Gurindji nasal cluster effects as trigger deletion

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Abstract

Processes of unbounded spreading are often claimed to be myopic (e.g. Wilson 2003; McCarthy 2009): the ability of some feature [F] to spread from some segment z to some segment y does not depend on its ability to spread from y to x. Recent work (e.g. Walker 2010, 2014; Jardine 2016) has however cast doubt on the universality of this claim. This paper contributes to the discussion on (non-)myopia on by suggesting that a kind of non-myopic process, trigger deletion, is attested in Gurindji (Pama-Nyungan, McConvell 1988): when the spreading domain contains a certain kind of blocking segment, the spreading trigger deletes. In order to capture this pattern, as well as the extant typology of non-myopic processes, I argue that any successful analysis of unbounded spreading must allow surface candidates to be globally evaluated.

1 Introduction

It is generally accepted that unbounded spreading is myopic (Wilson 2003, McCarthy 2009, 2011; cf. Walker 2010, 2014). In this context, myopic means that spreading processes cannot look ahead (description after Walker 2014): given an unbounded spreading process for some feature [F], and a domain [w x y z], the decision to spread [F] from z to y does not take into account whether [F] will succeed in spreading to w, the edge of the domain. A schematic example illustrates. In Step 1 (1a), the spreading feature [F] spreads from its host, z, to the adjacent y. In Step 2 (1b), [F] spreads from y to x. In Step 3 (1c), [F] cannot spread from x to w (w blocks spreading), so the process terminates.

(1) Schematic myopic spreading process

a. [F] spreads to y  
   \[w \ x \ y \ z\]
   \[\overline{F}\]
   b. [F] spreads to x  
   \[w \ x \ y \ z\]
   \[\overline{F}\]
   c. [F] cannot spread to w  
   \[w \ x \ y \ z\]
   \[\overline{F}\]

The process in (1) is myopic because the ability of [F] to spread from z to y, and from y to x, is blind to [F]'s eventual failure to spread from x to w. An example of a non-myopic process would be one in which the language anticipates that [F] will be unable to spread from x to w, and adjusts its behavior accordingly. The language could choose to not initiate the spreading process, for example, based on the knowledge that spreading will eventually fail.

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The apparent absence of non-myopia poses a problem for theories in which well-formedness is assessed globally over surface forms, e.g. classical Optimality Theory (classical OT; Prince & Smolensky 2004). If global evaluation is possible, nothing prohibits a process spreading [F] from z to y from checking to see if it can spread all the way to w. Accounting for the absence of non-myopic patterns has led analysts to propose substantial revisions to the architecture of classical OT. Wilson (2003), for example, excludes non-myopic patterns by employing a new class of constraints, targeted constraints, couched within a derivational variant of OT. McCarthy (2009, 2011) proposes to both redefine the harmony-driving constraints and redefine GEN, i.e. the set of candidates considered. These proposals result in the exclusion of non-myopic processes from the predicted typology, which is a desirable result – if non-myopic processes are in fact unattested.

This paper suggests that a non-myopic [nasal] spreading process is attested in Gurindji (Pama-Nyungan, McConvell 1988, 1993). When full application of [nasal] spreading would violate a local phonotactic, the trigger deletes, blocking spreading from occurring. Although phonetic evidence to support this proposal is unavailable, I argue that it is the best available interpretation of the data. A simplified, schematic version of this pattern is in (2). If the blocker w is absent from the spreading domain, [nasal] spreads from z to x (2a). If w is present, [nasal] deletes (2b).

(2) Trigger deletion in Gurindji (schematic, simplified)

a. If blocker w is absent, [nasal] spreads from z to x.
\[
\begin{array}{c|c|c}
[ x \ y \ z ] & [ x \ y ] & [ x \ y ] \\
| & [nasal] & [nasal] \\
\end{array}
\]

b. If blocker w is present, [nasal] deletes.
\[
\begin{array}{c|c|c}
[ w \ x \ y \ z ] & [ w \ x ] & [ w \ x ] \\
| & [nasal] & [nasal] \\
\end{array}
\]

The pattern in (2) is non-myopic in the sense defined above, as the decision to spread [nasal] from z to x depends on the presence or absence of the blocker w within the spreading domain. In what follows, I argue that the existence of the Gurindji pattern (and others, in Section 5) has implications for theories of unbounded spreading and the structure of the phonological grammar more generally, as the only theories that can account for it are those in which surface candidates are globally evaluated.

2 Nasal cluster effects in Gurindji

In Gurindji and many other languages, there is an observable dispreference for words containing sequences of nasal-stop clusters (NCs). In these systems, while words like ambada and abanda are possible, words like ambanda are not (on this topic see e.g. Meinhof 1932, Meeussen 1963, Herbert 1977, 1986, McConvell 1993, Jones 2000, Blust 2012, Stanton 2016). Languages repair sequences like ambanda in a variety of ways: many delete either the first oral (ambanda \(\rightarrow\) amanda) or second nasal consonant (ambanda \(\rightarrow\) ambada); these repairs are well-known in the literature as Meinhof’s Law (or the Ganda Law) and the Kwanyama Law, respectively. Throughout, I refer to this collection of repairs to illicit NCVNC sequences as nasal cluster effects.

I assume throughout that the feature [nasal] is privative (e.g. Steriade 1993b), but this is not crucial to the analysis.
Regardless of repair, in most languages the application of nasal cluster effects exhibits segmental or contextual restrictions. In Gurindji, if the material that intervenes between NC$_1$ and NC$_2$ contains only [+continuant] segments, nasal cluster effects must occur, subject to certain morphological restrictions \( (\text{ambawanda} \rightarrow \text{ambawada}, \ast \text{ambawanda}) \). If however the intervening material contains a [-continuant] segment, nasal cluster effects are blocked \( (\text{ambatanda} \rightarrow \text{ambatada}, \ast \text{ambatada}) \). In this section I suggest that the observed blocking effects can be seen as a symptom of non-myopic regressive [nasal] spreading, and propose an interpretation of the data along these lines.

### 2.1 Data

In most dialects of Gurindji, NC$_1 \ldots$ NC$_2$ is repaired through eradication of N$_2$’s [nasal] feature (though see McConvell 1988:150 on different repairs in some western dialects). How [nasal] is eradicated depends on the composition of NC$_2$. If NC$_2$ is homorganic, the nasal consonant deletes (3a–b); if it is heterorganic, the nasal consonant is realized as an oral stop (3c–d).

\[
(3) \quad \text{N}_2 \text{ modification in Gurindji (McConvell 1988: 138)}^2 \\
\quad a. \quad /\text{ka}\text{peu}+\text{mpal}/ \rightarrow [\text{ka}\text{peu}-%5c\text{p}4\text{l}] \quad \text{‘across below’} \quad (\text{cf. [kajira-mpal] ‘across the north’}) \\
\quad b. \quad /\text{kanka}+\text{mpa}/ \rightarrow [\text{kanka}-%5c\text{p}4\text{a}] \quad \text{‘upstream’} \quad (\text{cf. [kani-mpa] ‘downstream’}) \\
\quad c. \quad /\text{jampa}-%5c\text{n-pula} \text{ pa-pa}/ \rightarrow [\text{jampa}-\text{t-pula} \text{ pa-pa}] \quad \text{‘what did you two see?’} \\
\quad d. \quad /\text{nataca}-%5c\text{a-pu}l\text{a} \text{ pa-pa}/ \rightarrow [\text{nataca}-\text{a-t-pula} \text{ pa-pa}] \quad \text{‘how many did you two see?’}
\]

The difference between (3a–b) and (3c–d) can be captured under an analysis in which N$_2$ deletion is the preferred repair, subject to a ban on the deletion of place features.$^3$ Assuming that place features are multiply linked in homorganic clusters, N$_2$ deletion is permitted in this context because the place features of the deleted nasal will still be linked to the remaining oral stop. But in heterorganic clusters, deletion of the nasal would result in the deletion of its place features, so the repair in this context is N$_2$ denasalization. Both N$_2$ deletion and denasalization serve the greater goal of destroying N$_2$’s [nasal] feature, however (see also McConvell 1993:18), and the source of the difference between them is not crucial here. Throughout, I refer to these processes as N$_2$ modification.

Throughout (3), N$_2$ modification is local: only a single vowel intervenes between the two NCs. N$_2$ modification can also be non-local, but as previewed, the applicability of non-local N$_2$ modification depends on the nature of the material that intervenes between NC$_1$ and NC$_2$. If the intervening material contains only [+continuant] segments (i.e. vowels, glides, and liquids$^4$), then N$_2$ modification is obligatory. Data illustrating this are in Table 1.

Note that the . . . .4 . . . w . . . . forms in Table 1 display lenition of postvocalic morpheme-initial /p/ and /k/ to [w]; this process is “fairly general” (McConvell 1988:139) and applies outside of the NC$_1 \ldots$ NC$_2$ context (e.g. /wa\text{u}+\text{kaci}/ \rightarrow [wa\text{u}-\text{waci}] ‘fireplace’, McConvell 1988:139). These forms show that, for the purposes of N$_2$ modification, underlying and derived [w]s behave alike: N$_2$ modification applies across a [w] regardless of whether it is underlyingly /w/, /l/, or /kl/. The . . . .1 . . . form shows us, however, that lenition does not apply to singleton stops that result from

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$^2$The Gurindji transcriptions in this paper follow McConvell’s, but with some substitutions: \(<rt>= /l/, \le j>= /k/; \le m>= /h/, \le ny>= /l/, \le ng >= /h/, \le rt>= /l/, \le ly>= /l/, \le rr>= /l/, \le r>= /l/. I follow McConvell in transcribing all oral stops as voiceless, but see McConvell p. 136 for information about allophonic stop voicing.

$^3$Given the data in (3), another possibility could be that N$_2$ deletion is impossible when it would result in the deletion of an entire morpheme. For data that favor the place-based analysis, see Section 4.1.3 (though cf. McConvell 1993:25–26).

$^4$[+continuant] segments are vowels, glides, and liquids; there are no contrastive fricatives (McConvell 1988:136).
Table 1: [+continuant] segments can intervene in N\textsubscript{2} modification (data from McConvell 1988)

<table>
<thead>
<tr>
<th>Intervener</th>
<th>Form</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>...l...</td>
<td>/kankula-mpa/ → [kankula-pa]</td>
<td>'on the high ground'</td>
</tr>
<tr>
<td>...d...</td>
<td>/cawura-ŋ-kai-ŋuca/ → [cawura-ŋ-kai-wuca]</td>
<td>'with another thief'</td>
</tr>
<tr>
<td>...w...</td>
<td>/nampa-wu-ŋa-n-cina pa-ni/ → [nampa-wu-wa-t-cina pa-ni]</td>
<td>'why did you hit them'</td>
</tr>
<tr>
<td>...j...</td>
<td>/jan-ku-ji-n-pula-ŋa/ → [jan-ku-ji-t-pula-ŋa]</td>
<td>'you two might come to me'</td>
</tr>
</tbody>
</table>

N\textsubscript{2} deletion: underlying /kankula-mpa/ surfaces as [kankula-pa], and the singleton [p] resulting from N\textsubscript{2} deletion does not lenite further to [w] ("[kankula-wa]"). McConvell (1988:144) analyzes this interaction as a result of rule ordering: lenition feeds N\textsubscript{2} modification. While interesting, this pattern is not relevant to the generalization of interest (that N\textsubscript{2} modification applies across all surface [+continuant] segments, and will not be addressed further.

