

# Gurindji nasal cluster dissimilation as trigger deletion\*

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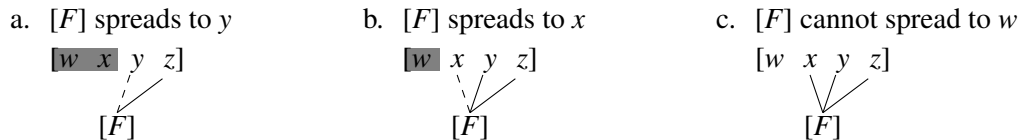
## Abstract

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: 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 (description after Walker 2014). 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



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

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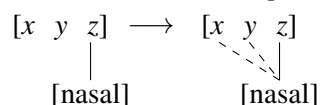
one in which the language anticipates that  $[F]$  will be unable to spread from  $x$  to  $w$ , and adjusts its behavior accordingly. The language could choose to not initiate the spreading process, for example, based on the knowledge that spreading will eventually fail.

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.

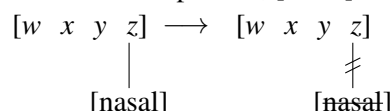
This paper suggests that a non-myopic [nasal] spreading process is attested in Gurindji (Pama-Nyungan, McConvell 1988, 1993). When full application of [nasal] spreading would violate a local phonotactic, the trigger deletes, blocking spreading from occurring. Although phonetic evidence to support this proposal is limited (see Section 2.4), I argue that it is a plausible 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).<sup>1</sup>

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

- a. If blocker  $w$  is absent, [nasal] spreads from  $z$  to  $x$ .



- b. If blocker  $w$  is present, [nasal] deletes.



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 has implications for theories of unbounded spreading and the structure of the phonological grammar more generally. The only theories that can account for its proposed interpretation are those in which surface candidates are globally evaluated.

## 2 Gurindji nasal cluster dissimilation

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 2018a). Languages repair sequences like *ambanda* in a variety of ways: many delete either the first oral (*ambanda* → *amanda*) or second

<sup>1</sup>I assume throughout that the feature [nasal] is privative (e.g. Steriade 1993b), but this is not crucial to the analysis.

nasal consonant (*ambanda* → *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 dissimilation, following McConvell (1988).

Regardless of repair, nasal cluster dissimilation often exhibits segmental or contextual restrictions. In Gurindji, if the material that intervenes between NC<sub>1</sub> and NC<sub>2</sub> contains only [+continuant] segments, nasal cluster dissimilation must occur, subject to certain morphological restrictions (*ambawanda* → *ambawada*, \**ambawanda*). If however the intervening material contains a [-continuant] segment, nasal cluster dissimilation is blocked (*ambatanda* → *ambatanda*, \**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 Preliminaries: phonemic inventory

I first provide basic information regarding the inventory and transcription of Gurindji phonemes, to aid in interpreting the data that follow. This discussion is based on McConvell (1988:136-137).

Gurindji has a small vowel inventory, composed of the short vowels /i/, /a/, and /u/. The quality of these vowels varies according to context: /a/ ranges in quality from [ɛ] to [ʌ] to [ə]; /i/ and /u/ may be lowered to [e] and [o], respectively; and /u/ is often realized as [ʊ] following palatal consonants. Phonetically long vowels usually result from loss of an intervocalic glide (e.g. *aya* can be pronounced as *aa*), but a small number of minimal pairs suggests a marginal contrast.

The consonant inventory is considerably larger, and is summarized in Table 1. For clarity, each phoneme is marked by both its correspondent in the practical orthography (in angled brackets) and the most likely phonetic category given the description and distinctive features provided by McConvell (in slashes). The transcriptions in this paper make use of phonetic symbols only.

Table 1: Gurindji consonant inventory

	Bilabial	Alveolar	Retroflex	Lamino-Palatal	Velar
Stop	<p>, /p/	<t>, /t/	<rt>, /ɽ/	<j>, /c/	<k>, /k/
Nasal	<m>, /m/	<n>, /n/	<rn>, /ɻ/	<ny>, /ɲ/	<ng>, /ŋ/
Lateral		<l>, /l/	<rl>, /ɭ/	<ly>, /ɕ/	
Rhotic		<rr>, /r/			
Glide	<w>, /w/		<r>, /ɻ/	<y>, /j/	

Regarding allophonic variation in the stop series, McConvell writes (p. 136) that “voiced allophones are generally found except in syllable-final position, where voiceless allophones appear, except in the case of *k*, where a voiceless allophone also occurs in initial position.” Throughout this paper, I follow the general orthographic trend and transcribe all stops as voiceless; the contextual variation between voiced and voiceless allophones is not important here.

## 2.2 Nasal cluster dissimilation

Gurindji allows NCs in suffixes (e.g., [lutcu-**ŋ**ka], ridge-LOC, ‘on the ridge’) and across suffix-suffix boundaries (e.g., [cawura-**p**-kaɽi-wuca], steal-NOM-OTHER-COMIT, ‘with another thief’), but NCs in these positions are dispreferred given the presence of a preceding NC<sub>1</sub> in the same phonological

word. In most dialects of Gurindji, such sequences are avoided through eradication of N<sub>2</sub>'s [nasal] feature (though see McConvell 1988:150 on the Western dialects). If NC<sub>2</sub> is homorganic, the nasal consonant deletes (3a–b); if it is heterorganic, the nasal consonant is realized as an oral stop (3c–d).

