Remarks
and
Replies

Remarks on Backcopying

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This article presents a rule-based serial model of reduplication that is empirically and conceptually capable of handling backcopying effects in reduplication, contrary to McCarthy and Prince's (1995) claim that serial models of phonology are incapable of adequately accounting for this phenomenon. The model of reduplication presented here claims that reduplication is the result of loops in underlying temporal precedence structures of segments in formatives and reduces over- and underapplication effects in reduplication to cases of opacity.

Keywords: backcopying, opacity, Optimality Theory, overapplication, reduplication

McCarthy and Prince (1995) argue that rule-based serial models of reduplication are inferior to correspondence theory–based models and are empirically inadequate. Specifically, they state,

> . . . [c]orrespondence [t]heory is superior, empirically and conceptually, to serial derivational approaches [to reduplication]. All such theories are incapable of dealing with cases in which B[ase] copies (or, more neutrally, *reflects*) R[eduplicant]. (p. 366)

Reduplicant-influences-base cases of reduplication, also referred to as *backcopying,* are the core of their argument against serial models of reduplication. A similar type of argument has existed since Wilbur (1973) first pointed out *overapplication* and *underapplication* effects in reduplication. This argument is valid against previous models of reduplication (Marantz 1982, Carrier 1979) if the overt realization of reduplication is computed solely within the phonological component. The purpose of this article is to present a serial model that does not suffer from this deficiency—that of Raimy 1999. There I develop a novel approach to representing precedence in phonological representations that allows backcopying effects to be empirically and conceptually captured within a serial model of reduplication. I will demonstrate the new model by examining backcopying effects in Malay and Akan.

I would like to thank the following people for contributing to and helping shape the ideas presented in this article: Bill Idsardi, John Frampton, Morris Halle, Rolf Noyer, Charles Reiss, and an anonymous *LI* reviewer. All mistakes are my own.

Linguistic Inquiry, Volume 31, Number 3, Summer 2000
541–552

1 Backcopying Effects: Nasal Spread in Malay

Perhaps the clearest case of backcopying presented by McCarthy and Prince (1995) is Malay nasal spread (Onn 1976, Kenstowicz 1981,[1] Seong 1994). Malay spreads nasalization rightward from nasal segments to vowels (Onn 1976, Seong 1994). This process is iterative, and /ʔ, h, w, y/ are transparent to it. In contrast, oral consonants block the rightward spread of [nasal]. Consider the data in (1).

(1) *Rightward nasal spread in Malay* (Seong 1994:36–40)

a. Transparent /ʔ, h, w, y/ (glides)

/minum/	[mĩnõm]	‘to drink’
/maʔin/	[mãʔĩn]	‘to play’
/mewah/	[mẽwãh]	‘prosperous’
/mayaŋ/	[mãyãŋ]	‘spadix, stalk (palm)’
/mahasiswa/	[mãhãsiswa]	‘undergraduate’

b. Opaque oral consonants

/makan/	[mãkan]	‘to eat’
/mandi/	[mãndi]	‘to bathe’
/mati/	[mãti]	‘to die’
/mampu/	[mãmpu]	‘affordable’

Although nasal spread definitely operates rightward in nonreduplicative forms (e.g., *tahan/mə̃nãhãn* ‘withstand’; Seong 1994), it overapplies in reduplication, producing the forms in (2).

(2) *Nasal spread in reduplicated forms* (Onn 1976, Kenstowicz 1981, McCarthy and Prince 1995)

/hamə/	[hã̲mə̃-hãmə̃]	‘germ/germs’
/waŋi/	[wã̲ŋĩ-wãŋĩ]	‘fragrant/(intensified)’
/aŋan/	[ã̲ŋãn-ãŋãn]	‘reverie/ambition’
/aŋen/	[ã̲ŋẽn-ãŋẽn]	‘wind/unconfirmed news’

The crucial aspect of the interaction between nasal spread and reduplication in Malay is that some reduplicated vowels become nasalized in environments where they are not preceded by a nasal segment phonetically. These vowels are indicated with underlining in (2). A nasal segment precedes all other nasalized vowels. McCarthy and Prince (1995) analyze the reduplicant as a suffix and claim that this is a case of backcopying.

