The (non)interaction of lenition and reduplication

Sharon Rose
University of California, San Diego

1. Introduction
It has long been observed that phonological segmental processes interact with reduplication in one of three ways: they may underapply, overapply or apply normally. These terms are originally due to Wilbur (1973) and characterize the following situations:

(1) **Underapplication**: phonological process fails to apply in context: base-reduplicant identity preserved
**Overapplication**: phonological process applies both in and out of context: base-reduplicant identity achieved
**Normal application**: phonological process applies only in context; base-reduplicant identity sacrificed

The Correspondence model of base-reduplicant identity (McCarthy & Prince 1995, to appear) makes the prediction that any kind of segmental phonological process may result in any of these situations through ranking of phonological constraints with faithfulness constraints on the input and output and the base-reduplicant relationship. Normal application arises when base-reduplicant faithfulness constraints are ranked lower than input-output faithfulness constraints and markedness/well-formedness constraints (2a). Underapplication and overapplication arise when constraints on base-reduplicant faithfulness are ranked above such constraints, as shown in (2b,c) from Kager (to appear) based on McCarthy & Prince (to appear):

(2) a. **Normal application**
   Well-formedness » IO-Faithfulness » BR-Identity
b. **Overapplication**
   BR-Identity, Well-formedness » IO-Faithfulness
c. **Underapplication**
   BR Identity, Blocker Constraint » Trigger Constraint » I-O Faithfulness

The 'trigger' constraint refers to a constraint which triggers a particular change and the ‘blocker’ constraint is the antagonist of the trigger constraint. These can be ranked in the opposite order to achieve overapplication. The free ranking possibilities, and in particular, the high-ranking of BR-Identity, predict that any phonological process may be subject to any of the three situations, depending on the ranking of constraints. One might be tempted to conclude that there are no generalizations as to what kind of processes are subject to under/over/normal application, and that this is a benefit of the standard Correspondence model. In
this paper, I show that there is, nevertheless, a skewed distribution based on the type of process. Overapplication cases are typically assimilatory: palatalization, coalescence, nasal harmony. In contrast, lenition (i.e. spirantization, flapping, debuccalization, deglottalization) displays a strong tendency to result in normal application cross-linguistically and does not result in overapplication. The crucial distinction between these two kinds of processes is that assimilation preserves and extends input features whereas lenition reduces features. This distinction establishes an affinity between assimilation and reduplication, in that both processes result in repetition or extension of input information.

I will argue that reduplication is a response to a constraint to copy the features and segments of the input, REPEAT-IO. The combination of this constraint with a spreading imperative results in overapplication or maximization of spreading if assimilation is involved. Conversely, since lenition results in poor copy of input features, lenition will be done minimally, resulting in normal application, or depending on the ranking of the lenition-inducing constraint, in underapplication. The paper is organized as follows. In section 2, I provide cross-linguistic examples of lenition showing normal application. In section 3, I show how cases of overapplication invariably involve assimilation or fusion. In section 4, I discuss approaches to normal application which capture the lexical/post-lexical distinction but fail to adequately express the lenition/assimilation distinction. In section 5, I show how the proposed constraint handles the relevant cases for normal and overcopy. In section 6, I address the issue of underapplication.

2. Lenition and normal application
Lenition has been used as a cover term for many different phonological alternations, wherein a sound experiences 'some reduction in constriction degree or duration' (Kirchner 1998). Typical examples of lenition include flapping, spirantization, approximantization, and debuccalization. Voicing/devoicing are often included in this class, although the contexts are not coextensive with the other types. Two recent surveys (Kirchner 1998) and Lavoie (1996) have greatly improved our understanding of lenition and the phonetic motivation behind it. Kirchner (1998) proposes that lenition is characterized by a general effort-based constraint LAZY. The response to this constraint is to decrease constriction and remove the offending feature (modeled as violation of constraints such as Preserve[feature]). While older analyses analyzed lenition as feature sharing by spreading the [+cont] or [+voice] feature of the preceding vowel (e.g. Harris 1983, Mascaro 1983), most recent approaches to lenition posit deletion rules or constraints (Harris 1990, McCarthy 1988, Lombardi 1991). Assimilation, on the other hand, is analyzed as positive constraints on featural sharing or gestural extension. In the next sections, I outline several cases of lenition interacting with reduplication. In each case, lenition applies normally.
2.1 Debuccalization - Muher /k'/ --&gt; [ʔ]
Muher is an Ethiopian Semitic language which shows debuccalization of an ejective /k'/ in post-vocalic contexts, excluding geminates. Like other Semitic languages, a verb root may be reduplicated (3b-d). Debuccalization applies regardless of both base-reduplicant identity and which consonant is identified as the reduplicant (Rose to appear):