(3) N<sub>2</sub> modification in Gurindji (McConvell 1988: 138)

- a. /ka**ŋ**cu+mpal/ → [ka**ŋ**cu-pal] 'across below'  
(cf. [kajira-mpal] 'across the north')
- b. /ka**n**ka+mpa/ → [ka**n**ka-pa] 'upstream'  
(cf. [kani-mpa] 'downstream')
- c. /ɲa**m**pa-n-pula ɲa-ɲa/ → [ɲa**m**pa-t-pula ɲa-ɲa] 'what did you two see?'
- d. /ɲatca**ŋ**-pa-n-pula ɲa-ɲa/ → [ɲatca**ŋ**-pa-t-pula ɲa-ɲa] 'how many did you two see?'

The difference between (3a–b, c–d) can be captured under an analysis in which N<sub>2</sub> deletion is the preferred repair to \*NC<sub>1</sub>...NC<sub>2</sub>, subject to a ban on the deletion of place features.<sup>2</sup> Assuming that place features are multiply linked in homorganic clusters, N<sub>2</sub> deletion is permitted in this context because the place features of the deleted nasal are still linked to the remaining oral stop. In heterorganic clusters, deletion of the nasal would result in the deletion of its place features, so the repair in this context is N<sub>2</sub> denasalization. Both N<sub>2</sub> deletion and denasalization serve the greater goal of destroying N<sub>2</sub>'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<sub>2</sub> modification.

Throughout (3), N<sub>2</sub> modification is local: only a single vowel intervenes between the two NCs. N<sub>2</sub> modification can also be non-local, but as previewed, the applicability of non-local N<sub>2</sub> modification depends on the nature of the material that intervenes between NC<sub>1</sub> and NC<sub>2</sub>. If the intervening material contains only [+continuant] segments (i.e., vowels, glides, and liquids), N<sub>2</sub> modification is obligatory. Data illustrating this are in Table 2.

Table 2: [+continuant] segments can intervene in N<sub>2</sub> modification (data from McConvell 1988)

<i>Intervener</i>	<i>Form</i> <i>Gloss</i>	<i>Page</i>
...l...	/kanku <b>l</b> a-mpa/ → [kanku <b>l</b> a-pa] 'on the high ground'	140
...ɭ...	/cawura- <b>ɲ</b> -ka <b>ɭ</b> i-kupca/ → [cawura- <b>ɲ</b> -ka <b>ɭ</b> i-wuca] 'with another thief'	140
...w...	/ɲa <b>m</b> pa-wu-pa[a-n-cina pa-ni/ → [ɲa <b>m</b> pa-wu-wa[a-t-cina pa-ni] 'why did you hit them'	145
...j...	/ja <b>n</b> -ku-ji-n-pula-ɲa/ → [ja <b>n</b> -ku-ji-t-pula-ɲa] 'you two might come to me'	145

Note that the ...ɭ... and ...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<sub>1</sub>...NC<sub>2</sub> context (e.g. /walu+**k**aci/ → [walu-waci] 'fireplace', McConvell 1988:139). These forms show that, for the purposes of N<sub>2</sub> modification, underlying and derived [w]s behave alike:

<sup>2</sup>Given the data in (3), another possibility could be that N<sub>2</sub> 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).

N<sub>2</sub> modification applies across a [w] regardless of whether it is underlyingly /w/, /p/, or /k/. The ...l...form shows us, however, that lenition does not apply to singleton stops that result from N<sub>2</sub> deletion: underlying /kankula-mpa/ surfaces as [kankula-pa], and the singleton [p] resulting from N<sub>2</sub> deletion does not lenite further to [w] (\*[kankula-wa]). McConvell (1988:144) analyzes this interaction as a result of rule ordering: lenition feeds N<sub>2</sub> modification. While interesting, this pattern is not relevant to the generalization of interest (that N<sub>2</sub> modification applies across all surface [+continuant] segments), and will not be addressed further.

If however the material that intervenes between NC<sub>1</sub> and NC<sub>2</sub> contains one or more [-continuant] consonants (i.e., a nasal consonant or oral stop), N<sub>2</sub> modification is does not occur (Table 3).

Table 3: [-continuant] segments block N<sub>2</sub> modification (data from McConvell 1988)

<i>Blocker</i>	<i>Form</i> <i>Gloss</i>	<i>Page</i>
...p...	[ɲu-ɲantipa- <b>ŋ</b> kulu pa-ɲa] 'they saw us'	141
...t...	[nampijita-wu <b>ɲ</b> ca] '(animal) lacking a female'	141
...k...	[wa <b>ɲ</b> ci-kura- <b>n</b> -cina ka-ɲa] 'where did you take them?'	145
...m...	[kuja- <b>ŋ</b> ka-ma- <b>ŋ</b> ku pa-ni] 'it was for that reason he hit you'	141
...n...	[ɲu- <b>n</b> -cunu- <b>ŋ</b> ku]a juwa-ni] 'you put it on yourself'	141

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

## 2.3 Proposed interpretation

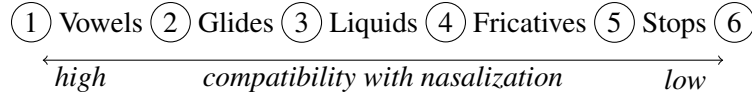
In this subsection, I argue that we can make sense of the facts summarized above by appealing to two independent but interacting processes: long-distance regressive [nasal] spreading initiated by coda nasals, and a dispreference for anticipatory nasalization preceding onset nasals.