Backcopying interactions are problematic for serial theories of reduplication for the following reason. Serial theories use rule ordering as their basic tenet to account for the interaction of

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[1] This paper was the first to mention the backcopying of the nasal spread process in Malay. Since the data in this paper were first reported, they have not been reconfirmed or replicated. For the purposes of this article I will assume, as McCarthy and Prince (1995) do, that Kenstowicz’s data on Malay are correct. Although Malay may not present a real case of backcopying, then, it does clearly represent the nature of the problem. Kenstowicz and Banksira (1999) present another case of backcopying that is better documented.

phonological processes. Under this view, the copying process of reduplication[2] and the process of nasal spread are ordered with respect to each other. For any two processes, two orderings are possible.

(3) *Ordering of nasal spread and reduplication in Malay*

Underlying form	/RED + aŋen/	Underlying form	/RED + aŋen/
Copy	aŋen-aŋen	*Nasal spread*	aŋẽn
Nasal spread	aŋẽn-ãŋẽn	*Copy*	aŋẽn-aŋẽn
Outcome	*aŋẽn-ãŋẽn	Outcome	*aŋẽn-aŋẽn

As (3) indicates, neither ordering produces a word-initial nasalized vowel. This is because at no time in the derivation is the word-initial vowel preceded by a nasal segment.

McCarthy and Prince (1995:291–294) point out that serial theories of reduplication may be able to account for this effect depending on whether reduplication is prefixing or suffixing in Malay. They conclude that serial models of reduplication are inferior to a correspondence theory–based model of reduplication for both conceptual and empirical reasons. The empirical argument is that if reduplication is suffixing in Malay, a serial model of reduplication is unable to produce the correct output forms. The conceptual argument is that where serial models of reduplication can be modified to account for backcopying effects, the modification incorporates correspondence theory into the serial model. (For details of these arguments, see McCarthy and Prince 1995.)

2 Backcopying in a Serial Model of Reduplication

In this section I will present a serial model of reduplication that accounts for backcopying effects. Since this model relies crucially on how precedence is encoded in phonological representations, I will begin by discussing this topic.

2.1 Temporal Precedence in Phonology

Phonological representations must contain some way of encoding the temporal order and sequencing of articulatory gestures. For example, [tæk] must be distinguished from [kæt]. However, the details of this aspect of phonological representations are typically suppressed, the use of left-to-right typographical layout standing for the actual model of temporal precedence (contrast this with the more explicit representations in Chomsky 1975 and Sproat 1985). Consider the representations in (4).

(4) a. #kæt# ‘cat’
b. #tæk# ‘tack’

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[2] For expository purposes I am disregarding the differences between a copy-and-associate model of reduplication such as Marantz’s (1982) and a parafix model of reduplication such as Mester’s (1986) and Clements’s (1985). Copy is equivalent to the linearization process in these models for the purposes of this article.

In (4a) we know that /#/ precedes /k/, /k/ precedes /æ/, /æ/ precedes /t/, and /t/ precedes /#/. In (4b) we know that /#/ precedes /t/, /t/ precedes /æ/, /æ/ precedes /k/, and /k/ precedes /#/. However, the difference between (4a) and (4b) is poorly conveyed in that it is represented only implicitly in the typographical layout. Although such assumptions are rarely discussed overtly, most theories seem to accept that precedence in phonological representations is asymmetrical, transitive, and irreflexive. Precedence is asymmetrical because in (4a) if “/k/ precedes /æ/” is true, then “/æ/ precedes /k/” is necessarily false (/kæ/ ≠ /æk/) if there are only unique instances of these segments. Precedence is transitive because “/k/ precedes /t/” is true if “/k/ precedes /æ/” and “/æ/ precedes /t/” are also true. Finally, precedence is irreflexive because there is no way of encoding the idea that a segment precedes itself. All of these characteristics derive from the lack of explicit precedence relationships; hence, there has been a lack of interest in this aspect of phonological representations.