If however the material that intervenes between NC\textsubscript{1} and NC\textsubscript{2} contains one or more [-continuant] consonants (i.e. a nasal consonant or an oral stop), N\textsubscript{2} modification is impossible (Table 2).

Table 2: [-continuant] segments block N\textsubscript{2} modification (data from McConvell 1988)

<table>
<thead>
<tr>
<th>Blocker</th>
<th>Form</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>...p...</td>
<td>[ŋu-ŋantipa-ŋkulu ŋa-ŋa]</td>
<td>'they saw us'</td>
</tr>
<tr>
<td>...t...</td>
<td>[nampiija-ŋuca]</td>
<td>'(animal) lacking a female'</td>
</tr>
<tr>
<td>...k...</td>
<td>[wajci-kura-n-cina ka-ŋa]</td>
<td>'where did you take them?'</td>
</tr>
<tr>
<td>...m...</td>
<td>[kuja-ŋka-ŋa-kku pa-ni]</td>
<td>'it was for that reason he hit you'</td>
</tr>
<tr>
<td>...n...</td>
<td>[ŋu-n-ŋunu-ŋku]</td>
<td>'you put it on yourself'</td>
</tr>
</tbody>
</table>

To summarize, illicit NC\textsubscript{1} VNC\textsubscript{2} in Gurindji is repaired by either deleting or denasalizing N\textsubscript{2}. N\textsubscript{2} modification is obligatory when all segments intervening between the two NCs are [+continuant], but blocked when one or more [-continuant] segments intervene.\textsuperscript{5} The question to answer, then, is why some segments block N\textsubscript{2} modification but others do not.

\textsuperscript{5} An additional point of note is that N\textsubscript{2} modification in Gurindji is to some extent morphologically restricted: it only occurs when N\textsubscript{2} is part of a suffix, a topic addressed briefly in Section 3.1.
2.2 Proposed interpretation

In this subsection, I argue that we can make sense of the constraints on interveners summarized above by appealing to two independent but interacting processes, both of which are well-attested elsewhere: long-distance regressive [nasal] spreading initiated by coda nasals (Section 2.2.1), and a dispreference for anticipatory nasalization preceding onset nasals (Section 2.2.2).

2.2.1 Nasal spreading

Although McConvell (1988, 1993) does not discuss the phonetics of nasality in Gurindji, the set of segments that can intervene in N\textsubscript{2} modification is reminiscent of cross-linguistic generalizations regarding the typology of [nasal] spreading. The sets of segments that can participate in nasal spreading processes are subject to implicational laws, schematized in (4) (see e.g. Schourup 1973, Cohn 1993, Walker 1998, also Pulleyblank 1989): in a given language, if nasality is able to spread through a segment with some value \(x\), then it is also able to spread through all segments with values equal to or lower than \(x\), where \(x\) is roughly equivalent to the segment’s compatibility (articulatory or perceptual) with nasalization (see Schourup 1973:533, Walker 1998:69–84).

(4) Implicational hierarchy in nasal spreading (adapted from Walker 1998: 26)

\[
\begin{array}{c|c|c}
\text{Vowels} & \text{Glides} & \text{Liquids} \\
\text{high} & \text{compatibility with nasalization} & \text{low}
\end{array}
\]

One interpretation of the Gurindji data in Section 2.1 takes seriously the link between (4) and the set of possible interveners in nasal cluster effects. Let us assume that Gurindji has a process of long-distance nasal harmony that is capable of spreading through liquids, vowels and glides, as in Kpelle (Niger-Congo, Welmers 1962; see Walker 1998:90–92 for other examples).\(^6\) This proposal is illustrated with /kajira+mpal/ ('across the north,' McConvell 1988: 138): [nasal] spreads regressively from N\textsubscript{2} until blocked by [k] (5). (It should be emphasized at this point that the claim that Gurindji exhibits a process of regressive [nasal] harmony is not supported by phonetic data, though there are also none showing the contrary; for more discussion on this point, see Section 2.3.)

(5) Proposed long-distance regressive [nasal] spreading in Gurindji

\[
k\text{a}j\text{i}r\text{a} - m\text{p}a\text{l} \rightarrow k\tilde{\text{a}}j\tilde{\text{i}}\tilde{\text{r}}\tilde{\text{a}} - m\text{p}a\text{l}
\]

[\text{n}asal] [\text{n}asal]

Assuming that such a process is active, we turn now to the context of interest: a word containing two NCs. If NC\textsubscript{1} and NC\textsubscript{2} are separated by only vocoids, approximants, or liquids, full application of regressive [nasal] spreading in this context results in nasalization of the vowel following NC\textsubscript{1}, as schematized for /kankula-mpa/ ('on the high ground,' McConvell 1988:140) in (6).

\(^6\)Additionally, in some dialects of Gurindji, [p] and [k] spirantize (McConvell 1988:163). This is potentially linked to the fact that some dialects exceptionally allow N\textsubscript{2} modification to apply across a [p] or a [k] (McConvell 1988:161); as the diagram in (4) indicates, nasal spreading is more likely to apply across fricatives than across stops.
Long-distance [nasal] spreading in NC₁…NC₂ would nasalize post-NC vowel

\[
\text{k a n k u l a - m p a} \quad \rightarrow \quad \text{kānkūlā - m p a}
\]

\[
[\text{nasal}] \quad \quad [\text{nasal}] \quad \quad [\text{nasal}] \quad \quad [\text{nasal}]
\]

There is reason to believe that nasalized vowels are dispreferred following NCs. Beddor & Onsuwan (2003) show that an important perceptual cue to the contrast between NCs and plain nasal consonants (Ns) is the quality of the following vowel: NCs are most accurately identified as NCs when followed by oral vowels, and Ns as Ns when followed by nasal vowels. Importantly, NCs followed by nasal vowels are regularly misidentified as Ns. Evidence that this difficulty translates into a typological dispreference comes from languages in which phonemically nasal vowels are banned following NCs (e.g. Acehnese, Durie 1985; Páez, Jung 2008). The hypothesis is that the source of the ban for NC₁…NC₂ sequences in Gurindji and elsewhere is not a dispreference for multiple NCs per se, but rather a dispreference for NCV – which full application of regressive [nasal] spreading, in an NC₁…NC₂ context, would create ((6); see also Herbert 1977, Jones 2000, Stanton 2016).

Let us assume, then, that full application of [nasal] spreading is banned in Gurindji NC₁…NC₂ contexts when it would create an NCV sequence. Faced with this impossibility, the language has several different options for forms like /kankula-mpa/. One is to spread [nasal] partway (7).

\[
\text{k a n k u l a - m p a} \quad \rightarrow \quad \text{kānkūlā - m p a}
\]

\[
[\text{nasal}] \quad \quad [\text{nasal}] \quad \quad [\text{nasal}] \quad \quad [\text{nasal}]
\]

The partial solution in (7) is myopic: [nasal] spreads as far as it can, even though it is eventually blocked. The solution that Gurindji prefers, however, is not myopic. The attested /kankula+mpa/ → [kankula-pa] mapping shows us that Gurindji’s preferred solution is deletion of the [nasal] trigger, which aborts the spreading process before it can begin. The way in which trigger deletion is implemented varies depending on whether NC₂ is homorganic or heterorganic (as previewed above; see (8–9)), but the end result is the same: eradication of the [nasal] trigger, through deletion of either the [nasal] feature or of the segment that hosts it, prevents [nasal] spreading from occurring.

\[
\text{k a n k u l a - m p a} \quad \rightarrow \quad \text{kānkula - p a}
\]

\[
[\text{nasal}] \quad \quad [\text{nasal}] \quad \quad [\text{nasal}]
\]

\[
\text{j a n - k u - j i - n - p u . . .} \quad \rightarrow \quad \text{jān - k u - j i - t - p u . . .}
\]

\[
[\text{nasal}] \quad \quad [\text{nasal}] \quad \quad [\text{nasal}] \quad \quad [\text{nasal}]
\]

As discussed above, I assume that [-continuant] segments block [nasal] spreading. In /nampijita-wupca/ ‘(animal) lacking a female’ (McConvell 1988:141), for example, regressive spreading of [nasal] from NC₂ is arrested by the presence of an intervening /h/ (so /nampijita-wupca/ → [nampijitā-wāpc,a]). Trigger deletion is unnecessary, as the post-NC₁ vowel is not at risk of becoming [nasal].
While we know little about the phonetics and phonology of nasality in Gurindji, positing a regressive [nasal] spreading process allows us to make sense of the set of segmental interveners in Gurindji N2 modification. The segments that can intervene (all [+continuant] segments) propagate [nasal]; the segments that cannot (all [-continuant] segments) block the spread of [nasal]. Viewed in this light, N2 modification is a strategy to avoid NCV sequences, which we independently know to be marked for perceptual reasons, and are typologically dispreferred. (For alternative interpretations of the data, e.g. the [-nasal] spreading analysis of McConvell 1993, see Section 4.)

2.2.2 Nasalization avoidance

If above interpretation of the data is correct, additional questions arise. If [nasal] spreads regressively, why are only coda nasals triggers (i.e. why is NC1VN2V not forbidden)? And why does onset nasals block the spread of nasality (i.e. why does the presence of an intervening N block N2 modification, as in [mu-n-cun-ŋku]a juwa-ni] ‘you put it on yourself,’ McConvell 1988:141)?

One answer to the first question is inspired by claims that some kinds of long-distance spreading are perceptually conditioned: harmony serves to enhance perception of the spreading feature(s) (e.g. Suomi 1983, Kaun 1995, Walker 2005). Arguments in favor of this conclusion comes from in part from weak trigger effects (term from Walker 2005), where spreading is triggered by those segments on which the spreading feature is independently believed to be less perceptible. For example, the generalization that rounding harmony is favored when the trigger is non-high can be linked to the observation that rounding contrasts are harder to perceive for non-high vowels (Kaun 1995).

Building on arguments from previous work that nasal harmony is perceptually motivated (e.g. Sanders 2003, Cole & Kisseberth 1995, Walker 2014), we can view Gurindji’s restriction of [nasal] triggers to coda nasals as a weak trigger effect. Assuming that the contrast between nasal and oral consonants (Ns and Cs) is in part cued by the presence or absence of coarticulatory nasalization, an N that induces some degree of nasal coarticulation will be more distinct from a C than an N that does not. Whether or not an N is able to induce coarticulatory nasalization, and in which directions, is dependent on its syllabic role.7 I focus on two contexts here: coda position, in which only anticipatory coarticulation is possible (VN); and intervocalic position, in which anticipatory and perseveratory coarticulation are possible (VN). Assuming that an N triggering nasal coarticulation on both sides is more distinct from a C than is a nasal that triggers nasal coarticulation on only one side, we expect coda Ns to be less distinct from coda Cs than intervocalic Ns are from intervocalic Cs (\(\Delta VN\bar{V}–VCV > \Delta VNC–VCC\), where \(\Delta\) = the perceptual distance between).