(3)  

<table>
<thead>
<tr>
<th>Root</th>
<th>Perfective</th>
<th>Imperfective</th>
<th>Jussive</th>
<th>Imperative</th>
</tr>
</thead>
<tbody>
<tr>
<td>/k't/</td>
<td>k'effəːm</td>
<td>yiʔeffu</td>
<td>yəʔif'f</td>
<td>k'if'f</td>
</tr>
<tr>
<td>/k'm/</td>
<td>k'iməkk'əm</td>
<td>yiʔməkk'im'μ</td>
<td>yəʔəmk'im</td>
<td>k'əmk'im'μ 'sip alcohol'</td>
</tr>
<tr>
<td>/lk'/</td>
<td>ləkk'əm</td>
<td>yiləkk'u</td>
<td>yəlk'i?</td>
<td>liʔiʔ?</td>
</tr>
<tr>
<td>/nk'l/</td>
<td>niʔakk'ələm</td>
<td>yink'akk'ilu</td>
<td>yənk'aʔil</td>
<td>niʔaʔil     'uproot again'</td>
</tr>
</tbody>
</table>

2.2 Spirantization

2.2.1 Tigrinya /k, k'/ --&gt; [x, x']
In Tigrinya, another Ethiopian Semitic language, spirantization of /k/ and /k'/ (and [k w] and [k' w]) occurs in post-vocalic position (4a-b). The spirantized /k/ has a range of pronunciations ([χ] [ʔ] or [ʔ]). Reduplicated forms do not show base-reduplicant identity (4d). These data are from the Eritrean dialect:

(4)  

<table>
<thead>
<tr>
<th>Root</th>
<th>Perfect</th>
<th>Imperfect</th>
<th>Jussive</th>
</tr>
</thead>
<tbody>
<tr>
<td>/kft/</td>
<td>kəfəte</td>
<td>yi-xəffit</td>
<td>yi-xət</td>
</tr>
<tr>
<td>/mktr/</td>
<td>məxəre</td>
<td>yi-məkkir</td>
<td>yi-məkər</td>
</tr>
<tr>
<td>/msktr/</td>
<td>məskəre</td>
<td>yi-miskir</td>
<td>yi-məskir</td>
</tr>
<tr>
<td></td>
<td>məsaxəre</td>
<td>yi-məsaxir</td>
<td>yi-məsaxir</td>
</tr>
<tr>
<td>/k't'/</td>
<td>x'ət'k'ət'e</td>
<td>yi-x'ət'k'it'</td>
<td>yi-x'ət'k'it</td>
</tr>
</tbody>
</table>

Similar stop/spirant alternations in the same post-vocalic context are found in Tiberian Hebrew (McCarthy 1986) and with voiced labials in Tigrinya (Lowenstamm & Prunet 1986) and in other Semitic languages such as Muher and Chaha. In all cases, spirantization occurs regardless of base-reduplicant identity.

2.2.2 Nisgha /k k' k'/ --&gt; [x x x']
In Nisgha, a Tsimshian language of British Columbia, dorsal stops are spirantized in coda position before another consonant. Shaw (1987) describes the rule as a general 'cyclic' process of Nisgha. Reduplicative identity is not respected:

(5)  

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. t'ák</td>
<td>t'iχ-t'ák</td>
<td>'to forget stg.'</td>
<td></td>
</tr>
<tr>
<td>b. lúk'w</td>
<td>lux'w-kúk'w</td>
<td>'to move stg.'</td>
<td></td>
</tr>
<tr>
<td>c. tsó:q</td>
<td>tsó:x-tsó:q</td>
<td>'to be embarrassed, ashamed'</td>
<td></td>
</tr>
</tbody>
</table>
Deaffrication of [tʰ] to [s] and deglottalization are also found in the reduplicative prefix. Shaw (1987) states that deglottalization is only found in the reduplicant, and is not a general rule of Nisgha. This reduction would then fall into the class of 'emergence of the unmarked' phenomena (McCarthy & Prince 1994), whereby less marked structure emerges only in the reduplicant.