Now consider the representations in (5), proposed in Raimy 1999, where precedence is encoded explicitly.

(5) a. # → k → æ → t → % ‘cat’
b. % ← t ← æ ← k ← # ‘cat’
c. % ← k ← æ ← t ← # ‘tack’

The symbol → is used to represent the relationship *precedes.* (5a) and (5b) are equivalent since both representations have the following precedence relationships: /#/ precedes /k/, /k/ precedes /æ/, /æ/ precedes /t/, and /t/ precedes /%/. The symbols # and % mark the beginning and end of a string of segments. These symbols are not word boundary symbols in the *SPE* (Chomsky and Halle 1968) sense. Instead, they can be understood as symbols that represent the null set; they are required owing to formal considerations on the representation of precedence in phonological strings. Phonological representations require a symbol for *nothing* just as set theory requires a symbol (∅) for *nothing.* Consequently, the string “/#/ → /k/” should be understood as ‘*nothing* precedes /k/’ and not as ‘*word boundary* precedes /k/’. (Further discussion of this topic and arguments bearing on why both # and % are necessary can be found in Raimy 1999.)

Continuing with the discussion of precedence in phonological representations, (5c) is different from both (5a) and (5b) because the overall ordering of (5c) is that /#/ precedes /t/, /t/ precedes /æ/, /æ/ precedes /k/, and /k/ precedes /%/. The addition of a precedence operator divorces ordering relationships in phonological representations from left-to-right graphic representation.

This change in representation also alters the possible characteristics of precedence in phonology. Precedence relationships can now be represented even if they are nonasymmetrical[3] or nonirreflexive; I will demonstrate the benefits of these traits in the following section. In short, my claim is that temporal relations in phonological representations are modeled by directed graphs.

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[3] *Nonasymmetrical* is not equivalent to *symmetrical. Nonasymmetrical* indicates that the relationships in a form are neither strictly asymmetrical nor symmetrical. This is the correct characterization of the representations that I will discuss.

2.2 *Reduplicative Morphology*

The introduction of the → symbol into phonological representation allows the addition of a novel precedence relationship, to be treated as a morphological process. Specifically, in Raimy 1999 I argue that overt reduplication results from the addition of a bare precedence relationship to an underlying form via a readjustment rule (Halle and Marantz 1993) in the morphological component. This change in phonological representation produces a ‘‘loop’’ in the precedence structure for the form. Consider the derivation in (6).

(6) *Reduplication in Malay*

MORPHOLOGY

a. ‘wind’
(input)
$\# \rightarrow a \rightarrow \text{ŋ} \rightarrow e \rightarrow n \rightarrow \%$

b. ‘unconfirmed news’
(reduplication)

$$\begin{tikzcd} \# \arrow[r] & a \arrow[r] & \text{ŋ} \arrow[r] & e \arrow[r] & n \arrow[r] \arrow[lll, bend left] & \% \end{tikzcd}$$

PHONOLOGY

c. (nasalization)

$$\begin{tikzcd} \# \arrow[r] & \tilde{a} \arrow[r] & \text{ŋ} \arrow[r] & \tilde{e} \arrow[r] & n \arrow[r] \arrow[lll, bend left] & \% \end{tikzcd}$$

PHONETICS

d. (linearization)
$\#\tilde{a}_1\text{ŋ}_1\tilde{e}_1n_1\text{-}\tilde{a}_2\text{ŋ}_2\tilde{e}_2n_2\%$

PRECEDENCE RELATIONSHIPS

e.