The proposal, then, is that only codaNs trigger [nasal] spreading in Gurindji because regressive spreading is necessary in this context to license an otherwise perceptually weak N–C contrast. The contrast between word-medial onset Ns and Cs, on the other hand, is not in need of further enhancement. The claim that Ns must spread nasality in some direction to remain distinct from Cs is corroborated by facts about Gurindji’s phonotactics: word-initial NCs, which cannot spread [nasal] progressively, are banned; but word-initial Ns, which can spread [nasal] progressively, are permitted. (Framed in this way, the notion that [nasal] must spread in some direction in order to survive is an example of what Mullin & Pater 2015 term the use it or lose it problem, in which a

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7 Assumption that NC sequences in Gurindji are clusters, as there is no reason to believe otherwise (also McConvell 1988: 142, McConvell 1993:20–24), and are syllabified as VN.CV. It is also possible to formulate the above generalizations with reference to the nasal’s vocalic context, i.e. prevocalic vs. non-prevocalic; this would allow us to remain agnostic as to the segment vs. cluster status of the NC, as well as the N’s syllabic role. I refer to syllabic role only for convenience.
A possible answer to the second question – why should onset nasals block propagation of \( [\text{nasal}] \)? – builds on observations in the literature that anticipatory nasalization preceding nasals is dispreferred in many languages of the area. In a number of Australian languages, a process of prestopping that affects nasal consonants, and in some cases laterals as well (e.g. Hercus 1972).

A comparison between ‘Common Australian’ (CA) and Arabana-Wangkangurru (AW) illustrates: intervocalic nasals or laterals in CA acquire an oral onset in AW (10).

(10) Prestopping in Arabana-Wangkangurru (Hercus 1994: 37)

<table>
<thead>
<tr>
<th></th>
<th>CA</th>
<th>AW</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>tyina</td>
<td>mti</td>
<td>milu/mila</td>
<td>‘foot’</td>
</tr>
<tr>
<td>thida</td>
<td>mti</td>
<td>midlha</td>
<td>‘nose’</td>
</tr>
</tbody>
</table>

Butcher (1999) hypothesizes that prestopping maximizes cues to sonorant place contrasts. Australian languages are well-known for their large sonorant inventories; Gurindji is no exception (11).

(11) Partial consonant inventory of Gurindji (from McConvell 1988: 136)

<table>
<thead>
<tr>
<th></th>
<th>Bilabial</th>
<th>Alveolar</th>
<th>Retroflex</th>
<th>Palatal</th>
<th>Velar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal</td>
<td>m</td>
<td>n</td>
<td>η</td>
<td>n</td>
<td>η</td>
</tr>
<tr>
<td>Lateral</td>
<td>l</td>
<td>l</td>
<td>η</td>
<td></td>
<td>η</td>
</tr>
</tbody>
</table>

It has been established that nasal place cues lie in part in the anticipatory VN transitions (Harrington 1994). Acoustic effects of anticipatory nasalization, however, render these place cues less perceptible (Repp & Svastikula 1988). By oralizing the closure phase of a nasal, prestopping enhances cues to nasal place contrasts. And although the number of languages reported to have overt prestopping is small, a more general dispreference for anticipatory nasalization appears to be a common property of Australian languages (on Warlpiri and Kunberlang, see Butcher 1999:481). The idea is that Gurindji belongs to this class of languages: anticipatory nasalization is dispreferred.

Note that, while it is typologically unusual for \( [\text{nasal}] \) stops to block \( [\text{nasal}] \) harmony, it is not unattested. In Mehinâku (Arawak), \( [\text{nasal}] \) spreads through approximants and the laryngeal \( [\text{h}] \), but is blocked by obstruents, nasals, and liquids (Corbera Mori 2008:71–72). Whether or not the pattern in Mehinâku can also be traced to a dispreference for anticipatory nasalization remains to be seen.

The following, then, is the proposal regarding the distribution of anticipatory nasalization in Gurindji. Vowels preceding onset nasals must not be nasalized, as nasalization would render cues to nasal place contrasts less distinct (as discussed above, \( \Delta \text{VN} \text{V} \text{V} \text{V} > \Delta \text{VN} \text{V} \text{V} \text{V} \text{V} \)). This dispreference for anticipatory nasalization is what causes onset nasals to block propagation of \( [\text{nasal}] \). Vowels (and potentially other material) preceding coda nasals however must be nasalized, as nasalization in this context is necessary to maintain sufficiently distinct contrasts between nasal and oral stops (\( \Delta \text{VN} \text{V} \text{V} \text{V} > \Delta \text{VN} \text{V} \text{V} \text{V} \)). In other words, propagation of \( [\text{nasal}] \) is allowed in Gurindji only when the nasal is in coda position, i.e. when cues to the N–C contrast are reduced.  

---

8 Are there other languages in which nasal spreading is triggered exclusively by coda nasals? In Walker (1998), the only language claimed to exhibit this restriction is Aguaruna (Jivaroan). This apparent restriction may be illusory, however, as the only nasal that triggers harmony is \( /n/ \), which appears only in coda; the other nasals \( /m/ \) and \( /n/ \) apparently do not induce nasalization in any context, including coda position (Overall 2007:30–38). I do not know why there are not more languages in which nasal harmony is triggered only by coda nasals, and treat it as an accidental gap.
2.3 On the phonetics of Gurindji nasalization

If the proposed interpretation of Gurindji nasal cluster effects is correct, it makes non-trivial predictions regarding the phonetics of nasality in Gurindji. The first prediction is that all [+continuant] segments preceding a coda N are nasalized. The second prediction is that no segments preceding an intervocalic N, [+continuant] or otherwise, are nasalized. (Note that the first prediction runs counter to the broader generalization that anticipatory nasalization is minimal or absent in most Australian languages (Butcher 1999, Fletcher & Butcher 2014.)

Are the predictions borne out? Given the available data, it is hard to know. The Gurindji recordings available to me (from: the Global Recordings Network; the Gurindji Multimedia Database, Meakins et al. 2013) are not suitable for the kind of phonetic analysis necessary to verify the claims in this section. It is generally difficult to study nasalization from recordings alone; as Cohn 1990:26 writes, “acoustic data alone are not sufficient for studying nasalization, since there is no single acoustic correlate.” In the case of Gurindji, the difficulty inherent in studying nasality acoustically is compounded by the fact that the existing recordings are field recordings, with background noise and often multiple people speaking at once. A satisfactory investigation of potential [nasal] harmony in Gurindji would involve analysis of both studio-quality acoustic data and articulatory data. These data are not currently available; such an investigation is beyond the scope of the current study.

The reader may be suspicious about the possibility that [nasal] harmony exists in Gurindji but has not been detected, and wonder is a reason why we might expect this phonetic property to have been overlooked. To this question I have no answer, except to note that which topics are addressed in a phonological description depends a great deal on the scope of the project and the questions the author seeks to answer. In Storto’s (1999) description of Karitâna (Tupí), for example, allophonic nasalization of vowels by nasal consonants is not discussed, as the description focuses more on documenting allophonic oralization of nasal consonants. Everett’s (2007) description of Karitâna however contains a detailed description of vowel nasalization, as one of his main points of interest is the relationship between vowel nasalization and consonant oralization (see esp pp. 141–142). Given that McConvell’s (1988) focus is on the relevance of consonantal strength hierarchies to the Gurindji data, and that his (1993) focus is on potential implications of the Gurindji data for the proposal that [-nasal] cannot spread (e.g. Steriade 1993b), we cannot expect that [nasal] harmony should have been discussed in either paper – not because it definitively does not exist, but because its existence was not directly relevant to questions that interested McConvell in 1988 and 1993.

In sum, further study of Gurindji phonetics is necessary to determine if the interpretation of the data proposed in this section – that a regressive [nasal] spreading process is active in Gurindji, and that in this way Gurindji is exceptional among Australian languages – is correct. If can be shown that it is not, all conclusions drawn from this point forward will have to be reconsidered.

3 Analysis of the Gurindji pattern

So far, I have proposed that coda nasals in Gurindji trigger regressive [nasal] spreading. But if full application of [nasal] spreading would result in the nasalization of a post-NC vowel, the [nasal] trigger is destroyed. Section 3.1 outlines an analysis of this pattern in parallel Optimality Theory (Prince & Smolensky 2004). Section 3.3 verifies that the analysis cannot be replicated in Harmonic

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9Of the recordings available on the GRN, the amount of relevant material is small: scripture narrations are performed by a non-native speaker (Noel Bachelor, p.c.), and several of the recorded testimonials are in Mudburra or Ngarinman.
Serialism (HS), a serial version of OT that precludes the existence of non-myopic patterns (e.g. McCarthy 2009, 2011). Some implications of the proposed analysis are discussed in Section 3.2.

### 3.1 Proposed analysis

To begin, I analyze the hypothesized distribution of anticipatory nasality in Gurindji (I do not address or analyze the distribution of perseveratory nasalization here, as it not crucial to the analysis). The general dispreference for anticipatory nasalization is formalized as *VN (12), and the preference for vowels preceding coda nasals to be nasalized is enforced by *VNσ (13).

\begin{align*}
\text{(12)} & \quad *\overline{\text{VN}}: \text{assign one * for each nasal consonant immediately preceded by a nasal vowel.} \\
\text{(13)} & \quad *\text{VNσ}: \text{assign one * for each coda nasal immediately preceded by an oral vowel.}
\end{align*}

To derive the result that vowels are nasalized before coda nasals only, *VNσ ≫ *VN (14–15).

\begin{align*}
\text{(14)} & \quad \text{Vowels preceding coda nasals are nasalized} \\
& \quad \text{/amba/} \quad *\text{VNσ} \quad *\overline{\text{VN}} \\
& \quad \begin{array}{ll}
& \text{a. [ ámba]} \\
& \text{b. [amba]}
\end{array} \\
\text{(15)} & \quad \text{Vowels preceding onset nasals are not nasalized} \\
& \quad \text{/ama/} \quad *\text{VNσ} \quad *\overline{\text{VN}} \\
& \quad \begin{array}{ll}
& \text{a. [ ámba]} \\
& \text{b. [ama]}
\end{array}
\end{align*}

The next component of the analysis is a constraint promoting [nasal] spreading. The sequential markedness constraint in (16) does this by banning sequences of [+continuant] segments in which the first is oral and the second is nasal (for previous analyses of unbounded spreading that employ sequential markedness constraints see e.g. Pulleyblank 2002, Mahanta 2007). Note that (16) builds the fact that [−continuant] segments block [nasal] spreading into its definition: *
[∅nasal,+cont][nasal,+cont] encourages regressive [nasal] spreading until [nasal] reaches a [−continuant] segment, at which point the markedness constraint is satisfied, and further spreading is not motivated. Below, [∅nasal] means the absence of [nasal], i.e. that the segment is oral.

\begin{align*}
\text{(16)} & \quad *[∅nasal,+cont][nasal,+cont]: \text{assign one * for each non-nasal continuant that is immediately followed by a nasal continuant.}
\end{align*}

---

10The analysis presented here is simplified for expositional purposes. *VNσ (13) likely stands for a constraint on contrast (as in Flemming 2002) that requires anticipatory nasalization to be present for coda Ns to be sufficiently distinct from coda Cs; *VN likely stands for a constraint on contrast that requires nasal consonants to be preceded by oral vowels for nasal place contrasts to be maximally distinct. The ranking *VNσ ≫ *VN reflects that maximizing cues to the N–NC contrast takes priority over maximizing cues to nasal place contrasts in Gurindji. I do not present the contrast-based analysis here as it would significantly complicate the analysis of spreading in ways orthogonal to the issues at hand.