2.3 **Flapping - Pangasinan /d/ --> [r] flapping**

In Pangasinan, an Austronesian language of the Phillipines (Benton 1971), the voiced stop /d/ flaps to [r] in intervocalic position (6a). The same effect is found in Tagalog (Carrier 1979). Flapping applies regardless of reduplication (6b-d) and to both base (6b) and reduplicant (6d).

(6) a. dabok 'dust' marabok 'dusty'
    b. dalikan 'clay stove' daralikan 'clay stoves'
    c. dasal 'pray' mandarasal 'is praying'
    d. marakep 'nice' maragdakep 'quite nice'

2.4 **Deglottalization/deaspiration – Chumash**

Word-internal coda deglottalization or deaspiration also ignores reduplication in Madurese (Stevens 1968, 1985) and Chumash (Applegate 1976).

(7) a. pon ponpon’ 'trees'
    b. s-tip\usi stiptip\usi 'it is heavily forested'
    c. k-ic’is kickic’is’ ‘my sisters’
    d. štexex’ štextexex’ ‘rivers’

2.5 **Voicing**

Voicing alternations are often treated as lenition. A voiceless obstruent may be voiced between vowels, and voiced obstruents may be devoiced in syllable-final or word final position. Normal application seems to be the general pattern.

An example of devoicing is found in Washo (Winter 1970), in which syllable-final obstruents are devoiced. A similar example can be found in Dakota (Shaw 1976). Reduplicative identity does not prevail:

(8) a. wét-wedi, wěk-wegi 'it's quacking'
    b. šüp-šubi 'he's crying gently'
    c. bák-bagi 'he's smoking'
    d. wa?ilnáp-nabi?i 'it's wet and slippery'
    e. ?ilwítwidi?i 'it's stiff'
Another interesting case of voicing comes from Dahalo (Tosco 1991) in which the voicing specification of the input is reflected only in the reduplicant. Tosco states (p. 7) that the only consonant clusters in the language are ‘those made up of a nasal and an unvoiced following element’, ex. ?entid- ‘to show’ or hunnl’- ‘to chew’. Exceptions occur in borrowed Swahili words: ñuuⁿba (<Swahili fumba) ‘mat’. Post-nasal devoicing of this kind is found in several Bantu languages (Hyman 1999). Reduplication is one method of plural formation. The final stem consonant is copied within the affix template -áCCi. In some cases, the reduplicant has a voiced consonant while in the base, the consonant is voiceless following a nasal. The contrast between (9c) and (9d) illustrates that there is no prohibition on voiceless geminate obstruents:

(9) a. túntumu ‘fist’ túntumámmi ‘fists’  
b. "bätt‘i ‘fragment’ "bätt‘ätt‘i ‘fragment’  
c. tumpi ‘horn’ tumpáppi ‘horns’  
d. támpo ‘trap’ támpabbí ‘traps’  
e. múganka ‘dance’ múgankáaggi ‘dances’

Finally, morphological devoicing, a requirement on penultimate consonants, is also not copied in Chaha, a Semitic language which reduplicates only consonants (Rose 1997):

(10) a. /sβr/ sāpār-Ōm ‘break’ sībāpār-Ō-m ‘shatter’  
b. /jgm/ jākām-Ōm ‘punch’ jīgākāmām ‘punch again’  
c. /gm/ gīmkām-Ōm ‘chip the rim’  
d. /dr/ dirōtār-Ōm ‘step on, pile up’

This illustrates that devoicing is not always an allophonic process, but may also be lexical. Normal application still results.

3. Assimilation and Over-application

In contrast to lenition, the overapplication effects described in the reduplication literature are cases of assimilation: nasal harmony, nasal substitution, glottal coalescence and palatalization. Malay nasal harmony (Onn 1976, Kenstowicz 1981, McCarthy & Prince 1995) is one celebrated case in which the spread of the [nasal] feature extends over the entire base and reduplicant. Nasal consonants trigger rightward harmony, even across morpheme boundaries. The initial (C)V of the first conjunct is not in a nasalizing environment except by virtue of being a correspondent of the nasalized portion in the second conjunct:
(11) a. hamõ hâmõ-hâmõ ‘germ/germs’
b. waŋi wâŋi-wâŋi ‘fragrant/(intensified)’
c. anjân ānjân-ānjân ‘reverie/ambition’
d. anjën ānjën-ānjën ‘wind/unconfirmed news’