Morphophonology	*Phonetics*
/ # / precedes / a /	/ # / precedes / a_1 /
/ a / precedes / ŋ /	/ a_1 / precedes / ŋ_1 /
	/ a_2 / precedes / ŋ_2 /
/ ŋ / precedes / e /	/ ŋ_1 / precedes / e_1 /
	/ ŋ_2 / precedes / e_2 /
/ e / precedes / n /	/ e_1 / precedes / n_1 /
	/ e_2 / precedes / n_2 /
/ n / precedes / a /	/ n_1 / precedes / a_2 /
/ n / precedes / % /	/ n_2 / precedes / % /

In the above derivation, morphology creates the representation in (6b) by adding one precedence relationship to the initial representation for *aŋẽn,* (6a). (6b) represents a form with repetition of a subsequence of segments that will result in overt reduplication. All of the needed precedence information that is contained in the reduplicated output form *ãŋẽn-ãŋẽn* (6d) is implied by (6b). This relationship is indicated in (6e), which presents a list of precedence relations in both (6c) and (6d). The only difference between the precedence information represented in the phonological form, (6c), and that represented in the surface form, (6d), is whether an individual segment is allowed to have multiple precedence relationships or not. The representation in (6c) indicates that both the /a/ and the /n/ have multiple precedence relationships because multiple segments either precede (/a/) or follow (/n/).

The representational difference between (6c) and (6d) is derived from a linearization process (similar in spirit to tier conflation, as in McCarthy 1979) that also acts as a copy process (similar to the one proposed in Mester 1986). This process converts phonological forms that contain loops into ones that are wholly asymmetrical with the same precedence information through the repetition of phonological material. The overt result of this process is what we recognize as reduplication in the surface form.

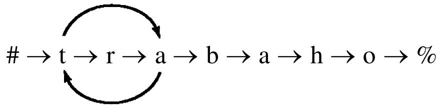
This linearization process has the interesting attribute that lexical precedence links and morphologically added precedence links are treated differently. Consider the reduplication pattern from Tagalog in (7).

(7) *Recent perfective reduplication in Tagalog* (McCarthy and Prince 1986:13)

ta-trabaho	'just finished working'
ga-galit	'just got mad'
bo-bloaut	'just gave a special treat'

McCarthy and Prince (1986) present this pattern as ''core syllable'' reduplication (another instance of this pattern can be found in Sanskrit; see Steriade 1988) that reduplicates the first consonant of an onset and the first vowel of the nucleus. This pattern requires the phonological representation in (8) to produce the correct postlinearization form.

(8) *ta-trabaho*



The representation in (8) is ambiguous once the /#/ → /t/ link is traversed. Should the morphologically added top link be followed first (producing *ta-trabaho*), or should the lexical link be followed first (producing *tra-tabaho*)? This is an empirical question. For Tagalog, following the morphological link first is the correct answer, and it appears that giving precedence to morphological information over lexical information is a characteristic of the linearization process for all languages (Raimy 1999). This novel notation for phonological precedence has led us to this surprising fact about language. (See Raimy 1999 for further discussion of the details of linearization.)

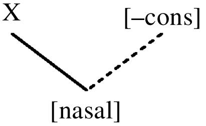
With these types of representations in hand, I return to the Malay example in section 1 and provide a serial account of the backcopying phenomenon.

2.3 Overapplication in Malay

The fact that multiple precedence relationships are encoded in representations like the ones in (6) allows a purely serial model of reduplication to account for backcopying effects. This advance is possible because morphology alters the phonological representation of the reduplicated forms in a way that adds the information that is necessary to trigger the nasal spread process.

Following Seong (1994), the nasal spread rule in Malay is (9).

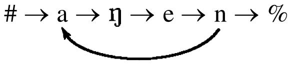
(9) *Nasal spread in Malay*



This rule spreads [nasal] iteratively and targets glides and vowels.[4] (See Seong 1994 for the details of this rule.)

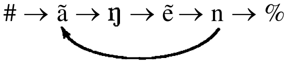
The basic problem for serial models identified in (3) is that the triggering environment for the nasal spread rule is not met until after overt reduplication has occurred. This is no longer the case if we consider the prelinearization representation of *ãŋẽn-ãŋẽn,* (6b), repeated as (10).