11The more standard analysis of nasal harmony is that it is motivated by a single harmony-driving constraint (e.g. AGREE[nasal], with blocking due to a fixed hierarchy of feature co-occurrence constraints (e.g. *NASLIQUID, *NASGLIDE, etc.; see Walker 1998). Because different classes of blockers behave differently in Gurindji, however – there is both normal myopic blocking and trigger deletion – such an analysis is unworkable here. See Section 3.2 for discussion.
An implicit claim here is that a vowel nasalized by a following coda nasal, and not the coda nasal itself, triggers [nasal] spreading. While this is not crucial, there is precedent: bidirectional [nasal] spreading in Capanahua has been argued to be triggered by allophonically nasalized vowels, not the consonants that nasalize them (Safir 1982). Beyond Capanahua, there are a number of languages where [nasal] spreading is triggered by nasal vowels, to the exclusion of nasal consonants; examples are Pame Otomi (Gibson 1956) and Lamani (Trail 1970) (see Walker 1998 for more).

The fact that propagation of [nasal] is preferred in the general case reveals several crucial rankings between the pro-spreading constraint, *[∅nasal,+cont][nasal,+cont], and various faithfulness constraints. *[∅nasal,+cont][nasal,+cont] must dominate DEP-LINK[nasal] (17), as [nasal] spreading results in new links between a [nasal] autosegment and segments in the spreading domain. [nasal] spreading occurs at the expense of other constraints as well, such as *[nasal,+cont] (penalizing nasalized continuants, which do not appear except when compelled by [nasal] spreading), but I do not include these in the tableaux that follow.

(17) DEP-LINK[nasal]: assign one * for every output segment linked to a [nasal] autosegment whose input correspondent is not linked to the same [nasal] autosegment.

As [nasal] spreading is generally preferred to destruction of the [nasal] trigger, we know that several faithfulness constraints are active. Denasalization (as in heterorganic clusters; NK → TK) is dispreferred by MAX-LINK[nasal] (18), and deletion of the trigger segment (as in homorganic clusters; NT → T) is dispreferred by high-ranked MAX-SEGMENT (19).

(18) MAX-LINK[nasal]: assign one * for every input segment linked to a [nasal] autosegment whose output correspondent is not linked to the same [nasal] autosegment.

(19) MAX-SEGMENT: assign one * for every segment present in the input that does not have an output correspondent.

These constraints perform the same function in the analysis – both militate against deletion of the trigger’s [nasal] feature – and from this point forward, I refer to them together as MAX. The interactions among the proposed constraints are illustrated in (20). In this tableau and the following, I refer to *[∅nasal,+cont][nasal,+cont] (16) as SPREAD, to save space.

(20) [nasal] spreading in /kajira-mpal/ ‘across the north’ (McConvell 1988: 138)

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td><img src="https://example.com/table.png" alt="Table" /></td>
</tr>
<tr>
<td></td>
<td><img src="https://example.com/table.png" alt="Table" /></td>
</tr>
<tr>
<td>a. [kajira-mpal]</td>
<td><img src="https://example.com/table.png" alt="Table" /></td>
</tr>
<tr>
<td>b. [kajirā-mpal]</td>
<td><img src="https://example.com/table.png" alt="Table" /></td>
</tr>
<tr>
<td>c. [kajira-pal]</td>
<td><img src="https://example.com/table.png" alt="Table" /></td>
</tr>
<tr>
<td>d. [kājirā-mpal]</td>
<td><img src="https://example.com/table.png" alt="Table" /></td>
</tr>
<tr>
<td>e. [kājirā-mpal]</td>
<td><img src="https://example.com/table.png" alt="Table" /></td>
</tr>
</tbody>
</table>

Candidate (20a), where the pre-NC vowel is oral, violates high-ranked *VN]_γ[_γ. Candidate (20b), where the pre-NC vowel is nasalized, violates SPREAD, as the nasalized vowel immediately follows a non-nasal continuant. In candidate (20c), the trigger deletion violates MAX. Candidate (20d), where harmony needlessly targets a voiceless stop, incurs a gratuitous violation of DEP-LINK[nasal]. Thus candidate (20e), where [nasal] spreads regressively until the oral stop, is optimal.

This is the hypothesized normal case. In NC_1…NC_2 sequences, however, spreading of [nasal]
is dispreferred when full application would result in the nasalization of a post-NC vowel. I formalize this dispreference for NCV sequences as *NCV (21).

(21) *NCV: assign one * for each NCV sequence.

The fact that trigger deletion is preferred to violation of *NCV reveals several crucial rankings. First, *NCV must dominate the MAX, as deletion of the [nasal] trigger is preferred to nasalization of a post-NC vowel (for example, [kánkula-pa] ≻ *[kánkůlů-mpa]). In addition, the harmony-driving constraint, SPREAD, must dominate both MAX and DEP-LINK[nasal], as trigger deletion is preferred to incomplete spreading of [nasal] (e.g. [kánkula-pa] ≻ *[kánkůlů-mpa]). *VNᵣ, which mandates that pre-NC vowels must be nasalized, must also dominate MAX and DEP-LINK[nasal], as trigger deletion is preferable to a situation in which a coda nasal is preceded by an oral vowel. A grammar with these rankings predicts trigger deletion (22).

(22) Trigger deletion in Gurindji /kankula-pa/ ‘on the high ground’ (McConvell 1988: 140)

<table>
<thead>
<tr>
<th>/kankula+mpa/</th>
<th>*VNᵣ</th>
<th>*NCV</th>
<th>SPREAD</th>
<th>MAX</th>
<th>DEP-LINK[nasal]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [kánkula-mpa]</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [kánkůlů-mpa]</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>c. [kánkůlů-mpa]</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
<td>***</td>
</tr>
<tr>
<td>d. [kánkula-pa]</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>e. [kánkůlů-mpa]</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
<td>****</td>
</tr>
</tbody>
</table>

Candidate (22a), where the pre-NC vowel is oral, violates *VNᵣ. Candidate (22b), where the pre-NC vowel is nasalized, violates SPREAD. Candidate (22c), where [nasal] spreading applies incompletely, also violates SPREAD. Candidate (22e), in which spreading applies fully, violates *NCV. The optimal candidate here, then, is (22d): given the ranking in (22), the only way to avoid violating all of the top-ranked constraints is to destroy the [nasal] trigger. Note that although the tableau in (22) does not consider the candidate [kánkula-ppa], where N₂ simply loses its [nasal] feature (as is attested when NC₂ is heterorganic, e.g. /jampa-n-pula ŋa-ŋa/ → /jampa-t-pula ŋa-ŋa/ ‘what did you two see?’, McConvell 1988:138), this candidate would receive the same violation profile as does candidate (22d), given the above constraints. The difference between these two ways to satisfy the top-ranked constraints is not crucial, and I do not analyze it here.

Note that (22) does not take into account all possible ways of satisfying NCV; other possible repairs include deleting N₁ (*[kakůlů-mpa]) or C₁ (*[kanůlů-mpa]). I assume that these repairs are ruled out by a constraint that bans the deletion of root material; this is independently well-motivated in Gurindji, as N₂ modification is banned when N₂ is root-internal ([ńampa karijja], not [ńampa karija]; ‘he died,’ McConvell 1988: 137). In addition, it would also be possible to remove the motivation for harmony by deleting C₂ (resulting in *[kankula-ma]); I assume that this is ruled out by a constraint that penalizes deletion of oral stops.

---

12 As discussed in Section 2.2, *NCV likely stands for a constraint on the contrast between Ns and NCs, requiring NC to be followed by an oral vowel to remain maximally distinct from N. I use the expositionally simpler *NCV here.

13 Given the current constraint set, N₁ and C₁ deletion are also harmonically bounded by (22d): like (22d), both [kakůlů-mpa] and [kanůlů-mpa] incur a MAX violation; unlike (22d), however, they incur multiple DEP-LINK[nasal] violations. Thanks to Sam Zukoff (p.c.) for pointing this out to me.

14 In some western dialects, underlying NCVN₁V is realized as NC₁VN₂V (e.g. /jųmpin+ku/ → /jųmpin-ŋu/), n.g., McConvell 1988:150). It is unclear however that C₂ deletion occurs specifically in response to illicit NC₁VNC₂ in these dialects, as McConvell (1988: 150) also notes that the speakers tend to realize underlying NC as N more generally.
A summary of the ranking arguments illustrated in (21) and (22) above is provided in (23).

(23) Summary of the analysis

\[ \begin{array}{c}
*\mathbf{N}\mathbf{N} \\
*\mathbf{N}\mathbf{C}\mathbf{V} \\
*[\emptyset\text{nasal,+cont}][\text{nasal,+cont}] \\
\text{MAX (MAX-LINK[nasal], MAX-SEGMENT)} \\
\text{DEP-LINK[nasal]} \\
\end{array} \]

Some discussion is necessary here about morphological restrictions on \(N_2\) modification in Gurindji. \(N_2\) modification only applies when \(N_2\) is part of a suffix: thus while underlying \(\text{kankula+mpa/}\) is realized as \(\text{kankula-pa}\), underlying \(\text{tampang karija/}\) is realized faithfully. Given this, it is possible to analyze the variation between [-mpa] and [-pa] (for example) as phonologically conditioned allomorphy, rather than \(N_2\) modification per se. The analysis, informally, would go as follows: [-mpa] is the default exponent of the locative suffix, appearing in the vast majority of phonological contexts. When however the locative suffix attaches to a root of the form \(\ldots \text{NC.} \ldots [+\text{continuant}] \ldots\), the allomorph [-pa] is chosen instead. The explanation behind the appearance of the [-pa] allomorph, given the current interpretation of the data, is also crucially non-myopic. The [-mpa] suffix would trigger a regressive [nasal] spreading process that, when applied fully, would create an illicit NCV sequence. The allomorph [-pa] is chosen to avoid this outcome. Thus even though this analysis would differ slightly in implementation from the analysis proposed above, in both cases [nasal] spreading in Gurindji is non-myopic: its application depends on the satisfaction of a local phonotactic, *NCV.

3.2 On sequential markedness constraints

The sequential markedness constraint introduced above, \*[\emptyset\text{nasal,+cont}][\text{nasal,+cont}], builds blocking effects into its definition. [nasal] is only required to spread from one [+continuant] segment to another; in contexts where a non-continuant precedes a continuant, spreading is not motivated.

It is more standard to assume that blocking in nasal spreading is regulated by a hierarchy of feature co-occurrence constraints that ban the combination of [nasal] and sets of other features (abbreviated as in (24)). Blocking occurs when a general \text{SPREAD[nasal]} constraint, promoting [nasal] spreading (regardless of segmental context), is interleaved within this hierarchy.\textsuperscript{15} If \*\text{NASLIQUID} \gg \text{SPREAD[nasal]}, for example, nasal spreading is blocked by obstruents, fricatives, and liquids; if \*\text{NASOBSSTOP} \gg \text{SPREAD[nasal]}, nasal spreading is blocked only by obstruents.

\[ \begin{array}{c}
*\text{NASOBSSTOP} \gg *\text{NASFRIC} \gg *\text{NASLIQUID} \gg *\text{NASGLIDE} \gg *\text{NASVOWEL} \\
\end{array} \]

In addition to correctly predicting implicational generalizations regarding the typology of blocking segments, this fixed hierarchy is claimed to correctly predict other generalizations. For example, if some class of segments \(x\) contrasts for nasality, then some other class of segments \(y\) must also contrast for nasality, where \*\text{NAS-}x \gg *\text{NAS-}y\) in the scale above (Schourup 1973, Cohn 1993, Schourup 1973, Pulleyblank 1989, Cohn 1993).