I list some other cases of overapplication affecting features below:\n
<table>
<thead>
<tr>
<th>Language</th>
<th>Feature</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madurese nasal harmony</td>
<td>/niat/ ŋāt-nēŋāt</td>
<td>(Stevens 1978)</td>
</tr>
<tr>
<td>Dakota palatalization</td>
<td>/ki-kōz-al/ kī-cōz-a</td>
<td>(Shaw 1976)</td>
</tr>
<tr>
<td>Chumash glottal coalescence</td>
<td>/k-ʔanīš/ k-an-k’anis</td>
<td>(Applegate 1976)</td>
</tr>
<tr>
<td>Bantu nasal substitution</td>
<td>/N-ku-ul-ite/ nuulite-ŋuulite</td>
<td>(Odden &amp; Odden 1985)</td>
</tr>
<tr>
<td>Austronesian nasal substitution</td>
<td>/N-tul-is/ nulis-nulis-ʔake</td>
<td>(Dudas 1975, Carrier 1979, Pater 1995 and references therein)</td>
</tr>
</tbody>
</table>

Nasal substitution involves the fusion of a nasal consonant with a following (usually voiceless) obstruent, ex. Javanese N+paŋan --> maŋan ‘eat (active)’. The resulting nasal consonant preserves the place features of the obstruent (Pater to appear). In reduplication, both base and reduplicant contain the nasal consonant\(^4\).

4. **Models of reduplication**

Serial derivational theories of reduplication such as Mester (1986) assigned normal application to the post-lexical component following tier conflation when morphological information is no longer accessible. Marantz (1982) attributed the over/normal distinction to morpholexical rules versus regular phonological rules. Raimy (1999) proposes an architecture similar to Mester’s which also captures the dichotomy whereby normal application applies post-cyclically in the post-linearization stage. Both Mester’s and Raimy’s models rely on representations which incorporate 'simultaneous' structure, which is later linearized at a given point in the derivation. Rules which apply prior to linearization result in overapplication or underapplication. Normal application occurs when rules apply after Tier Conflation. Only those segments in the correct context will be affected. The link between the base and reduplicant is obliterated by Tier Conflation.

The lexical/postlexical distinction cannot account for all cases of normal application versus under or overapplication, and it misses the distinction between lenition and assimilation in reduplication. Non-neutralizing allophonic processes may underapply (Karok palatalization - see section 5) or overapply (Malay nasal...
The lexical/postlexical system predicts normal application. Furthermore, not all normal application cases are post-lexical. These include Tagalog flapping, which has numerous exceptions (Carrier-Duncan 1979) and Chaha devoicing (§2.5), which is a morphologically induced alternation. Assimilatory phenomena may also result in normal application. For example, while most languages with nasal substitution have overapplication, Balangao displays normal application (McCarthy & Prince 1995). Thus, the point in the derivation at which linearization applies does not seem to capture these different cases. In the following section, I outline my proposal and demonstrate its applicability to the typology of cases discussed above.

5. The proposal

The typology of reduplicative overcopy and normal copy can be handled by treating reduplication and assimilation as striving towards the same goal: extension of input material. The McCarthy & Prince (1995) standard model relies on two separate unrelated correspondence relationships: input-output and base-reduplicant. A more direct model is needed, the so-called 'broad' input-output correspondence model proposed under various guises by Orgun (1996), Spaelti (1997) and Struijke (1998). This model maintains that the input corresponds to both base and reduplicant through the same correspondence relation, and that there is no separate input-reduplicant relation as there is in the full model of reduplication in McCarthy & Prince (1995). This is illustrated below in (13) for the word kan-kan:

\[
\begin{array}{c|c}
\text{Full model} & \text{Broad model} \\
\hline
\text{Af}_\text{RED} + \text{k a n} & \text{Af}_\text{RED} + \text{k a n} \\
\{\text{k a n}\} & \{\text{k a n}\} \\
\{\text{k a n}\} & \{\text{k a n}\} \\
\text{RED} & \text{RED+BASE} \\
\text{BASE} & \\
\end{array}
\]

In the Full model, the input /k/ corresponds to the base [k], and this [k] in turn corresponds to the reduplicant [k]. Any relation between the input /k/ and the reduplicant [k] is modeled via another correspondence relation (Input-Reduplicant). In the Broad model, on the other hand, the input /k/ corresponds simultaneously to both output [k].