### 2.3.1 Nasal spreading

Although McConvell (1988, 1993) does not discuss the phonetics of nasality in Gurindji, the set of segments that can intervene in N<sub>2</sub> 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

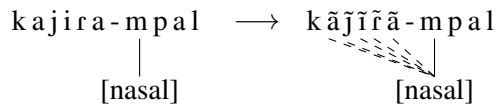
equal to or lower than  $x$ , where  $x$  is roughly equivalent to the segment's compatibility (articulatory or perceptual) with nasalization (see Schourup 1973:533, Walker 1998:69–84).

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



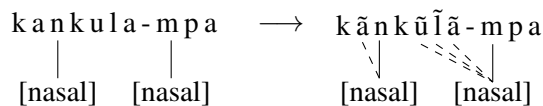
The proposed interpretation of the Gurindji data in Section 2.2 takes seriously the link between (4) and the set of possible interveners in nasal cluster dissimilation. Let us assume that Gurindji has a process of long-distance nasal harmony that is capable of spreading through liquids, vowels and glides, as in Kpelle (Niger-Congo, Welmers 1962; see Walker 1998:90–92 for other examples).<sup>3</sup> This proposal is illustrated with /kajira+mpal/ (‘across the north,’ McConvell 1988: 138): [nasal] spreads regressively from N<sub>2</sub> until blocked by [k] (5). (It should be noted at this point that the claim that Gurindji exhibits a process of regressive [nasal] harmony is supported by phonetic data in only a limited way. While work by Ennever 2014 suggests that vowels preceding nasal-stop sequences may be nasalized, it has not been shown that this nasalization is consistent, or that it can propagate through multiple preceding segments. For more discussion on this point, see Section 2.4.)

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



Assuming that such a process exists, we turn now to the context of interest: a word containing two NCs. If NC<sub>1</sub> and NC<sub>2</sub> 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<sub>1</sub>, as schematized for /kankula-mpa/ (‘on the high ground,’ McConvell 1988:140) in (6).

- (6) Long-distance [nasal] spreading in NC<sub>1</sub>...NC<sub>2</sub> would nasalize post-NC vowel



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 NC<sub>1</sub>...NC<sub>2</sub> sequences in Gurindji and elsewhere is not a dispreference for multiple NCs

<sup>3</sup>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<sub>2</sub> 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. (For a recent phonetic study of lenition in Gurindji, see Ennever et al. 2017).

*per se*, but rather a dispreference for NC $\tilde{V}$  – which full application of regressive [nasal] spreading, in an NC<sub>1</sub>...NC<sub>2</sub> context, would create ((6); see also Herbert 1977, Jones 2000, Stanton 2018a).

Let us assume, then, that full application of [nasal] spreading is banned in Gurindji NC<sub>1</sub>...NC<sub>2</sub> contexts when it would create an NC $\tilde{V}$  sequence. Faced with this impossibility, the language has several different options for forms like /kankula-mpa/. One is to spread [nasal] partway (7).

- (7) Partial spreading of [nasal] in NC<sub>1</sub>...NC<sub>2</sub>
- |                       |   |                          |
|-----------------------|---|--------------------------|
| k a n k u l a - m p a | → | k ã n k u ã - m p a      |
|                       |   | \                      / |
| [nasal]    [nasal]    |   | [nasal]    [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 begins. The way in which trigger deletion is implemented varies depending on whether NC<sub>2</sub> 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.

- (8) Trigger deletion: in homorganic NC<sub>2</sub>, N<sub>2</sub> deletes
- |                       |   |                          |
|-----------------------|---|--------------------------|
| k a n k u l a - m p a | → | k ã n k u l a - p a      |
|                       |   | \                      \ |
| [nasal]    [nasal]    |   | [nasal]                  |
- (9) Trigger deletion: in heterorganic NC<sub>2</sub>, N<sub>2</sub>'s [nasal] feature deletes
- |                                 |   |   |
|---------------------------------|---|---|
| j a n - k u - j i - n - p u ... | → | j ã n - k u - j i - t - p u ...                 |
|                                 |   | \                      /                      / |
| [nasal]    [nasal]              |   | [nasal]    [nasal]    [nasal]                   |

As discussed above, I assume that [-continuant] segments block [nasal] spreading. In /nampijita-wupja/ '(animal) lacking a female' (McConvell 1988:141), for example, regressive spreading of [nasal] from NC<sub>2</sub> is arrested by the presence of an intervening /t/ (so /nampijita-wupca/ → [nãmpijitã-wũpca]). Trigger deletion is unnecessary, as the post-NC<sub>1</sub> vowel is not at risk of becoming [nasal].

In sum, positing regressive [nasal] spreading allows us to make sense of the set of interveners in Gurindji N<sub>2</sub> modification. The segments that can intervene ([+continuant] segments) propagate [nasal]; the segments that cannot ([-continuant] segments) block its spread. A summary of the proposed interpretation, with schematic forms, follows. Full spreading occurs when NC is preceded by [+continuant] segments; partial spreading occurs when NC is preceded by a singleton [-continuant] segment; and trigger deletion occurs when NC is preceded by [+continuant] segments and an NC.

- (10) Summary of proposed interpretation of data (domain of spreading bolded)
- | Underlying representation | Surface representation | Type of spreading |
|---------------------------|------------------------|-------------------|
| /wa[urumpa/               | [wã[ũrũmpa]            | Full spreading    |
| /waturumpa/               | [watũrũmpa]            | Partial spreading |
| /wanurumpa/               | [wanũrũmpa]            | Partial spreading |
| /wampa[umpa/              | [wampa[upa]            | Trigger deletion  |

### 2.3.2 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  $NC_1VNC_2$ , but not  $NC_1VN_2V$ , forbidden)? And why do onset nasals act like singleton stops in blocking the spread of nasality?

