, what would a descriptively adequate model of allomorphic locality look like? The name $\mathbb{C}_1$-LIN bears the subscript '1' because it allows for allomorphic dependencies across a single cyclic node. Category-changing and aspectual reduplication seem to demand an expansion of this system to allow for allomorphic dependencies that cross *two* cyclic nodes.

But what would be the further costs of such a drastic revision of the $\mathbb{C}_1$-LIN theory? At the theoretical level, a modified '$\mathbb{C}_2$-LIN' theory would require a generative engine that could count the number of cyclic heads in a given syntactic structure, rather than simply testing for the presence or absence of a cyclic head as in $\mathbb{C}_1$-LIN. There is of course much precedent for assuming that generative grammars are incapable of this sort of counting (see e.g. Kayne 1984).

$\mathbb{C}_2$-LIN is also objectionable on empirical grounds. First, it would permit cross-clausal allomorphic dependencies, as in (32).

(32) $\mathbb{C}_2$-LIN and cross-clausal allomorphy



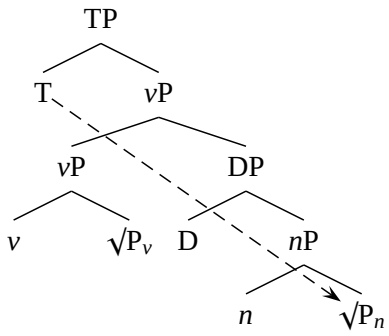
There are at least two cyclic heads in the structure in (32): C, *n*, and possibly D (e.g. McCloskey 2000; Svenonius 2004). Assuming for the moment that D is not a cyclic head, the expanded $\mathbb{C}_2$-LIN theory makes the bizarre prediction that the nominal root contained within the subject DP could show allomorphy determined by the non-cyclic node X, even though X and the nominal root are in distinct clauses. For example, take X to be a clausal embedding verb V: under $\mathbb{C}_2$-LIN, the morphological shape of an embedded subject noun could potentially vary with properties of the verb that embeds its containing clause (provided that C, D, and *n* are null). The reverse dependency is also conceivable, with the form of the embedding verb covarying with properties of the subject of the clause that it embeds. If D is a cyclic head, the same objections apply, but with V interacting with the determiner of the subject DP instead.

Similarly, $\mathbb{C}_2$-LIN predicts that the morphological representation of tense could vary with the properties of a direct object nominal root, or vice-versa.[23]

[22] See Gribanova (2010) for such an example within the verbal system of Russian, and Tucker (this volume) for an example in Arabic.

[23] The representation in (33) assumes that direct object complements are sister to *v*P, rather than immediate complements of the acategorial root $\sqrt{P}_v$. See Arad (2005) for discussion; and *cf.* Embick (2010:53).

(33) $\mathbb{C}_2$-LIN and tense-object dependencies



Again, it is immaterial whether D is a cyclic head: assuming D is phasal, $\mathbb{C}_2$-LIN still predicts that the realization of tense could depend on e.g. the definiteness of a direct object.

Without belaboring the point, it seems that an expanded $\mathbb{C}_2$-LIN theory would massively overgenerate the typology of possible allomorphic interactions, and in effect would fail to distinguish itself from a morphological theory with no locality conditions at all.

5.1 Toward a non-cyclic notion of allomorphic locality

Though this paper is far from an adequate survey of reduplication phenomena, it presents strong evidence that reduplication — and by extension, contextual allomorphy — is insensitive to the opacity-inducing morpho-syntactic boundaries posited in the $\mathbb{C}_1$-LIN system of Embick (2010). In all of the reduplication patterns discussed above RED copies phonologically adjacent material, regardless of the number of cyclic syntactic heads intervening between RED and its base. Theories of allomorphy relying on the presence of abstract, often phonologically null opacity-inducing heads are thus consigned to either undergenerate patterns of reduplication, or wildly overgenerate patterns of allomorphy in other domains.

The overriding lesson from reduplication seems to be that phonological adjacency (or near-adjacency; see Shaw 2005 for discussion) is the crucial conditioning factor for allomorphic dependencies. This idea is hardly novel, and within derivational frameworks has even been proposed as a general principle, the 'Generalized Determinant Focus Adjacency Condition' of Inkelas (1990) and Paster (2006) (see also Poser 1989:134 and Hayes 1990:106; and Inkelas and Zoll 2007:4.3 for an approach to morpho-phonological locality in an OT framework). Note, too, that the $\mathbb{C}_1$-LIN theory already recognizes that phonological adjacency is a necessary condition for some types of allomorphy. The question then becomes whether adjacency is the *only* relevant condition on contextual allomorphy. More to the point, if it turns out that the sole condition on allomorphy is phonological in nature, doesn't that suggest that allomorphy properly belongs to the phonological component of the grammar, and not to morpho-syntax? (See Wolf 2008 for similar suggestions.)

It should be stressed that the importance of phonological adjacency is not an argument in favor of realizing RED via VI, rather than by readjustment rule (see section 2).[24] Regardless of the mechanism used to 'fill in' a reduplicative affix in DM, as long as reduplication is triggered by the merger of a morpheme into syntactic structure, the $\mathbb{C}_1$-LIN theory predicts that reduplication cannot target a base embedded beneath two cyclic nodes. As the preceding discussion makes clear, this prediction is falsified by category-changing

[24]Forms like (18) also argue against realizing the segmental content of RED by VI. The infixal reduplicant in West Tarangan copies segmental material from the foot that it appears adjacent to; in other words, copying follows infixation. It is commonly held in DM that Vocabulary Insertion occurs prior to infixation/inversion (Embick and Noyer 2001). Consequently, the realization of RED cannot be determined by VI, at least not without incurring an ordering paradox.

and aspectual reduplication. Consequently, as a theory of allomorphic locality, $\mathbb{C}_1$-LIN does not correctly characterize the range of possible patterns of reduplication.

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Morphological Processes Morphological processes alter stems to derive new words. They may change the wordâ€™s meaning (derivational) or grammatical function (inflectional). There are various types of processes, not all of which are present in all languages.Â Suppletion Suppletion is a different type of morphological process. While in affixation and reduplication it is often easy to see how one form is related to another, suppletion involves a relationship between two forms that do not share phonological shape. Generally, it is a relationship in which one form cannot be derived phonologically from the other. A few examples are found in Indo-European languages. As reduplicative patterns in other languages demon-strate, the power to produce morphological identity is independently necessary.Â 1. Morphological Identity under Reduplication 1.1. Adhola In verbal reduplication in Adhola, a Nilotic language spoken in Uganda, some morphemes copy obligatorily to the exclusion of other morphemes (cf. Kinande (Mutaka and Hyman 1990)). We investigate reduplication in Ewe, experimentally inducing phonological errors to see whether reduplicated forms show accommodation. This was the case. Implications for reduplication in Ewe and for models of language production are discussed. Export citation Request permission. Footnotes. Hide All All. * This work was supported in part by NIH Training Grant NS-7134-06 to Indiana University.