Within the Broad model, the computation of B-R and I-O faithfulness can be reformulated. As Struijke (1998) points out, under this model, the input has two chances to appear in the output, in the base or the reduplicant. We can go one step further and eliminate the separate Base-Reduplicant relationship. Instead of invoking a MAX-BR constraint and an IDENT-BR constraint, we can combine them into a single input-output constraint requiring repetition of input elements:
(14) **REPEAT-IO** Every element in the input must be repeated in the output as two identical elements

This is similar in spirit to the REPEAT constraints of Yip (1995, 1998) and eliminates the need to have a RED input morpheme. Violations will be assessed for each input segment or feature which fails to be replicated in the output. Partial reduplication will be penalized, since partial reduplication entails input segments which have only a single output correspondent. This was previously the work of MAX-BR. Furthermore, and most importantly for the data in this paper, loss of features will also be penalized, restricting the cases of lenition to normal application, but allowing assimilation to overapply. Thus REPEAT-IO also handles the job of IDENT-BR, which required base and reduplicant to match for the same features.6

I illustrate with an example from Muher: yəʔəmk'im. An undominated constraint against post-vocalic velar ejectives (*Vk') is ranked above REPEAT-IO and MAX-IO[dorsal]. REPEAT-IO is violated by the winning candidate (15a) and candidate (15b) through failure to repeat the [dorsal] feature of the input segment /k'/. Even though (15b) has identical base and reduplicant consonants, the feature [dorsal] appears nowhere in the output. The overapplication candidate (15b) can never surface, as it violates both REPEAT-IO and MAX-IO. The normal application candidate does not violate MAX-IO, as the [dorsal] input feature appears in at least one half of the output:

$$
(15) \begin{array}{|c|c|c|c|}
\hline
yə-k'm & *V_k' & \text{REPEAT-IO} & \text{MAX-IO [dorsal]} \\
\hline
a. r*yəʔəmk'im & * & & \\
\hline
b. yəʔəmʔim & * & * & \\
\hline
c. yəʔəmk'im & * & & !
\hline
\end{array}
$$

Ranking REPEAT-IO above *V_k’ will favor the underapplication candidate (15c) over the overapplication candidate (15a). I return to underapplication cases of this type in section 5.

This same ranking can be applied to any of the lenition cases. Take Daholo voicing, for example (9). The reduplicant reveals that the post-nasal input consonant is voiced. A constraint against post-nasal voicing is ranked above REPEAT-IO and MAX-IO[voice]. REPEAT-IO is violated equally for candidates (15a and b), indicated here by a single violation pertaining to the [voice] feature of the post-nasal consonant. However, by allowing the voicing to appear in the reduplicant, a violation of MAX-1O [voice] is avoided:
Consider now the example of Malay nasal harmony which overapplies. Nasal harmony is achieved by ranking Spread[nasal] R over a constraint on nasal vowels *\(\ddot{v}\) (Walker 1998). Nasal harmony spreads rightward across morpheme boundaries, and aligns the [nasal] feature with the right edge of the word. Overapplication results when the REPEAT-IO constraint outranks constraints against nasal vowels. Unlike in lenition, MAX-Io has no deciding role to play as all features of the input are preserved in the output. The nasal output vowels have simply acquired an extra [nasal] feature from the nasal consonant:

(17) \[
\begin{array}{|c|c|c|c|}
\hline
\text{wa}\-\text{\`{a}ji} & \text{Spread[nasal]} & \text{REPEAT-IO} & \text{MAX-Io[nasal]} & *\(\ddot{v}\) \\
\hline
\text{a. wa\-\`{a}ji-wa\-\`{a}ji} & * & & ** & \\
\text{b. w\-\`{a}ji-wa\-\`{a}ji} & & * & & \\
\text{c. wa\-\`{a}ji-wa\-\`{a}ji} & & ** & & \\
\hline
\end{array}
\]

Normal application can be achieved by ranking *\(\ddot{v}\) higher than REPEAT-IO. Underapplication (16c) cannot result, as Spread[nasal] must always be ranked above *\(\ddot{v}\) to achieve nasal harmony. It could only result if there were a ban on initial nasal vowels (i.e. that are not linearly preceded by other nasal segments) and REPEAT were ranked above Spread.