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 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 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.<sup>4</sup> I focus on two contexts: coda position, in which anticipatory coarticulation is possible ( $\tilde{V}NC$ ); and intervocalic position, in which anticipatory and perseveratory coarticulation are possible ( $\tilde{V}N\tilde{V}$ ). Assuming that an N triggering nasal coarticulation on both sides is more distinct from a C than is a N triggering coarticulation on only one, we expect coda Ns to be less distinct from coda Cs than intervocalic Ns are from intervocalic Cs ( $\Delta \tilde{V}N\tilde{V}-VCV > \Delta \tilde{V}NC-VCC$ , where  $\Delta$  = perceptual distance).

The proposal, then, is that only coda Ns 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 given feature deletes if it is unable to spread.)

A possible answer to the second question – why should onset nasals block propagation of [nasal]? – builds on observations in the literature that anticipatory nasalization is dispreferred in many languages of the area (see e.g., Butcher 1999:481 on Warlpiri and Kunberlang). Why might this be? A partial answer comes from the fact that perceptual cues to nasal place contrasts 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). It is possible to view the failure to nasalize a pre-N vowel as an enhancement effect, which serves to improve or maintain cues to nasal place contrasts. The idea is that Gurindji belongs to this class of languages in which anticipatory nasalization is dispreferred, potentially for perceptual reasons.

<sup>4</sup>I assume 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.



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,  $\Delta \text{VN}\tilde{\text{V}}\text{--VM}\tilde{\text{V}} > \Delta \tilde{\text{VN}}\tilde{\text{V}}\text{--}\tilde{\text{VM}}\tilde{\text{V}}$ ). This dispreference for anticipatory nasalization is what causes onset nasals to block propagation of [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 ( $\Delta \tilde{\text{VN}}\text{--VC} > \Delta \text{VN}\text{--VC}$ ). In other words, propagation of [nasal] is allowed in Gurindji only when the nasal is in coda position, i.e. when cues to the N–C contrast are reduced. For evidence that a similar distribution of anticipatory nasalization is attested in Yindjibarndi, see Stanton (2018a).<sup>5</sup>

A final note: while it is unusual for [nasal] stops to block [nasal] harmony, it is not unattested. In Mehináku (Arawak), [nasal] spreads through approximants and the laryngeal [h], but is blocked by obstruents, nasals, and liquids (Corbera Mori 2008:71–72). Whether or not the Mehináku pattern could also be linked to a dispreference for anticipatory nasalization remains to be seen.

## 2.4 On the phonetics of Gurindji nasalization

If the proposed interpretation of Gurindji nasal cluster dissimilation is correct, it makes non-trivial predictions regarding the phonetics of anticipatory nasalization in Gurindji. The first prediction is that all [+continuant] segments preceding a coda nasal are nasalized. The second prediction is that no segments preceding an intervocalic nasal, [+continuant] or otherwise, are nasalized.

Are the predictions borne out? The information available at present is suggestive but incomplete. Ennever (2014:97), in investigating the acoustic properties of intervocalic NCs in Gurindji, notes that in a number of tokens “...the [nasal] antiresonance [of the nasal consonant] is in fact pre-empted in the preceding vowel... where a clear white space can be seen extending in at those specified frequencies. In those cases... [the velum] is... lowering earlier and giving the preceding vowel a distinct nasalised quality.” While Ennever does not document the existence of nasal spreading over larger distances, he also does not rule it out: in a discussion of potential cues to the contrast between Ns and NCs, he notes that a “closer investigation of how far nasalisation can spread and in what direction (progressive or regressive)” is a potential topic for future research (p. 108). Thus while further work is necessary to verify the existence of regressive [nasal] spreading in Gurindji, the available data are not inconsistent with its existence.

The reader may however be suspicious about the possibility that [nasal] harmony exists in Gurindji but has not yet been detected, and wonder if 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 Karitiâna (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 justifying an analysis in which orality spreads, we cannot expect that [nasal] harmony should have been discussed in either paper – not be-

<sup>5</sup>Nasal spreading in Aguaruna (Jivaroan) is also claimed to be only triggered by coda nasals Walker (1998), but this restriction may be illusory: the only nasal that triggers harmony is /ŋ/, which appears only in coda position.

cause it does not exist, but because its existence was not directly relevant to questions that interested McConvell in 1988 and 1993. Similarly, Ennever 2014 cannot have been expected to document a long-distance nasal spreading process, as his main focus was on lenition in Gurindji stops.

In sum, while the available data are suggestive, further study is necessary to determine if the interpretation of the data proposed in this section 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 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 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  $*\tilde{V}N$  (11), and the preference for vowels preceding coda nasals to be nasalized is enforced by  $*VN]_{\sigma}$  (12).

(11)  $*\tilde{V}N$ : assign one \* for each nasal consonant immediately preceded by a nasal vowel.

(12)  $*VN]_{\sigma}$ : assign one \* for each coda nasal immediately preceded by an oral vowel.

To derive the result that vowels are nasalized before coda nasals only,  $*VN]_{\sigma} \gg *\tilde{V}N$  (13–14).<sup>6</sup>

(13) Vowels preceding coda nasals are nasalized

	/amba/	$*VN]_{\sigma}$	$*\tilde{V}N$
a.	[ãmba]		*
b.	[amba]	*!	