(10) *Prelinearization reduplicative forms in Malay*



The crucial aspect of this representation is that the "word-initial" vowel, /a/, *is* preceded by a nasal segment at this point in the derivation. The substring /n → a/ in (10) satisfies the structural requirement of (9). Thus, if the nasal spread rule applies *before* linearization occurs, the word-initial vowel is preceded by a nasal and nasal spreading occurs, resulting in (11).

(11) *Reduplicated form in Malay after application of nasal spread rule*



Both vowels in (11) are directly preceded by a nasal segment, and they thus become nasalized via the nasal spread process. /a/ shares the nasal feature originating from /n/, and /e/ shares the nasal feature originating from /ŋ/. Later the linearization process makes the application of the nasal spread rule opaque (Kiparsky 1971) because in order to represent the /# → ã/ of the prelinearized

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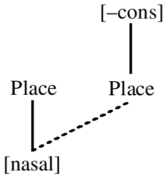
[4] As written, this rule will produce /w̃, ỹ, h̃, ʔ̃/. An alternative formulation would be (i),

(i)

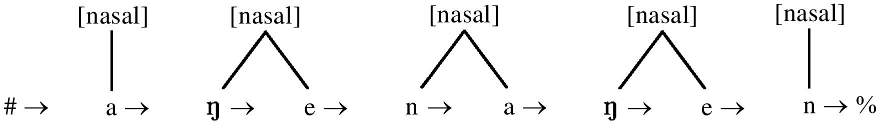


which would not produce /h̃/ and /ʔ̃/. Which formulation of the nasal spread rule should be adopted largely depends on the exact model of feature geometry and whether /h̃/ and /ʔ̃/ should be excluded universally. I leave this issue aside since it is orthogonal to the main points of this article.

phonological representation in the phonetic component, /ã/ must occur in word-initial position. This interaction produces *overapplication* effects as first noticed by Wilbur (1973).

Linearization converts the representation in (11) into the representation in (12), which contains only asymmetrical ordering relationships. The issue of whether all of the [nasal] features are collapsed into a single feature as a result of the Obligatory Contour Principle (OCP) is left for future research.

(12) *Linearized* ãŋẽn-ãŋẽn



An important question I have not yet addressed is what qualifies as the trigger of the nasal spread rule. This is an important issue because the word-initial /a/ has multiple precedence links and occurs in both an environment that triggers nasal spread (/n → a/) and one that does not trigger nasal spread (/# → a/) (consider (10)). Which environment should the nasal spread rule attend to? The striking thing is that languages differ in how they treat such examples. In Malay the /a/ is nasalized—a case of what is known in the literature as *overapplication.*

There are also cases of *underapplication,* where a rule fails to apply to a phoneme with multiple precedence links if even one of its environments does not satisfy the conditions of the rule. Underapplication is illustrated by the Akan example discussed in the following section.[5]

2.4 Underapplication and Normal Application in Akan

McCarthy and Prince (1995) present palatalization in Akan as an example where a phonological process varies between underapplication and what appears to be normal application. The relevant data are presented in (13).

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[5] In Raimy 1999 I propose a uniformity parameter, present on all phonological rules, that specifies whether a rule overapplies or underapplies when a target for that rule appears in conflicting environments. An anonymous reviewer asks whether the uniformity parameter is reduplication-specific machinery because it appears to have an effect only in rules that apply to reduplicative structures before linearization occurs. It appears that linearization makes the uniformity parameter superfluous with respect to reduplicative structures because it eliminates reduplicative loops, with the result that segments appear only in uniform environments. This is not the case, though. Both infixation and geminates provide other examples where the environment a segment appears in may not be uniform. Sundanese nasal spread (Anderson 1980), analyzed in Raimy 1999:sec. 4.3, provides an example of overapplication with infixation. Whether a rule is subject to geminate blockage effects (Schein and Steriade 1986) can also be derived from the rule's setting for the uniformity parameter. Rules that require uniformity in environments for application are subject to geminate blockage; this is analogous to underapplication. Rules that do not show geminate blockage effects do not require uniformity in environments; this can be considered a type of overapplication. The nonuniform environments that exist in some geminate structures are not eliminated by linearization, as evidenced by rules that show geminate blockage effects that persist into the postlexical phonology. This situation indicates the necessity of the uniformity parameter even after linearization occurs. The uniformity parameter unifies the previously unconnected phenomena of the unusual behavior of rules when interacting with reduplication and geminates and is thus not reduplication-specific at all.