Another example is illustrated in (17) with Chumash glottal coalescence. The best candidate is that which preserves the input features by coalescence and maximization of reduplication. This is ranked above Uniformity, the constraint penalizing coalescence:

(18) \[
\begin{array}{|c|c|c|}
\hline
\text{k-\`{a}nis} & \text{REPEAT-IO} & \text{MAX-IO}\_F \\
\hline
\text{a. kan-k\`{a}nis} & * & * \\
\text{b. k\`{a}nis-k\`{a}nis} & * & ** \\
\text{c. kan-k\`{a}nis} & * & * \\
\hline
\end{array}
\]

Consider now the example of Malay nasal harmony which overapplies. Nasal harmony is achieved by ranking Spread[nasal] R over a constraint on nasal vowels *\(\ddot{v}\) (Walker 1998). Nasal harmony spreads rightward across morpheme boundaries, and aligns the [nasal] feature with the right edge of the word. Overapplication results when the REPEAT-IO constraint outranks constraints against nasal vowels. Unlike in lenition, MAX-Io has no deciding role to play as all features of the input are preserved in the output. The nasal output vowels have simply acquired an extra [nasal] feature from the nasal consonant:

(16) \[
\begin{array}{|c|c|c|c|}
\hline
\text{\`{a}mba\+ aCCi} & *\text{NC[voice]} & \text{REPEAT-IO} & \text{MAX-Io[voice]} \\
\hline
\text{a. \`{a}mpabbi} & * & & \\
\text{b. \`{a}mpappi} & * & * & \\
\text{c. \`{a}mbabbi} & * & & \\
\hline
\end{array}
\]
This model addresses a problem noted by Steriade (cited in McCarthy & Prince 1995). Backcopy, or the overextension of features of the reduplicant to the base, as in Malay nasal harmony, does not produce examples such as /RED-bonat/ → *[bombomat], whereby the place features of the reduplicant nasal, once assimilated, are copied back to the base. Backcopy is restricted to cases such as nasal harmony. The same generalization can be made with respect to voice assimilation, ex. Sawai *tep-tubo ‘the top’ (Whisler 1992). The distinction is the preservation of features. In the unattested *[bombomat], the Coronal place feature has not survived to the output, thereby violating REPEAT and MAX-I-O. Overcopy is limited to assimilation of a particular kind: nasal harmony, nasal substitution, glottal coalescence. In each of these cases, no loss of input material is found.7

In both instances of assimilation and lenition, the trigger constraint is ranked above or on a par with REPEAT-IO. This provides a symmetrical account for why there is a skewed distribution in lenition vs. assimilation cases with respect to overapplication and normal application. Assimilation tends to overcopy whereas lenition tends to show normal application. Ranking the constraint REPEAT-IO high also produces two divergent outcomes: overapplication in the case of assimilation, and underapplication in the case of lenition.

6. Underapplication
McCarthy & Prince stress that underapplication is simply a sub-type of overapplication. In their model, underapplication is modeled by ranking B-R faithfulness constraints above I-O faithfulness, with two other phonological constraints, a blocker constraint ranked on a par with B-R faithfulness, and a trigger constraint sandwiched between them and the I-O faithfulness constraints: BR Identity, Blocker Constraint » Trigger Constraint » I-O Faithfulness. In essence, the blocker constraint must prevent overapplication by ruling out the opaque situation whereby a form undergoes a process despite being out of context. The same essential analysis can be applied using REPEAT-IO.

Several cases of underapplication have arisen in the literature. What is striking is that no type of process seems to have a monopoly on underapplication. One example of underapplication is the Tokyo Japanese with η/g alternation (McCarthy & Prince 1995 citing Itô & Mester 1990). A constraint against initial velar nasals is ranked higher than MAX-I-O, whereas the constraint against post-vocalic [g] is ranked lower. This is the analysis of McCarthy & Prince (1995). The relevant data are shown in (19):

(19) a. geta 'clogs' e. kaṇi 'key'
b. giri 'duty' f. oruṇaN 'organ'
c. gaku-sei 'student' g. suu-ṇaku 'mathematics'
d. gara-gara 'rattle' h. moṇju-moṇju 'mumbling'
The alternations show no loss of features. Assuming underlying /g/, a nasal feature is added, but Place, voice and manner are maintained. With a non-reduplicated form, it suffices to rank the *Vg constraint over a constraint banning [ŋ] (or a DEP constraint on the feature [nasal])

(20)  
<table>
<thead>
<tr>
<th>ku-gai</th>
<th>*#ŋ</th>
<th>*Vg</th>
<th>*ŋ</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. กุ-กاء</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b. กุเก่า</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

In reduplicated forms, these constraints are ranked below REPEAT-IO. REPEAT is violated in (21a) in that the correspondent [g] and [ŋ] are not identical.