(14) Vowels preceding onset nasals are not nasalized

	/ama/	$*VN]_{\sigma}$	$*\tilde{V}N$
a.	[ãma]		*!
b.	[ama]		

The next component of the analysis is a constraint driving [nasal] spreading. The sequential markedness constraint in (15) 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

<sup>6</sup>The analysis presented here is simplified for expositional purposes.  $*VN]_{\sigma}$  (12) 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;  $*\tilde{V}N$  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  $*VN]_{\sigma} \gg *\tilde{V}N$  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.

markedness constraints see e.g. Pulleyblank 2002, Mahanta 2007). Note that (15) builds the fact that [-continuant] segments block [nasal] spreading into its definition:  $*[\emptyset\text{nasal}, +\text{cont}][\text{nasal}, +\text{cont}]$  encourages regressive [nasal] spreading until [nasal] reaches a [-continuant] segment, at which point the markedness constraint is satisfied, and further spreading is not motivated.<sup>7</sup> Below,  $[\emptyset\text{nasal}]$  means the absence of [nasal], i.e. that the segment is oral.

- (15)  $*[\emptyset\text{nasal}, +\text{cont}][\text{nasal}, +\text{cont}]$ : assign one \* for each non-nasal continuant that is immediately followed by a nasal continuant.

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 others).

The general preference for [nasal] spreading reveals several crucial rankings between the pro-spreading constraint,  $*[\emptyset\text{nasal}, +\text{cont}][\text{nasal}, +\text{cont}]$ , and various faithfulness constraints.  $*[\emptyset\text{nasal}, +\text{cont}][\text{nasal}, +\text{cont}]$  must dominate DEP-LINK[nasal] (16), 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  $*[\text{nasal}, +\text{cont}]$  – penalizing nasalized continuants, which do not occur except when compelled by nasal spreading – but I do not include these below.)

- (16) 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;  $\text{NK} \rightarrow \text{TK}$ ) is dispreferred by MAX-LINK[nasal], which disprefers deleting links attached to a [nasal] autosegment (17); deletion of the trigger segment (as in homorganic clusters;  $\text{NT} \rightarrow \text{T}$ ) is dispreferred by high-ranked MAX-SEGMENT, which disprefers deletion of segments (18).

- (17) 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.
- (18) 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 (19). In this tableau and the following, I refer to  $*[\emptyset\text{nasal}, +\text{cont}][\text{nasal}, +\text{cont}]$  (15) as SPREAD, to save space.

---

<sup>7</sup>The 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.

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

	/kajira+mpal/	*VN] <sub>σ</sub>	SPREAD	MAX	DEP-LINK[nasal]
a.	[kajira-mpal]	*!			
b.	[kajirã-mpal]		*!		*
c.	[kajira-pal]			*!	
d.	[kãjĩrã-mpal]				*****!
e.	[kãjĩrã-mpal]				*****

Candidate (19a), where the pre-NC vowel is oral, violates high-ranked \*VN]<sub>σ</sub>. Candidate (19b), where the pre-NC vowel is nasalized, violates SPREAD, as the nasalized vowel immediately follows a non-nasal continuant. In candidate (19c), the trigger deletion violates MAX. Candidate (19d), where harmony needlessly targets a voiceless stop, incurs a gratuitous violation of DEP-LINK[nasal]. Thus candidate (19e), where [nasal] spreads regressively until the oral stop, is optimal.

This is the hypothesized normal case. In NC<sub>1</sub>...NC<sub>2</sub> 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 NC $\tilde{V}$  sequences as \*NC $\tilde{V}$  (20).<sup>8</sup>

- (20) \*NC $\tilde{V}$ : assign one \* for each NC $\tilde{V}$  sequence.

The fact that trigger deletion is preferred to violation of \*NC $\tilde{V}$  reveals several crucial rankings. First, \*NC $\tilde{V}$  must dominate the MAX, as deletion of the [nasal] trigger is preferred to nasalization of a post-NC vowel (for example, [kãnkula-pa] > \*[kãnkũĩã-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. [kãnkula-pa] > \*[kãnkũĩã-mpa]). \*VN]<sub>σ</sub>, 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 (21).

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

	/kankula+mpa/	*VN] <sub>σ</sub>	*NC $\tilde{V}$	SPREAD	MAX	DEP-LINK[nasal]
a.	[kãnkula-mpa]	*!				*
b.	[kãnkũĩã-mpa]			*!		**
c.	[kãnkũĩã-mpa]			*!		***
d.	[kãnkula-pa]				*	*
e.	[kãnkũĩã-mpa]		*!			****

Candidate (21a), where the pre-NC vowel is oral, violates \*VN]<sub>σ</sub>. Candidate (21b), where the pre-NC vowel is nasalized, violates SPREAD. Candidate (21c), where [nasal] spreading applies incompletely, also violates SPREAD. Candidate (21e), in which spreading applies fully, violates \*NC $\tilde{V}$ . The optimal candidate here, then, is (21d): given the ranking in (21), the only way to avoid violating all of the top-ranked constraints is to destroy the [nasal] trigger. Note that although the tableau in (21) does not consider the candidate [kãnkula-ppa], where N<sub>2</sub> simply loses its [nasal] feature (as is attested when NC<sub>2</sub> is heterorganic, e.g. /ɲampa-n-pula ɲa-ɲa/ → [ɲampa-t-pula ɲa-ɲa] ‘what did you two see?’, McConvell 1988:138), this candidate would receive the same violation