(13) *Palatalization in Akan* (McCarthy and Prince 1995, Schachter and Fromkin 1968)

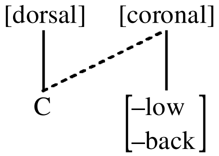
a.	tɕɛ	*kɛ	'divide'	
	dʝe	*ge	'receive'	
	ɥi	*wi	'nibble'	
	çɪ	*hɪ	'border'	
	ɲɥĩn	*ŋwĩn	'weave'	
b.	kɪ-kaʔ	*tɕɪ-kaʔ	*tɕɪ-tɕaʔ	'bite'
	hɪ-hawʔ	*çɪ-hawʔ	*çɪ-çawʔ	'trouble'

(13a) shows the effects of a palatalization process that changes dorsal segments (/k, g, w, ŋʷ/) and /h/ to palatodorsal segments when they precede a nonlow front vowel. The data in (13b) present an exception to the palatalization process in reduplicated forms: namely, the /k/ and /h/ segments in (13b) do not undergo the palatalization process, even though the word-initial segment is followed by a nonlow front vowel. McCarthy and Prince (1995) claim that this anomaly is due to the reduplication in the form. Specifically, high-ranking base-reduplicant faithfulness requires the consonant that is in both the base and the reduplicant to be identical in feature composition. This analysis also requires an unusual interpretation of the OCP to make palatalization underapply and not overapply. (See McCarthy and Prince 1995:340–345 for the details of their analysis.)

An important aspect of reduplication in Akan is that the vowel is prespecified to be [high] and receives [back] and [round] features from the following vowel as the result of a general harmony process in the language (Schachter and Fromkin 1968). However, for the sake of exposition, I will show the vowel in the reduplicant as /ɪ/. The crucial aspect of this vowel in the reduplicant is why it does not trigger palatalization in the forms in (13b).

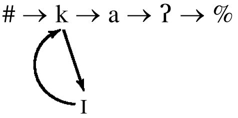
We can understand the behavior of palatalization in Akan as a case where a language requires all the environments a target segment appears in to trigger a rule for that rule to apply. Consider the palatalization rule in (14), which is based on suggestions by McCarthy and Prince (1995) that the palatodorsal segments result from the spreading of a [coronal] feature present in front nonlow vowels.

(14) *Palatalization in Akan*



Now let us reconsider the representation that the morphology provides to the phonology for the reduplicated forms in (13b)—namely, (15). The focus of interest in this representation is the environment(s) that /k/ occurs in. /k/ occurs in two distinct environments in (15): /k → a/ and /k → ɪ/. Only one environment satisfies the structural requirements of the palatalization rule. Consequently, the rule does not apply. As in the Malay example, this form is later linearized and the appearance of underapplication of the palatalization rule results as an opacity effect.

(15) *Akan forms prior to linearization*



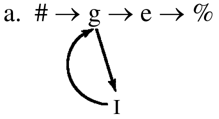
Surprisingly, there are additional facts from the interaction of palatalization and reduplication in Akan that support the view that whether a rule overapplies or underapplies depends on whether the language requires uniformity in triggering environments that a target segment appears in. Consider the forms in (16).