(21)  
<table>
<thead>
<tr>
<th>gara</th>
<th>*#ŋ</th>
<th>REPEAT-IO</th>
<th>*Vg</th>
<th>*ŋ</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. การะง่าระ</td>
<td>*!</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. ง่าระาง่าระ</td>
<td>*!</td>
<td>*!</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. กะระقارب严格落实</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The same analysis can be applied to Southern Paiute ŋ/w alternation, assuming underlying /w/ which is preserved as a secondary articulation: [ŋw] (Sapir 1930). The labialized velar nasal is prohibited from appearing in word-initial position, but otherwise appears between a non-round vowel and another vowel. The [w] appears elsewhere, including between a round vowel and another vowel.

Karok (Bright 1957) is another case of underapplication. Karok has an allophonic alternation between [s] and [ʃ]. The latter occurs following front vowels (often separated by a single consonant). The alternation applies across morpheme boundaries, including compounds, and may be bled by deletion of a front vowel:

(22)  
| a. mu + ิพuka | muspuka | 'his money' |
| b. ʔarip + suru | ʔaripʃuru | 'to cut a strip off' |
| c. pahip + suruk | pahipʃuruk | 'under the pepperwood' |
| d. tasin-sǐr | | 'to brush repeatedly' |
| e. simsim | | 'knife' |

Palatalization underapplies in reduplicated forms even in what appear to be frozen lexical items. Bright only gives two examples (22d-e). Karok palatalization applies within words. There are no cases of ʃ when not preceded by a front vowel. The blocker constraint prevents [ʃ] from appearing when no front vowels precede:
(23) | 
<table>
<thead>
<tr>
<th>tasīr</th>
<th>*V[back]%</th>
<th>REPEAT-IO</th>
<th>V<a href="C">front</a>S Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. tasīfīr</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. taśīfīr</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| c. *tasīfīr | | *

There is one final case of underapplication, and that is Javanese ‘devoicing’\(^9\), a kind of lenition. Voiced stops are devoiced in coda position (Schlindwein 1991), and high vowels are laxed in closed syllables:

(24)  
**unaffixed demonstrative**

| a. murłat mgud-e | *student* |
| b. biblt biblt-e | ‘origin’ |
| c. bōdt bōdt-e | ‘mosque drum’ |

In reduplication, there is no neutralization of a coda obstruent if its corresponding segment is in an onset position. There is also no laxing of vowels in closed syllables in a reduplicated form if the vowel in the other conjunct is in an open syllable. We thus have underapplication of vowel laxing and coda obstruent devoicing:

(25)  
**unaffixed demonstrative**

| a. murłatmurłat muriḍmuriḍ-e | ‘students’ |
| b. bibltbiblt bibbitbibit-e | ‘origins’ |
| c. bōdtbōdt bōgdbōg-e | ‘mosque drums’ |

Previous analyses posit reduplication as applying after rules of devoicing and laxing (Schlindwein 1991, Hargus 1993) in the lexical component. Yip (1995) argues that Javanese reduplication is a compounding process requiring repetition of stems to realize the morphosyntactic category. This is similar to REPEAT-IO. If REPEAT is ranked above *voiced coda (and *tense vowel in closed syllable), the result is underapplication. No ‘blocker’ constraint is necessary. The laryngeal features of the input consonant fail to be repeated in both the losing candidates:

(26)  

<table>
<thead>
<tr>
<th>murid-e plural</th>
<th>REPEAT-IO</th>
<th>*voiced coda</th>
<th>MAX(_{1-O})</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. muriṭmurid-e</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. muriḍmurid-e</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. muriṭmurid-e</td>
<td>*!</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>
As REPEAT-IO regulates both the size of the reduplicant (former MAX-BR) and identity (former IDENT-BR), this is suggestive of a correlation between total stem reduplication and maximization of input features, producing underapplication. All the cases of lenition examined in §2 involved affixation not stem repetition and ranking of REPEAT-IO below lenition-inducing constraints. Furthermore, while both lenition and assimilation can result in underapplication, underapplication appears to be rarer than the other types. This may be due to a tendency to rank REPEAT lower than contextual constraints which are otherwise undominated in the language. I leave this issue aside for future research.