\textsuperscript{15}Wilson (2003) rejects \text{SPREAD[nasal]} constraints on grounds of overgeneration. Wilson’s alternative proposal, however, involves restricting the theory in such a way that it precludes the possibility of all non-myopic patterns, including trigger deletion as well as a type of sour grapes pattern attested in Romanian (Steriade 2016; Section 5.1). Given this, I continue to reference \text{SPREAD[nasal]} constraints: even though they overgenerate, they at least do not undergenerate.
Walker 1998, also Pulleyblank 1989). In addition, as noted by Wilson 2003, the ability of [nasal] to dock on a certain class of segments also follows the hierarchy in (24): if [nasal] can dock on a segment in the \(x\) class, it can also dock on a segment in the \(y\) class, where again \(*\text{NAS}-x \gg *\text{NAS}-y\).

It should be noted, however, that some of these generalizations are based on very little data or have substantial exceptions. For example, there has been no systematic study of [nasal] docking; Wilson (2003:14) notes only that all patterns he knows are consistent with (24). And aside from the typology of blockers in [nasal] spreading, evidence for the fully stratified ranking in (24) is sparse: contrastively nasalized glides are rare, it is unclear that contrastively nasalized liquids or fricatives exist (Cohn 1993), and the sole piece of evidence for \(*\text{NASLIQUID} \gg *\text{NASGLIDE}\) comes from Zoque (Wonderly 1951), where a [nasal] prefix nasalizes a word-initial glide ([nasal] + /j/ → [j̃]) but deletes before a word-initial liquid ([nasal] + /l/ → [l], *[̃l]). In addition, the typology of blockers does not always match up with the typology of segment inventories (Flemming 2004: 264–266). With two possible exceptions (see Walker 1998:79–81), laryngeals (e.g. [h], [ʔ]) pattern with vowels in that they are frequent targets of [nasal] spreading. If \(*\text{NASLARYNGEAL}\) is low-ranked, as suggested by its propensity to undergo [nasal] spreading, languages exhibiting contrastively nasalized laryngeals should be common. But this prediction is incorrect, as contrastively nasalized laryngeals are extremely rare, if not unattested; in the two known cases, the contrast is acoustically realized on a following vowel (see Ladefoged & Maddieson 1996, Walker & Pullum 1999 on Kwangali; and Blust 1998, Walker & Pullum 1999 on Seimat).

Wilson (2003) and McCarthy (2009) argue that building the definition of blockers into the harmony constraints (as \(*\{[\text{nasal},+\text{cont}][\text{nasal},+\text{cont}]\}\) does) loses the explanation for parallels between the typology of blockers in nasal spreading, contrasts in nasality, and the ability of [nasal] to dock on certain segments. To the extent that these parallels exist, they are predicted by (24). But whatever the status of (24), it cannot account for the interpretation of the Gurindji data in Section 2: the necessary analysis of blocking by [-continuant] segments is incompatible with the fact that trigger deletion occurs at all. We can analyze the fact that oral stops block spreading, for example, with a general spreading constraint (definition in (25) adapted from Wilson 2003:2) ranked beneath \(*\text{NASOBSSTOP}\). For incomplete spreading to be preferred to trigger deletion, \text{MAX} must dominate \text{SPREAD-L[nasal]}. A tableau for hypothetical /pawanta/ is in (26).

(25) \text{SPREAD-L[nasal]}: for every [nasal] autosegment \(n\), assign one \(\ast\) for every segment that is to the left of \(n\)’s domain (where the \text{domain} of an autosegment is the sequence of segments that are associated to it).

(26) Trigger deletion blocked by \(\text{MAX} \gg \text{SPREAD-L[nasal]}\)

<table>
<thead>
<tr>
<th>/pawanta/</th>
<th>(*\text{NASOBSSTOP})</th>
<th>MAX</th>
<th>\text{SPREAD-L[nasal]}</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [p̃aw̃anta]</td>
<td>(*)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. [pawata]</td>
<td></td>
<td>(*)</td>
<td></td>
</tr>
<tr>
<td>c. [p̃aw̃anta]</td>
<td></td>
<td></td>
<td>(\ast)</td>
</tr>
</tbody>
</table>

But the ranking \(\text{MAX} \gg \text{SPREAD-L[nasal]}\), while necessary to account for myopic blocking by oral stops, is inconsistent with the fact that trigger deletion \textit{does} occur when the alternative is nasalizing a post-NC vowel. Partial [nasal] spreading is only one strategy used to avoid nasalization of inhospitable segments, but the analysis sketched in (26) prevents the possibility of other repairs. The fact

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16I am grateful to Edward Flemming (whose Spring 2016 class notes on blocking in nasal harmony form the basis of this paragraph) and Donca Steriade for discussion on these points.
that myopic blocking and trigger deletion co-exist in Gurindji, given the interpretation of the data in Section 2, cannot be predicted by any analysis claiming that all blocking effects are the result of interleaving a more general SPREAD constraint within the hierarchy in (24). To analyze myopic blocking, it must the case that MAX \(\gg\) SPREAD-L[nasal]; to analyze trigger deletion, it must be the case that SPREAD-L[nasal] \(\gg\) MAX. Put simply, a ranking paradox emerges.

The Gurindji pattern as interpreted in Section 2, then, stands as an argument that sequential markedness constraints like *(∅nasal,+cont)[nasal,+cont] have a place in CON: analysis of mixed blocking effects is impossible without them. Whether nasal harmony processes ought to be analyzed using sequential markedness constraints more generally is a question I leave for future work.

3.3 Evaluation must be global

So far, I have shown that the trigger-deletion interpretation of the Gurindji pattern can be derived in a framework that allows global evaluation of surface candidates. The next step in the argument is to show that the pattern cannot be derived when the domain of evaluation is restricted, e.g. to adjacent segments within a surface candidate. This subsection considers one instantiation of such a framework, the Harmonic Serialist analysis of long-distance spreading processes (McCarthy 2009, 2011), and shows that it cannot generate the pattern.

To rule out the possibility of non-myopic spreading, McCarthy (2009) presents a proposal with three components. The first, that features are privative, is assumed here for [nasal] and needs no further comment. The second is a new variety of harmony-driving constraint, \(\text{SHARE}([F])\), where F stands for any feature that can spread. Since the discussion in this paper focuses solely on [nasal] spreading, I introduce only a specific instantiation of this constraint, \(\text{SHARE}[\text{nasal}]\) (27).

(27) \(\text{SHARE}([\text{nasal}])\): assign one * for every pair of adjacent segments that are not linked to the same token of [nasal].

To avoid certain pathologies of the \(\text{SHARE}([F])\) constraints, McCarthy argues that the analysis of spreading must be couched in Harmonic Serialism, a serialist implementation of Optimality Theory in which Gen can make only one change at a time. Though the question of what constitutes one change is debated, McCarthy (2009) proposes that, regarding autosegmental structure, the following operations count as a single change: (i) inserting a feature and a single association line linking it to some pre-existing structure; (ii) inserting a single association line linking two elements of pre-existing structure; (iii) deleting a feature and a single association line linking it to some pre-existing structure, and (iv) deleting an association line linking two elements of pre-existing structure.

These assumptions make analysis of the Gurindji pattern impossible. To see why, consider first how a successful derivation of /kajira+mpal/ \(\rightarrow\) [k̃ĩr̃a+mpal] would proceed. The fact that [nasal] is allowed to spread shows us that \(\text{SHARE([nasal]])}\) dominates DEP-LINK[nasal] (28). In the first stage of the derivation, high-ranked \(\text{SHARE([nasal]])}\) motivates spreading [nasal] one segment to the left; candidates where [nasal] spreads further than one segment to the left are not considered, as the change between input and output is not gradual and therefore not allowed by Gen. Below, violations of \(\text{SHARE([nasal]])}\) are annotated with pairs of segments that are not both linked to [nasal].

---

17I exclude a candidate with trigger deletion here ([kajira-pal]) because deletion of an entire segment does not satisfy the requirement for gradual change, and is therefore not allowed by Gen; see McCarthy 2009:27–28 for discussion.
In the second step of the derivation, [nasal] spreads to [r], to more fully satisfy \text{SHARE([nasal])} (30).

Steps 3–5 of the derivation proceed similarly, with [nasal] spreading one segment to the left at each step. The final result of Step 5 is in (30); I assume that further spreading of [nasal] to the voiceless stop is prohibited by a feature co-occurrence constraint (e.g. *NASOBSSTOP).

Problems arise when we try to account for deletion of the [nasal] trigger in the NC1…NC2 forms. If we begin with the input /kankula+mpa/, then the ranking established above, \text{SHARE([nasal])} >> \text{DEP-LINK([nasal])}, will require [nasal] to spread from NC2 to the preceding vowel, and from that vowel to the preceding approximant (31). (The tableau below is Step 3 of the derivation, as I assume that the vowels preceding NC1 and NC2 are nasalized in Steps 1 and 2.)

At the next step, however, we see that further satisfaction of \text{SHARE([nasal])} can only occur at the expense of *NC\textbackslash V, the markedness constraint that blocks full application of [nasal] spreading. Assuming that *NC\textbackslash V dominates \text{SHARE([nasal])} (as in Section 3.1), harmony can apply no further.

Here, the derivation converges: [nasal] cannot spread to the post-NC1 vowel, and no constraint can motivate undoing the [nasal] spreading that has already occurred. In other words, the analysis predicts that partial spreading should be the optimal state of affairs, as deletion of the existing links between [nasal] and segments in the input to (31) would result in gratuitous violations of \text{SHARE([nasal])}. The desired result, that deletion of the [nasal] trigger is preferable to partial [nasal] harmony in Gurindji, cannot be derived. This is of course the expected result, as McCarthy’s (2009)
proposal is designed to preclude the possibility of non-myopic patterns.\textsuperscript{18}

If the interpretation of the Gurindji pattern proposed in Section 2 is correct, this poses a substantial problem for McCarthy’s (2009) proposal, and more generally any proposal that precludes the possibility of non-myopic spreading (e.g. Wilson 2003). This is because the ability of [nasal] to spread from some segment $z$ to another segment $y$ is dependent on whether it will be able to further spread to $w$: any successful analysis of this pattern must be one in which evaluation is global.

4 Alternatives

The analysis of Gurindji N\textsubscript{2} modification proposed above is successful, as it makes sense of the constraints on interveners. But it is also surprising: trigger deletion is a type of non-myopic pattern, and non-myopic patterns are often argued to be unattested (e.g. Wilson 2003, McCarthy 2009). This section discusses two alternative interpretations of the data and argues that neither is more desirable.

4.1 Nasal cluster effects as dissimilation

An alternative analysis of the Gurindji data could claim that N\textsubscript{2} modification is a dissimilatory process, perhaps driven by an OCP constraint banning multiple NCs from occurring within a single word.\textsuperscript{19} This constraint is defined in (33) (see esp. Suzuki 1998 on the OCP in OT).

\begin{equation}
*\text{NC}...\text{NC}: \text{assign one } * \text{ for each pair of NC sequences within a phonological word.}
\end{equation}

A form like /kanka+m\textipa{p}a/ would be penalized by *NC...NC; the fact that /kanka+m\textipa{p}a/ surfaces as [kanka] shows that *NC...NC dominates MAX-SEGMENT, which penalizes the change (34).

\begin{equation}
\text{Nasal cluster effects as } *\text{NC}...\text{NC} >> \text{MAX-SEGMENT}
\end{equation}

<table>
<thead>
<tr>
<th>/kanka+m\textipa{p}a/</th>
<th>*NC...NC</th>
<th>MAX-SEGMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. [kanka-m\textipa{p}a]</td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>b. [kanka-p\textipa{a}]</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

There are however a number of arguments that is not the correct analysis of the pattern attested in Gurindji, and of nasal cluster effects more generally. Below I outline three such arguments.