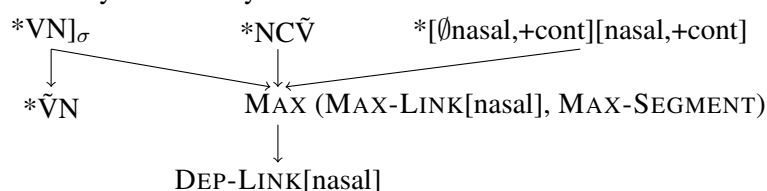
<sup>8</sup>As discussed in Section 2.3, \*NC $\tilde{V}$  likely stands for a constraint on the contrast between Ns and NCs, requiring NC to be followed by an oral vowel to remain maximally distinct from N. I use the expositionally simpler \*NC $\tilde{V}$  here.

profile as does candidate (21d), 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 (21) does not take into account all possible ways of satisfying NC $\tilde{V}$ ; other possible repairs include deleting N<sub>1</sub> (\*[kakũĩã-mpa]) or C<sub>1</sub> (\*[kanũĩã-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 N<sub>2</sub> modification is banned when N<sub>2</sub> is root-internal ([tampañ kariɲa], not [tampa kariɲa]; ‘he died,’ McConvell 1988: 137).<sup>9</sup> In addition, it would also be possible to remove the motivation for harmony by deleting C<sub>2</sub> (resulting in \*[kankula-ma]); I assume that this is ruled out by a constraint that penalizes deletion of oral stops.<sup>10</sup>

A summary of the ranking arguments illustrated in (20) and (21) above is provided in (22).

(22) Summary of the analysis



McConvell (1988:144-145) notes that when a word contains three NCs, the second one undergoes N<sub>2</sub> modification (e.g. /wajpci-ŋka-nta/ → [wajpci-ka-nta], which-LOC-2P.S., ‘where are you lot?’). As shown in (23), the present analysis predicts this: N<sub>2</sub> modification of NC<sub>2</sub> is the most economical way to satisfy all high-ranked constraints.

(23) N<sub>2</sub> modification of NC<sub>2</sub> in /wajpci-ŋka+nta/ (McConvell 1988:141)

/wajpci-ŋka+nta/	*VN]σ	*NCṼ	SPREAD	MAX	DEP-LINK[nasal]
a. [wãjpci-ŋka-nta]	*!*				**
b. [wãjpci-ŋkã-nta]		*!*			****
c. [wãjpci-ŋka-ta]		*!		*	***
d. [wãjpci-kã-nta]				*	***
e. [wãjpci-ka-ta]				**!	**

Some discussion is necessary here about morphological restrictions on N<sub>2</sub> modification in Gurindji. As stated in Section 2.2, N<sub>2</sub> modification only applies when N<sub>2</sub> is part of a suffix: while underlying /kankula+mpa/ is realized as [kankula-pa], underlying /tampañ kariɲa/ 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<sub>2</sub> modification per se. The analysis, informally, would go as follows: [-mpa] is the default exponent of the locative suffix, appearing in the majority of phonological contexts. When however the suffix attaches to a root of the form ...NC... [+cont]..., [-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

<sup>9</sup>Given the current constraint set, N<sub>1</sub> and C<sub>1</sub> deletion are also harmonically bounded by (21d): like (21d), both [kakũĩã-mpa] and [kanũĩã-mpa] incur a MAX violation; unlike (21d), however, they incur multiple DEP-LINK[nasal] violations. Thanks to Sam Zukoff (pers. comm.) for pointing this out to me.

<sup>10</sup>In some western dialects, underlying NC<sub>1</sub>VNC<sub>2</sub>V is realized as NC<sub>1</sub>VN<sub>2</sub>V (e.g. /ɲumpin+ku/ → [ɲumpin-ɲu], n.g., McConvell 1988:150). It is unclear however that C<sub>2</sub> deletion occurs specifically in response to illicit NC<sub>1</sub>VNC<sub>2</sub> in these dialects, as McConvell (1988: 150) also notes that the speakers tend to realize underlying NC as N more generally.

[nasal] spreading process that, when applied fully, would create an illicit NC $\tilde{V}$  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, \*NC $\tilde{V}$ .

### 3.2 On sequential markedness constraints

The sequential markedness constraint introduced above, \* $[\emptyset\text{nasal}, +\text{cont}][\text{nasal}, +\text{cont}]$ , 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 SPREAD[nasal] constraint, promoting [nasal] spreading (regardless of segmental context), is interleaved within this hierarchy.<sup>11</sup> If \*NASLIQUID  $\gg$  SPREAD[nasal], for example, nasal spreading is blocked by obstruents, fricatives, and liquids; if \*NASOBSSTOP  $\gg$  SPREAD[nasal], nasal spreading is blocked only by obstruents.

- (24) Blocking hierarchy (Walker 1998:45; also Schourup 1973, Pulleyblank 1989, Cohn 1993):  
 \*NASOBSSTOP  $\gg$  \*NASFRIC  $\gg$  \*NASLIQUID  $\gg$  \*NASGLIDE  $\gg$  \*NASVOWEL

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 \*NAS- $x$   $\gg$  \*NAS- $y$  in the scale above (Schourup 1973, Cohn 1993, 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 \*NAS- $x$   $\gg$  \*NAS- $y$ .