7. Conclusion
The tendency for lenition to apply normally in reduplication, and in particular, to never show overapplication effects, was attributed to the constraint REPEAT-IO, which requires repetition and penalizes loss of input features. Assimilation that superimposes input features on neighboring segments is able to overapply without violating REPEAT-IO. This accounts for the observed generalization. Normal application is also possible for assimilation cases by ranking (contextual) markedness constraints higher than REPEAT-IO. Underapplication is also possible for both by ranking blocker constraints higher in assimilation, or by ranking REPEAT-IO high in lenition. Crucially, lenition fails to overapply given any ranking. The normal application of lenition was previously attributed to a lexical/post-lexical distinction, but this cannot handle all the attested cases, and fails to account for the generalization about the type of process involved.

Notes
1 In the presentation of this paper, I proposed a fixed ranking of MAX-IO[F] > IDENT-BR. Dissatisfaction with a fixed ranking led to the present proposal.
2 Loanwords are often exceptions, ex. [rosas] 'roses'.
3 See Pylkkänen (1999) for an alternate analysis of overapplication cases involving alignment of prosodic edges.
4 In some Austronesian languages, the single nasal prefix /N-/) is copied in reduplication in non-substituting verb stems. This occurs in Tagalog with vowel-initial stems, and optionally in Jakarta Malay and Javanese with all stems.
5 Spaelti labels the model Reduplicate!, whereas Struijke proposes the term 'Broad'. Struijke (1998) also allows for a direct relationship between the BASE and the input Stem or Root.
6 Emergence of the unmarked can still be handled in this model by using the direct Root-Base relationship proposed in Struijke (1998), a subset of the larger Input-Output relationship, as follows: Root- Faith >> Well-formedness >> Input-Output Faith. This allows changes in the reduplicant as it is not subject to the more restricted Root Faithfulness.
7 As for Dakota palatalization, which overapplies, I maintain that palatalization of a velar to produce a [k] does not result in loss of the Dorsal place feature of the velar, but superimposes the Coronal or [-back] feature of the preceding vowel. The result is a Dorsal-Coronal (Keating 1988). Voicing does not overapply in Dakota: ki-čos-čoz-a. This is one of several phonological 'lenition' processes in Dakota that apply normally (Shaw 1976, Mester 1986).
Austronesian nasal substitution is another case in which one could argue that the [-voice] value of the obstruent is lost under substitution. There are two possible solutions. One is to assume that [voice] is a monovalent feature (Lombardi 1991) not present on voiceless obstruents, and therefore undeletable. This predicts that intervocalic voicing of voiceless obstruents should be able to overapply since it does not involve deletion of features, i.e. RED-/tap/-e -> tabtabe. Another solution is to split the REPEAT constraint with the ranking *NC > REPEAT[nasal] > REPEAT [-voice]. This mimics the ranking of MAX feature constraints in non-reduplicative environments.

8 If underlying [n] is assumed, REPEAT would be violated and normal application should result. However, given that these are fixed lexical forms, and the independent word [gara] does not occur, lexicon optimization would force the analysis that the form is underlyingly /gara/.

9 Although transcribed as [t] and [d], Javanese stops contrast for lowered larynx and breathy release, not voicing (Hayward & Muljono 1991).

10 Chaha x/k alternation is analyzed as hardening in Petros (1997) and Kenstowicz & Petros (to appear), and relies on an output-output constraint interacting with reduplication. It respects base-reduplicant identity, unlike devoicing (§2). This alternation was historically spirantization similar to that of Tigrinya. I propose in Rose (to appear) for the sister dialect, Muher, that the x/k alternation has generalized across paradigms producing the pattern that verb stems contain either [k] or [x] within a basic stem either postvocally or postconsonantally, with gradual phonemicization. Certain verbs in Muher still allow variation between [k] vs. [x], but internal reduplication copies whichever output consonant is preferred in the base form by the speaker.

References