4.1.1 Asymmetries in the typology of dissimilation

Nasal cluster effects do not fit comfortably within the typology of dissimilation. Dissimilatory processes tend to target segments that share one or more features (e.g. [+labial] or [+spread glottis]). NCs can, but are not necessarily, treated as single segments by the language’s phonology (e.g. Riehl 2008); in Gurindji, many of the NCs involved in nasal cluster effects are heterorganic and therefore likely clusters (McConvell 1988:142–143, McConvell 1993:20–24). Regardless of the segment vs. cluster status of an NC, however, they can only be characterized using a sequence

\textsuperscript{18}The HS analysis also fails under the alternative assumption that the variation between [-mpal] and [-pal] (for example) is one of allomorphy (see Section 3.1). Assuming that allomorph selection occurs in the first step of the derivation (following McCarthy 2009), the undesirable effects of affixing the default [-mpal] to roots like /kanka/ will not be visible until [nasal] spreads regressively, in subsequent steps of the derivation.

\textsuperscript{19}Alternatively, a ban on multiple NCs could be seen as a result of a gang effect (in a weighted constraint model; e.g. Pater 2009), or local conjunction of *NC (e.g. Alderete 1997). This analysis is open to the criticisms outlined below.
of features (e.g. Steriade 1993a; see Anderson 1976 on difficulties of representing NCs with one feature matrix). In Bennett’s (2015) comprehensive survey of long-distance dissimilatory processes, the only dissimilation patterns listed that target sequences of features involve NCs (35).

(35) Summary of Bennett’s (2015) survey (see Bennett 2015 for references)

<table>
<thead>
<tr>
<th>Segments</th>
<th>Featural description</th>
<th>No.</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>C Place</td>
<td>[+lab], [+cor], [+dors]</td>
<td>42</td>
<td>Akkadian</td>
</tr>
<tr>
<td>Nasal</td>
<td>[nasal]</td>
<td>2</td>
<td>Takelma</td>
</tr>
<tr>
<td>Laryngeal Features</td>
<td>[+const. glottis], etc.</td>
<td>29</td>
<td>Chol</td>
</tr>
<tr>
<td>Continuancy</td>
<td>[+continuant]</td>
<td>5</td>
<td>Chaha</td>
</tr>
<tr>
<td>Liquids/Rhotics</td>
<td>[+cons, +son, ±lat]</td>
<td>22</td>
<td>Latin</td>
</tr>
<tr>
<td>Sibilants</td>
<td>[+strident]</td>
<td>4</td>
<td>Nkore-Kiga</td>
</tr>
<tr>
<td>Voicing</td>
<td>[-voice]</td>
<td>29</td>
<td>Kinyarwanda</td>
</tr>
<tr>
<td>NC sequences</td>
<td>[nasal][∅nasal]</td>
<td>21</td>
<td>Gurindji</td>
</tr>
</tbody>
</table>

Why should NCs be the only exception to the generalization that dissimilatory processes target segments? Even if there were an obvious answer, there are asymmetries in the typology of nasal cluster effects that would go unexplained under an analysis in which they are motivated by an OCP constraint. For example, with only a single exception\(^{20}\), all languages that ban NC\(_1\) VNC\(_2\) also ban NC\(_1\) VN\(_2\)V. The results in (36) are from Stanton (2016); see also Herbert (1977, 1986).

(36) Repair of NC\(_1\) VN\(_2\)V implies repair of NC\(_1\) VNC\(_2\)

<table>
<thead>
<tr>
<th></th>
<th>*NC(_1) VN(_2)V</th>
<th>√ NC(_1) VN(_2)V</th>
</tr>
</thead>
<tbody>
<tr>
<td>*NC(_1) VNC(_2)</td>
<td>34</td>
<td>27</td>
</tr>
<tr>
<td>√ NC(_1) VNC(_2)</td>
<td>1</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

If nasal cluster effects are motivated by an OCP constraint, the source of the implicational generalization in (36) is unclear. Because NC\(_1\) VN\(_2\)V does not violate *NC...NC, it needs no repair. One must explain, under an analysis where *NC...NC is responsible for the ban on NC\(_1\) VNC\(_2\), why repair of NC\(_1\) VN\(_2\)V should imply satisfaction of *NC...NC. Furthermore, even if it were possible to formulate an OCP constraint that could penalize both *NC...NC and *NC...N, without further amendment this constraint would penalize both *N...NC and *NC...N. This, however, is not the empirical result we want: while restrictions on NC...N are widely discussed in the literature, restrictions on N...NC are not.\(^{21}\)

The implicational generalization in (36) is, however, predicted by an account under which the dispreference for NC\(_1\) VNC\(_2\) is due to coarticulatory nasalization on the vowel, which compromises

\(^{20}\)The exception is Bolia (Niger-Congo; Mamet 1960, Meeussen 1963), where the plural morpheme /ŋη/ is claimed to be realized as [ŋ] preceding a VNV-initial word. The reasons for disregarding this exception have to do with the quality of the description: it is brief, and little data is provided, leaving open the possibility that the plural morpheme’s shape is at least partially controlled by other factors. The reader may wonder, though, why disregarding this typological outlier is justified, when this article is largely about what we can learn from Gurindji, which is an outlier in other ways. On this point it is important to note that McConvell’s (1988) description of the Gurindji pattern is thorough, supplemented with large amounts of data, and consistent with descriptions of related languages (fn. 24). Unlike Mamet’s description of Bolia, McConvell’s description of Gurindji leaves little room for speculation that the facts are otherwise.

\(^{21}\)The only language I’m aware of in which combinations of Ns and NCs are penalized, regardless of order, is Ngbaka (Ubangian, Thomas 1963). Crucially, though, this doesn’t appear to be driven by a OCP constraint, as a single word can contain either multiple Ns or NCs (e.g. [nuz’inz’ilänbü] ‘butterfly’; Thomas 1963: 46).
cues to the contrast between NC₁ and a plain nasal. Relevant here is a cross-linguistic asymmetry regarding the amount of nasalization induced by onset and coda nasals: when a difference exists, vowels are more nasalized before coda than before onset nasals (e.g. Schourup 1973, Diakoumakou 2004, Jeong 2012, Stanton to appear for summaries), as diagrammed schematically below.

(37) Coda nasals induce more anticipatory coartication
    a. NC₁  V  ˜V  NC₂
    b. NC₁  V  ˜V  N₂V

Recall that one of the most important cues to the N–NC₁ contrast is the quality of the following vowel: NC₁ is identifiable as such when preceding an oral vowel, but consistently misidentified as N when preceding a nasal vowel (Beddor & Onsuwan 2003). Assuming this effect is gradient, and that the greater the amount nasalization in the vowel following NC₁, the less distinct NC₁ will be from N, we expect for the contrast between NC₁ and N to be more distinct in NC₁VN₂V (where the vowel is less nasalized, (39)) than it is in NC₁VNC₂ (where the vowel is more nasalized, (38)).

(38) N–NC₁ less distinct in NC₁VNC₂
    a. NC₁  V  ˜V  NC₂
    b. N₁  ˜V  NC₂

(39) N–NC₁ more distinct in NC₁VN₂V
    a. NC₁  V  ˜V  N₂V
    b. N₁  ˜V  NC₂

If the constraint that disprefers NC₁VN₂(C) sequences is a constraint on the distinctiveness of the N–NC₁ contrast (as discussed above; also Stanton 2016), then we might expect for any distinctiveness constraint that penalizes N–NC₁ in NC₁VN₂V (where it is more distinct) to also penalize N–NC₁ in NC₁VNC₂ (where it is less distinct). Framed this way, the generalization that repair of NC₁VN₂V implies repair of NC₁VNC₂ is just one instantiation of a more general observation that a dispreference for some contrast x–y in a context where the cues to the contrast are readily available implies a dispreference for x–y in all contexts where the cues are less available (e.g. Steriade 1997).

In addition, the fact that many languages ban NC…N but not N…NC is predicted by the account outlined above. In NC…N, the contrast between NC and a plain nasal consonant is compromised by anticipatory nasalization from N (see (38–39)). But in N…NC, this problem does not arise. The generalization that repair of NC₁VN₂V implies repair of NC₁VNC₂ is only one fact about the typology of nasal cluster effects that a contrast-based analysis predicts, but an OCP-motivated analysis has trouble accounting for. Others exist; see Stanton (2016) for discussion and analysis.²²

²²Are vowels preceding NCs nasalized in languages that ban NC₁VNC₂? Stanton (2016) does not provide any such evidence, and an investigation into this question is beyond the scope of this study.
4.1.2 Constraints on interveners

Recall that whether or not nasal cluster effects are attested in Gurindji depends only on the nature, and not the amount, of intervening material. If the intervening material contains only continuants, NC₁VNC₂ is banned (40). If it contains one or more non-continuants, NC₁VNC₂ is licit (41).

(40) \[ NC₁\ldots [+cont]\ldots NC₂ \rightarrow NC₁\ldots [+cont]\ldots (C)C₂ \]

(41) \[ NC₁\ldots [-cont]\ldots NC₂ \rightarrow NC₁\ldots [-cont]\ldots NC₂ \]

This sensitivity to the identity of the material between the two NCs does not resemble what we know about the typology of blocking in dissimilation. While it is common for dissimilatory processes to fail to apply (or apply less regularly) as the offending segments grow further apart (e.g. Suzuki 1998, Zymet 2014), it is not clear that any attested dissimilatory pattern is sensitive to the identity of the intervening material. Every clear case of blocking in dissimilation (i.e. those cases discussed in Bennett 2015’s Chapter 8) can be analyzed as an interaction among competing OCP constraints (Stanton 2017; cf. Suzuki 1998; Bennett 2015); the Gurindji pattern, however, cannot be analyzed in this way. Dissimilatory processes tend to care about how much but not what material intervenes, but N₂ modification in Gurindji displays the opposite preference.

4.1.3 Constraints on interveners, II

So far, the arguments against the OCP-motivated analysis have amounted to the following: if nasal cluster effects in Gurindji are dissimilatory effects, they are typologically unusual. But the argument can be made stronger by showing that the OCP-based analysis fails on its own terms.

Up to this point, we have focused only on repairs to NC₁…NC₂. But as predicted by the analysis in Section 3.1, the more accurate description of the pattern is that Gurindji disfavors NC₁…N₂ in all contexts where N₂ is in coda position, including when N₂ is word-final (in certain morphological contexts). Take for example the suffix /-jin/, which is usually realized faithfully (ku[a]-jin ‘from the south’, McConvell 1988:147). When the /n/ in /-jin/ serves as N₂ in an NC₁…+[cont]…N₂ sequence, it denasalizes. (Note that the analysis of N₂ deletion vs. N₂ denasalization outlined in Section 2.1 correctly predicts that N₂ denasalization is the preferred repair to NC₁VN₂, since deletion of the nasal would result in the deletion of its place features.) This instance of N₂ denasalization can also be non-local, and it obeys the familiar constraints on interveners (42).