It should be noted, however, that some of these generalizations are based on very little data or have substantial exceptions.<sup>12</sup> 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 \*NASLIQUID  $\gg$  \*NASGLIDE comes from Zoque (Wonderly 1951), where a [nasal] prefix nasalizes a word-initial glide ([nasal] + /j/  $\rightarrow$  [j]) but deletes before a word-initial liquid ([nasal] + /l/  $\rightarrow$  [l], \* $[\tilde{l}]$ ). 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 \*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

<sup>11</sup>Wilson (2003) rejects 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 SPREAD[nasal] constraints: even though they overgenerate, they at least do not undergenerate.

<sup>12</sup>I 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.

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  $*[\emptyset\text{nasal}, +\text{cont}][\text{nasal}, +\text{cont}]$  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, MAX must dominate SPREAD-L[nasal]. A tableau for hypothetical /pawanta/ is in (26).

- (25) SPREAD-L[nasal]: for every [nasal] autosegment  $n$ , assign one  $*$  for every segment that is to the left of  $n$ 's domain (where the *domain* of an autosegment is the sequence of segments that are associated to it).

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

	/pawanta/	$*\text{NASOBSSTOP}$	MAX	SPREAD-L[nasal]
a.	[pãwãnta]	*!		
b.	[pawata]		*!	
c.	[pãwãnta]			*

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 *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 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 be the case that  $\text{MAX} \gg \text{SPREAD-L[nasal]}$ ; to analyze trigger deletion, it must be the case that  $\text{SPREAD-L[nasal]} \gg \text{MAX}$ . Put simply, a ranking paradox emerges.

The Gurindji pattern as interpreted in Section 2, then, stands as an argument that sequential markedness constraints like  $*[\emptyset\text{nasal}, +\text{cont}][\text{nasal}, +\text{cont}]$  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, 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, SHARE[nasal] (27).

- (27) SHARE([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 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/ → [kãjĩrã+mpal] would proceed. The fact that [nasal] is allowed to spread shows us that SHARE([nasal]) dominates DEP-LINK[nasal] (28). In the first stage of the derivation, high-ranked 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 SHARE([nasal]) are annotated with pairs of segments that are not both linked to [nasal].<sup>13</sup>

- (28) Step 1: SHARE([nasal]) >> DEP-LINK[nasal]

	/kajira+mpal/	SHARE([nasal])	DEP-LINK[nasal]
☞ a.	[kajirã-mpal]	* <sub>ka</sub> * <sub>aj</sub> * <sub>ji</sub> * <sub>ir</sub> * <sub>rã</sub> * <sub>mp</sub> * <sub>pa</sub> * <sub>al</sub>	*
b.	[kajira-mpal]	* <sub>ka</sub> * <sub>aj</sub> * <sub>ji</sub> * <sub>ir</sub> * <sub>ra</sub> * <sub>am</sub> * <sub>mp</sub> * <sub>pa</sub> * <sub>!al</sub>	

In the second step of the derivation, [nasal] spreads to [r], to more fully satisfy SHARE([nasal]) (30).

- (29) Step 2: SHARE([nasal]) >> DEP-LINK[nasal]

	/kajirã-mpal/	SHARE([nasal])	DEP-LINK[nasal]
☞ a.	[kajĩrã-mpal]	* <sub>ka</sub> * <sub>aj</sub> * <sub>ji</sub> * <sub>ir</sub> * <sub>mp</sub> * <sub>pa</sub> * <sub>al</sub>	*
b.	[kajirã-mpal]	* <sub>ka</sub> * <sub>aj</sub> * <sub>ji</sub> * <sub>ir</sub> * <sub>rã</sub> * <sub>mp</sub> * <sub>pa</sub> * <sub>!al</sub>	

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. \*NASOBSSSTOP).

- (30) Step 5: SHARE([nasal]) >> DEP-LINK[nasal]

	/kãjĩrã-mpal/	SHARE([nasal])	DEP-LINK[nasal]
☞ a.	[kãjĩrã-mpal]	* <sub>ka</sub> * <sub>mp</sub> * <sub>pa</sub> * <sub>al</sub>	*
b.	[kãjĩrã-mpal]	* <sub>ka</sub> * <sub>aj</sub> * <sub>mp</sub> * <sub>pa</sub> * <sub>!al</sub>	

<sup>13</sup>I 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.



Problems arise when we try to account for deletion of the [nasal] trigger in the NC<sub>1</sub>...NC<sub>2</sub> forms. If we begin with the input /kankulã-mpa/, then the ranking established above, SHARE([nasal]) >> DEP-LINK([nasal]), will require [nasal] to spread from NC<sub>2</sub> 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 NC<sub>1</sub> and NC<sub>2</sub> are nasalized in Steps 1 and 2.)

(31) Step 3: SHARE([nasal]) >> DEP-LINK[nasal]

	/kãnkulã-mpa/	SHARE([nasal])	DEP-LINK[nasal]
☞ a.	[kãnkũlã-mpa]	* <sub>kã</sub> * <sub>nk</sub> * <sub>ku</sub> * <sub>ul</sub> * <sub>mp</sub> * <sub>pa</sub>	*
b.	[kãnkulã-mpa]	* <sub>kã</sub> * <sub>nk</sub> * <sub>ku</sub> * <sub>ul</sub> * <sub>lã</sub> * <sub>mp</sub> * <sub>!pa</sub>	

At the next step, however, we see that further satisfaction of SHARE([nasal]) can only occur at the expense of \*NC<sub>1</sub><sup>̃</sup>, the markedness constraint that blocks full application of [nasal] spreading. Assuming that \*NC<sub>1</sub><sup>̃</sup> dominates SHARE([nasal]) (as in Section 3.1), harmony can apply no further.