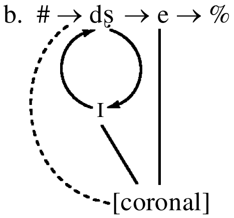
(16) *Normal application of palatalization in Akan*

dʑɪ-dʑe	*gɪ-ge	‘receive’
tɕɥi-tɕɥeʔ	*kwi-kwe	‘cut’

The reduplicated forms in (16) show the effects of palatalization. What must be noted about these forms, though, is that the dorsal segments that undergo palatalization occur in environments that uniformly trigger the palatalization rule. Consider the prelinearization representation of these forms.

(17) *Normal application of palatalization in Akan*





(17a) shows a form where a dorsal segment occurs in the multiple environments of /g → e/ and /g → ɪ/. Both of these environments satisfy the triggering environments of the palatalization rule; therefore, this rule applies and (17b) is produced. (17b) is later linearized and appears as a form that has undergone normal application of the palatalization rule. This is a dramatic result that provides strong evidence for the view that phonological rules are sensitive to whether a target segment occurs in uniform or nonuniform environments.

It is interesting to note that what appears to be an alternation between normal application and underapplication of the palatalization rule in Akan is not really this type of alternation. The alternation is based only on whether the palatalization rule applies or not, and this is directly linked to whether or not all environments a segment appears in satisfy the rule. This phonological pattern is not exceptional, contrary to the claims made by Wilbur (1973) about the overapplication and underapplication of phonological rules in reduplicated forms.

The approach to reduplication taken here provides a greater understanding of overapplication and underapplication effects because these effects are accounted for by the general mechanisms of rule ordering and application of rules. The nonnormal surface appearances are simply further instances of opacity. In this type of analysis backcopying is not an exceptional process; all other analyses of backcopying effects in reduplication posit an extra reduplication-specific mechanism (McCarthy and Prince 1995, base-reduplicant correspondence; Wilbur 1973, the Identity Constraint; Carrier 1979 and Marantz 1982, allomorphy-based solutions) that claims that reduplication is so special with respect to phonology that it requires special treatment and technology.

3 Conclusion

The introduction of explicit precedence relations into phonological representations allows a rule-based serial model of reduplication to account for backcopying effects, contrary to the claims of McCarthy and Prince (1995). The main implication of this point is that arguments based on backcopying effects originally put forth by McCarthy and Prince against serial models of phonology in general are actually arguments against the specific serial models of reduplication (Carrier 1979, Marantz 1982, Clements 1985, Mester 1986, Steriade 1988) existing at the time. In Raimy 1999 I propose a new serial model of reduplication that can insightfully account for backcopying effects in reduplication, indicating that data from reduplication do not directly bear on the issue of computation in phonology.

Furthermore, it should be apparent that within the model of reduplication developed in Raimy 1999 the descriptive terms *overapplication* and *underapplication* and the resulting typology are theoretically misleading. A rule applies when all of its environmental requirements are met. It does not apply when some of these requirements are not met. In the particular cases of backcopying discussed here,[6] overapplication and underapplication effects are derived by whether a rule requires uniformity in its triggering environments or not. Thus, backcopying effects are further instances of phonological opacity (Kiparsky 1971) whereby a linearization process obscures the environments that trigger or block the application of the rule. Models of phonology based on the serial application of rules were specifically created to account for opacity effects (Chomsky 1951, 1975:25–26), and the approach I have proposed provides a unified account of these phenomena by reducing overapplication and underapplication effects to cases of opacity.

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[6] Another case of backcopying in the current literature is found in Kenstowicz and Banksira 1999. Kenstowicz and Banksira present a process of /x/ dissimilation in Chaha as a case of backcopying. In Raimy 1999 I account for this case by limiting the rule of /x/ dissimilation in Chaha to applying only in nonderived environments. Once this limit is imposed, /x/ dissimilation applies in Chaha without exception and without recourse to the extra mechanism of output-output correspondence (Benua 1995) as proposed by Kenstowicz and Banksira. (See Raimy 1999 for the details of this analysis.)

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