(42) N₂ modification affects the suffix /-jin/ (McConvell 1988: 148)
   a. /kanka+jin/ → [kanka-jit]
      “from upstream”
   b. /kŋŋuli-jin/ → [kŋŋuli-jit]
      ‘from below’
   c. /kula-ŋku[a]-jin/ → [kula-ŋku[a]-jit]
      ‘from the south side of the river’
   d. /kara-ŋkara-jin/ → [kaara-ŋkara-jit]
      ‘from the east side of the river’

If a constraint of the form *X…X motivates nasal cluster effects in Gurindji, *NC…NC cannot be the correct constraint, as it will not penalize NC₁…N₂ (42). The examples of N₂ modification in (42) diagnose a restriction on multiple coda nasals within the same word, as formalized in (43).
Appealing to structural position when assessing similarity is not an unprecedented move. For example: to explain some complexities that arise in the analysis of Kikongo nasal harmony, Rose & Walker (2004:510–512) argue that nasals sharing a syllabic role (or, alternatively, a vocalic context) are more similar than nasals that don’t. But while redefining the OCP constraint as in (43) is not in itself problematic, the consequences of this move are, as it becomes much more difficult to state a coherent generalization regarding the set of possible interveners. Notice that, in the forms in (42), stops do not block N₂ denasalization: the stop that immediately follows N₁ does not prevent denasalization from occurring. Elsewhere, however, we have seen that stops do block N₂ modification; relevant data from Table 2 is summarized in Table 3.

<table>
<thead>
<tr>
<th>Blocker</th>
<th>Form</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>...p...</td>
<td>[tu-ŋantuŋpa-nkulu ha-na]</td>
<td>'they saw us'</td>
</tr>
<tr>
<td>...t...</td>
<td>[nampijita-wuŋja]</td>
<td>'(animal) lacking a female'</td>
</tr>
<tr>
<td>...k...</td>
<td>[wąpiŋi-kura-njina ka-na]</td>
<td>'where did you take them?'</td>
</tr>
</tbody>
</table>

The contrast between the data in (42) and Table 3 is diagrammed schematically below: a post-N₁ stop does not block N₂ modification (44a), but a stop in any other position does (44b).

(44) a. Post-N₁ stop does not block N₂ modification

\[
\begin{array}{c}
\ast \\
N₁ T \ldots N₂ \\
\end{array}
\]

b. Other stops block N₂ modification

\[
\begin{array}{c}
\checkmark \\
N₁ T \ldots T \ldots N₂ \\
\end{array}
\]

To explain the situation in (44), we could propose one of at least two modifications: (i) only intervocalic stops block N₂ modification, or (ii) two stops are necessary to block N₂ modification (one on its own is transparent). In both cases, it is necessary to claim that stops sometimes, but not always, block N₂ modification; in neither case is it clear what the analysis of this fact would be. Under an analysis in which the dispreference for NC₁...N₂ in Gurindji is a dissimilatory effect, it is difficult if not impossible to state a coherent generalization regarding the set of segmental interveners.

### 4.2 Nasal cluster effects as spreading of [-nasal]

A second alternative analysis of the Gurindji facts, proposed by McConvell (1993), claims that [±nasal] is a bivalent feature, and that N₂ deletion and denasalization arise as a consequence of
progressive [-nasal] spreading. In /kankula-mpa/, for example, [-nasal] spreads from the second /k/ and denasalizes /m/, resulting in a geminate [pp] (that is later simplified to singleton [p]) (45).

(45) Nasal cluster effects as [-nasal] spreading

\[
\text{k a n k u l a - m p a} \rightarrow \frac{\text{k a n k u l a - p p a}}{[-\text{nasal}]} \quad \frac{\text{\[-nasal\]}}{}
\]

McConvell proposes that oral and nasal stops block spreading due to a constraint on line crossing: [-nasal] is blocked from further propagation when it encounters a segment specified as either [-nasal] or [+nasal]. (A necessary assumption here is that oral stops are [-nasal] and nasal stops are [+nasal]; all other segment types in Gurindji are unspecified for [±nasal].) Thus in /ŋu-ŋantipaŋkulu/ (from [ŋu-ŋantipaŋkulu ŋa-ŋa] ‘they saw us’, Table 2), the [-nasal] feature that spreads from /t/ is blocked by [-nasal] /p/ (46); in /ŋanta-ŋaŋku/ (from [ŋanta-ŋaŋku ja-n-ku] ‘I want to go to you’, Table 2), [-nasal] does not reach /ŋ/ because its propagation is blocked by [+nasal] /ŋ/.

(46) Oral stops block [-nasal] spreading

\[
/\frac{\text{ŋu-ŋantip NRA aŋku}}{[+\text{nasal}][+\text{nasal}][+\text{nasal}][+\text{nasal}][-\text{nasal}] [+\text{nasal}][+\text{nasal}]}
\]

(47) Nasal stops block [-nasal] spreading

\[
/\frac{\text{ŋanta-ŋaŋku}}{[+\text{nasal}][+\text{nasal}][+\text{nasal}][+\text{nasal}][+\text{nasal}]}
\]

At first glance, this analysis appears to be preferable to the analysis proposed above, as we do not have to posit the existence of a [nasal] spreading process for which there is no phonetic evidence. But even with this consideration taken into account, there are reasons why the trigger deletion analysis proposed in this paper is preferable to the analysis schematized in (46–47). Principle among these is the fact that McConvell’s (1993) analysis does not generate the observed data. For example, there is no reason provided as to why only post-nasal stops trigger [-nasal] spreading. Furthermore, there is no component of the analysis mandating that a singleton nasal stop block [-nasal] spreading, but that a nasal consonant followed by an oral stop should undergo it. In other words, the status of an oral or nasal consonant as a trigger or target of [-nasal] harmony depends on its position with respect to other [±nasal] stops; there is no component of the analysis that captures this distinction.

Beyond this, there are more general issues with the proposal that [-nasal] can spread. Steriade (1993b) claims that there is no known case of [-nasal] spreading, long-distance or otherwise; spreading of [+nasal] is however quite frequent. Allowing for the possibility that [-nasal] can spread predicts patterns like in (48) (adapted from Steriade 1993b:335), where [-nasal] spreads from stressed oral vowels. If the stressed vowel is oral, all following segments must be oral; if the stressed vowel is nasal, the following segments can be either oral or nasal, as [+nasal] does not spread.

\[23\]To account for the fact that in some dialects /p/ and /k/ do not block [-nasal] spreading (see earlier discussion in fn. 6), McConvell 1993:29ff (see also McConvell 1988:162ff) appeals to a strength hierarchy of constraints, argued to be relevant to other aspect of the phonotactics of Australian languages.
Unattested nasal spreading pattern

a. Stressed oral vowel must be followed by oral segments
   ✓ badaga, but *banaña

b. Stressed nasal vowel can be followed by oral or nasal segments
   ✓ bādaga, ✓ bānaña

While (48) is unattested, the mirror-image situation – where [+nasal] but not [-nasal] spreads from stressed vowels – is relatively common, attested in Guaraní (e.g. Rivas 1975) and Urak Lawoi’ (Hogan 1988), among others. The broader fact that there are many patterns where [+nasal] must be realized over a multi-segment domain, but none where [-nasal] must be, suggests that [+nasal] but not [-nasal] can spread. Put differently, the option to spread [-nasal] does not appear to be one that we want the phonological grammar to have, as it leads to massive overgeneration.

Thus if [-nasal] spreading is the correct analysis of N₂ modification in Gurindji and other languages, it would be the only known example of [-nasal] spreading. Given that it is possible to reanalyze the data as an example of the typologically more common process of [+nasal] spreading, this seems a prudent move to make. (Note that a proponent of the [-nasal] spreading analysis could reverse this argument, as allowing [-nasal] spreading would allow us to avoid making the claim that [+nasal] harmony can be triggered by only coda nasals, and that non-myopic patterns exist. The first claim does not seem so far-fetched: while this pattern is otherwise unattested, the two components necessary to generate it – [+nasal] harmony and greater nasalization preceding coda nasals – are. The second claim, that non-myopic patterns exist, is backed up by the discussion below. By contrast, the claim that [-nasal] spreading is possible has no typological precedent.)

5 Discussion and conclusions

In this paper, I have shown that nasal cluster effects in Gurindji can be analyzed as an example of trigger deletion, a type of non-myopic pattern in which a spreading trigger deletes when full application of spreading is dispreferred. Although the evidence for a process spreading [nasal] in Gurindji is indirect, I have argued that it is the best available interpretation of the data. Similar patterns attested in the other Eastern Ngumpin languages (Mudburra and Ngarinyman; see McConvell 1988, 1993; Nichols 2016) make the same points as the Gurindji pattern discussed here.²⁴

If the interpretation of the Gurindji pattern proposed in Section 2 is correct, it stands as an argument for global evaluation. As demonstrated in Section 3.3, in frameworks that preclude non-myopia, the only outcome that can be derived in NC₁…NC₂ contexts is partial spreading (49). This is, however, not the desired result: instead, the spreading process is aborted through deletion of the trigger when its domain contains certain kinds of material.

(49) Unattested partial spreading

```
NC₁ x x x NC₂  →  NC₁ x x NC₂  →  NC₁ x x x NC₂
\[\text{[nasal]}\]  \[\text{[nasal]}\]  \[\text{[nasal]}\]
```

²⁴The Ngarinyman pattern is presented briefly in Nichols (2016) and discussed in more depth in Jones (1994), the latter of which is not available to me. I have been unable to locate a source of data for Mudburra long-distance nasal cluster effects, but their existence is implied by McConvell 1993:12. An additional possible case exists in Jaru (Central Ngumpin, Pama-Nyungan), but the specifics of this process are not clear (Tsunoda 1981; also McConvell 1993:44).
In the following subsections, I summarize what is currently known regarding the typology of non-myopic processes, with the aim of showing that, even if the proposed interpretation of Gurindji nasal cluster effects is later shown to be incorrect, there is still substantial evidence that the correct theory of the phonological grammar must be one in which surface candidates are globally evaluated. A pattern in Romanian that greatly resembles the well-known sour grapes pathology (Steriade 2016) is discussed in Section 5.1; other apparently non-myopic processes are briefly discussed in Section 5.2. While it has been shown that some of these patterns can be analyzed in frameworks that preclude global evaluation, this is not true for all.

5.1 Across-the-board raising in Romanian

The term sour grapes (name from Padgett 1995) describes a type of non-myopic pattern in which a language chooses not to initiate a spreading process, based on the knowledge that some restriction will eventually cause spreading to fail. Such patterns are commonly argued to be unattested (though cf. Bickmore & Kula 2013 on Copperbelt Bemba), and their apparent absence is often used as a reason to exclude the possibility of non-myopia more generally (e.g. McCarthy 2009:3–4). This subsection summarizes work by Steriade (2016) which shows that a productive process with a similar character exists in Romanian.

In modern Romanian, two morphological contexts cause an input /a/ raises to an output [A]. The first, in (50): if a stem [a] loses primary stress under suffixation, that vowel is realized as [A] in the suffixed form. That loss of stress is necessary in this context is exemplified by (50f), where an [a] that does not lose stress does not raise. The second, in (51): a stressed [a] in the stem raises when the feminine plural suffix ([–i], realized as [–i] in clitic-group final position) is added. The fact that only (formerly) stressed [a]s raise is illustrated in (50g) and (51c), where a pretonic [a] fails to raise given addition of the same suffixes that motivate raising elsewhere. (A note on Steriade’s sources of data, reproduced here: D = dexonline.ro, a large online dictionary; G = searches performed on Google, when a dictionary entry was not available.)

(50) Romanian [a]-raising due to loss of stress (Steriade 2016)

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a. săni-e ‘sled’ săni-úts-Á ‘sled-DIM’ (D)  
b. pákost-e ‘trouble, disaster’ pákost-áf ‘trouble-maker’ (D)  
c. bár-b-Á ‘beard’ bár-bós ‘bearded-MASC’ (D)  
d. ispráv-Á ‘deed’ ispráv-nik (nobleman’s title) (D)  
e. mafín-Á ‘car’ mafín-útsA ‘car-DIM’ (D)
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(51) Romanian [a]-raising due to addition of feminine plural suffix (Steriade 2016)

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a. săni-e ‘sled’ săni-­ì ‘sled-PL’ (D)  
b. bár-b-Á ‘beard’ bár-b-­ì ‘beard-PL’ (D)  
c. mafín-Á ‘car’ mafín-­ì ‘car-PL’ (D)
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Both [a]-raising processes are fully productive, with some caveats regarding register (nonce derivatives must belong to the casual register) and morphology (at least some part of the nonce derivative must signal that it belongs to the native lexicon).

Consider now what happens when the [a] forced to raise by (50) or (51) is a member of a string of [a]s. Given that raising targets only one vowel, and that stressless [a]s do not raise ((50g), (51c)), we would expect for only the targeted [a] to raise. What we find, however, is that if one [a] in a sequence of [a]s raises, all must raise (subject to constraints discussed below). (52) illustrates, with
examples from both kind of [a]-raising.

(52) Romanian [a]-raising targets strings of [a]s (Steriade 2016)
   a. kalafát ‘pitch’ kalafaut-uf ‘to seal with pitch’ (D)
   b. taráb- ‘market stall’ tarab-öi ‘noise, as in a market’ (D)
   c. pitpalák ‘quail’ pitpálak-öi ‘male quail’ (D)
   d. matahál- ‘giant’ matalhál-i ‘giant-PL’ (D)
   e. katarám- ‘buckle’ katarám-i ‘buckle-PL’ (D)
   f. salát- ‘salad’ saláts-i ‘salad-PL’ (G)

It is crucial that the string of [a]s is uninterrupted; if the [a]s are interrupted by a vowel with a different quality, only the (formerly) stressed [a] raises. The data in (53) thus provide further evidence that [a]-raising does not target all [a]s in the stem; what is special about the forms in (52) is that the [a] forced to raise is part of an uninterrupted sequence of [a]s.

(53) [a]-raising does not target interrupted [a]-strings (Steriade 2016)
   a. urangután ‘orangutan’ urangutan-én ‘orangutan-DIM’ (G; *urangután-én)
   b. kapitál- ‘capital city’ kapitál-úts- ‘capital-DIM’ (D; *kapitál-úts-)
   c. fakultát- ‘faculty’ fakultáts-i ‘faculty-PL’ (D; *fakultáts-i)
   d. katedrál- ‘cathedral’ katedráls-i ‘cathedral-PL’ (G; *katedráls-i)

Steriade (2016) analyzes (52) as an across-the-board shift, enforced by a base-derivative correspondence constraint (e.g. Benua 1997): if two vowels in some base are identical for F1 (or [+low], [+high]), then their correspondents in a derivative must also be identical for F1.

Of interest here are the ways in which this across-the-board raising process interacts with phonotactic constraints that govern the distribution of [a]. Here I focus on the effects of one: an absolute prohibition on [a] in onsetless syllables, both word-initially and elsewhere, abbreviated as *#a. As shown in (54), the ban on onsetless [a] prevents [a]-raising from occurring when the targeted vowel is in an onsetless syllable. And as shown in (55), this same ban prevents across-the-board raising of an initial onsetless [a]s that is adjacent to the targeted [a].

(54) [a]-raising blocked by *#a (Steriade 2016)
   a. álb ‘white’ alb-úts ‘white-DIM’ (D; *Álbúts)
      cf. kál ‘horse’ kal-úts ‘horse-DIM’
   b. áp ‘water’ ap-ík- ‘water-DIM’ (D; *Ap-ík-)
      cf. páp ‘food’ páp-ík- ‘food-DIM’
   c. álbi-e ‘washtub-FEM’ álbi-i ‘washtub-FEM.PL’ (D; *Álbi-i)
      cf. sáltfi-e ‘willow-FEM’ sáltfi-i ‘willow-FEM.PL’

(55) Across-the-board [a]-raising blocked by *#a (Steriade 2016)
   a. aráb ‘Arab’ aráb-ésk ‘Arabian’ (D; *Aráb-ésk, *aráb-ésk)
   b. albátj ‘place name’ albátj-éan ‘man of Albac’ (G; *Albátj-éan, *albatj-éan)
   c. amár ‘bitter’ amar-új ‘bitterish’ (D; *Amár-új, *amar-új)
   d. alám- ‘bronze-FEM’ álám-úrij ‘bronze-FEM.PL’ (D; *Alám-úrij, *álam-úrij)

Crucial to this discussion is the behavior of words in which the onsetless [a] and the [a] targeted for [a]-raising are non-local. As shown in (56), in this situation, across-the-board [a]-raising is not

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25The other phonotactic, a ban on [a] following palatal consonants, works equivalently for the current purposes.
initiated: only the morphologically-motivated [a]-raising occurs.

(56) Across-the-board [a]-raising blocked by *#A (Steriade 2016)
   a. aragáz ‘gas stove’ aragaz-él ‘gas stove-DIM’
      (G; *aragaz-él, *aragaz-él)
   b. atanáse (name) atanasésku ‘Atanase-PATRONYMIC’
      (G; *atanasésku, *atanasésku)
   c. avangárd-á ‘vanguard’ avangárz-i ‘vanguard-FEM.PL’
      (G; *avangárd-i, *avangárz-i)

When framed in derivational terms, this pattern is clearly non-myopic: in words that contain multiple [a]s ([a₁a₂a₃], where a₃ is the vowel targeted for morphological [a]-raising), whether or not a₂ raises is crucially dependent on whether or not a₁ is able to raise. If a₁ is able to raise, then a₂ raises, as in (52); if however a local phonotactic prevents a₁ from raising, then a₂ does not raise (56). The restriction that across-the-board [a]-raising is only initiated if each [a] in a sequence of [a]s can undergo is reminiscent of the schematic sour grapes patterns argued to be pathological in much of the literature on unbounded spreading.

Steriade (2016) shows that the pattern described here can be easily derived in parallel OT, given the existence of a (i) a transderivational constraint demanding that a sequence of vowels identical for F₁ in the base is identical for F₁ in the derivative, and (ii) local phonotactics that govern the distribution of [a] (e.g. *#A). Like the proposed Gurindji pattern, the Romanian pattern cannot be analyzed in Harmonic Serialism, given current assumptions (as demonstrated by Steriade 2016), or any other framework that prohibits global evaluation. The inability of such theories to analyze the patterns found in Gurindji and Romanian is due to the simple fact that, in both cases, what happens at step x of the derivation is dependent on what will happen at some later step y.

5.2 Other apparent cases of non-myopia

In addition to the Romanian pattern summarized above, there are several other cases that have a non-myopic character, in that full application of an unbounded spreading process depends on the satisfaction of other constraints. (For discussion of additional patterns that bear a less close relation to the cases already discussed, see Walker 2014 and Ryan 2016 on non-local trigger-target relations.) In these four remaining cases, spreading only occurs if the spreading feature succeeds in reaching some targeted position over the course of the derivation. If the targeted position is absent or otherwise inaccessible, then spreading fails. This type of pattern is schematized below.

(57) Spreading if target is present
   a. If target (T) is present, spread [F] all the way to target.
      \[ T \ x \ x \ x \rightarrow T \ x \ x \ x \]
      \[ \text{[F]} \]
   b. If no target is present, don’t spread [F].
      \[ x \ x \ x \rightarrow x \ x \ x \]
      \[ \text{[F]} \]
One pattern of this kind comes from metaphony in two Italian dialects: Central Veneto and Grado (Walker 2010, though cf. Mascaro 2016). In these languages, a regressive raising process triggered by post-tonic high vowels is initiated only if it ultimately succeeds in raising the stressed vowel. For example: stressed /e/ is capable of raising to [i], but stressed /e/ is not (see Walker 2010 for more details). In an [ɛ₁e₂i₃] string, both [ɛ₁] and [e₂] raise, yielding [i₁i₂i₃]. In [ɛ₁e₂i₃], however, neither raises, yielding [ɛ₁e₂i₃]. This process is non-myopic: whether or not [e₂] raises depends on whether the preceding stressed vowel is also able to raise. A second pattern of this kind comes from Kinyarwanda sibilant harmony, where regressive retroflexion harmony spreads regressively only if a possible undergoer resides within the harmony domain (Walker et al. 2008, Hansson 2010). This process is also non-myopic: whether or not retroflexion spreading propagates regressively depends on whether or not it will reach a desirable target. And finally, a third pattern with this character comes from bounded tone spreading in Copperbelt Bemba (Bickmore & Kula 2013, Jardine 2016), where a high tone spreads to the end of the word /bá-ka-fik-a/ → [bá-ká-fiká] ‘they will arrive’, Bickmore & Kula 2013: 110), unless the final vowel already hosts a high tone, in which case bounded ternary spread occurs (e.g. /bá-ka-londolol-a kó/ → [bá-ká-lóndolól-a kó] ‘they will introduce them,’ Bickmore & Kula 2013: 111). The choice between bounded and unbounded spread is thus non-myopic: unbounded spreading occurs unless full application would cause two [high] autosegments to be associated to adjacent vowels (violating OCP[high]).

These patterns are however unlike the Gurindji and Romanian patterns discussed above, as they are examples of bounded harmony, and it has been shown cases of apparently non-myopic bounded harmony can be derived without making use of global evaluation. For example, Kimper (2012) shows that the metaphony patterns of Central Veneto and Grado can be derived in Harmonic Serialism, assuming that metaphony directly targets the stressed vowel (and that raising subsequently applies to the vowels that intervene between the stressed and the final vowel); Pater (2016) provides a similar analysis for Copperbelt Bemba. Such analyses are not available for Gurindji or Romanian, however, as there is no sense in which spreading occurs to satisfy some goal.

5.3 Summary

Evidence from Gurindji, Romanian, and others suggests that non-myopic patterns exist, and that any successful theory of the phonological grammar must be able to account for the existence of both myopic and non-myopic spreading. This desideratum supports models of the grammar like standard Optimality Theory (Prince & Smolensky 2004), in which well-formedness is globally assessed over entire surface candidates; it disqualifies models like Serial Harmony (McCarthy 2009), in which non-myopia is ruled impossible.

But this conclusion perhaps raises more questions than it answers. In particular: if non-myopic processes are possible, why are they not widespread? Why, in the vast majority of cases, is spreading myopic? I leave this and other questions to future work, but note that even the small class of non-myopic patterns summarized above has implications for our understanding of the nature of the phonological grammar. One of the most basic desiderata of a theory of phonology is that it should predict all existing patterns; this includes the non-myopic ones.
References


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