(32) Step 4: SHARE([nasal]) >> DEP-LINK[nasal]

	/kãnkulã-mpa/	NC <sub>1</sub> <sup>̃</sup>	SHARE([nasal])	DEP-LINK[nasal]
a.	[kãnkũlã-mpa]	*!	* <sub>kã</sub> * <sub>nk</sub> * <sub>kũ</sub> * <sub>mp</sub> * <sub>pa</sub>	*
☞ b.	[kãnkulã-mpa]		* <sub>kã</sub> * <sub>nk</sub> * <sub>ku</sub> * <sub>ul</sub> * <sub>mp</sub> * <sub>pa</sub>	

Here, the derivation converges: [nasal] cannot spread to the post-NC<sub>1</sub> 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 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.<sup>14</sup>

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. 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<sub>2</sub> 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.

<sup>14</sup>The Harmonic Serialist 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 /kankula/ will not be visible until [nasal] spreads regressively, in subsequent steps of the derivation.

## 4.1 Nasal cluster dissimilation as a co-occurrence restriction

An alternative analysis of the Gurindji data could claim that N<sub>2</sub> modification is driven by a co-occurrence constraint that prohibits multiple NCs from occurring within a single word.<sup>15</sup> This constraint, \*NC...NC, is defined in (33) (following Suzuki 1998).

(33) \*NC...NC: assign one \* for each pair of NC sequences within a phonological word.

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

(34) Nasal cluster dissimilation as \*NC...NC >> MAX-SEGMENT

	/kankula+mpa/	*NC...NC	MAX-SEGMENT
a.	[kankula+mpa]	*!	
b.	[kankula+pa]		*

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

### 4.1.1 Asymmetries in the typology of dissimilation

Nasal cluster dissimilation does not fit comfortably within the larger 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 dissimilation are heterorganic and likely clusters (McConvell 1988:142–143, McConvell 1993:20–24). Regardless of the segment vs. cluster status of an NC, however, they are most easily characterized using a sequence 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)

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

Why should NCs be the only exception to the generalization that dissimilatory processes target segments? Even if an answer were obvious, asymmetries in the typology of nasal cluster dissimilation would go unexplained under an analysis in which they are motivated by a co-occurrence constraint.

<sup>15</sup> 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 also subject to the criticisms below.

For example, with few and likely explicable exceptions, languages that ban NC<sub>1</sub>VNC<sub>2</sub> also ban NC<sub>1</sub>VN<sub>2</sub>V.<sup>16</sup> The results in (36) are from Stanton (2018a); see also Herbert (1977, 1986).

(36) Repair of NC<sub>1</sub>VN<sub>2</sub>V implies repair of NC<sub>1</sub>VNC<sub>2</sub>

	*NC <sub>1</sub> VN <sub>2</sub> V	✓NC <sub>1</sub> VN <sub>2</sub> V
*NC <sub>1</sub> VNC <sub>2</sub>	21	43
✓NC <sub>1</sub> VNC <sub>2</sub>	3	<i>n.a.</i>

If nasal cluster dissimilation is motivated by a co-occurrence constraint, the source of the generalization in (36) is unclear. As NC<sub>1</sub>VN<sub>2</sub>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<sub>1</sub>VNC<sub>2</sub>, why repair of NC<sub>1</sub>VN<sub>2</sub>V should imply satisfaction of \*NC...NC. Furthermore, even if it were possible to formulate an co-occurrence 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: in the 21 languages above where NC...N is banned, N...NC is licit.

The implicational generalization in (36) is, however, predicted by an account under which the dispreference for NC<sub>1</sub>VNC<sub>2</sub> is due to coarticulatory nasalization on the vowel, which compromises cues to the contrast between NC<sub>1</sub> 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 2018b for summaries), as diagrammed schematically below.

(37) Coda nasals induce more anticipatory coarticulation

a.	NC <sub>1</sub>	V	✓Ṽ	NC <sub>2</sub>
b.	NC <sub>1</sub>	V	✓Ṽ	N <sub>2</sub> V

Recall that one of the most important cues to the N–NC<sub>1</sub> contrast is the quality of the following vowel: NC<sub>1</sub> 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 NC<sub>1</sub>, the less distinct NC<sub>1</sub> will be from N, we expect for the contrast between NC<sub>1</sub> and N to be more distinct in NC<sub>1</sub>VN<sub>2</sub>V (where the vowel is less nasalized, (39)) than it is in NC<sub>1</sub>VNC<sub>2</sub> (where the vowel is more nasalized, (38)). For experimental results that are consistent with this assumption, see Stanton (2018a).

(38) N–NC<sub>1</sub> less distinct in NC<sub>1</sub>VNC<sub>2</sub>

a.	NC <sub>1</sub>	V	$\tilde{V}$	NC <sub>2</sub>
b.	N <sub>1</sub>	$\tilde{V}$		NC <sub>2</sub>

<sup>16</sup>The three potential exceptions are Bokote (Niger-Congo), Bolia (Niger-Congo), and Sango (Ngbandi-based creole). In all cases there is reason to doubt that these are true exceptions. For example, in Bolia, Mamet (1960:22) writes that the plural suffix is realized as [ɲj] before a vowel, but as [ɲ] “if the root has as its first consonant a singleton nasal” (translation mine). The available examples, however, are consistent with an alternative analysis in which [ɲj] cannot occur before [i]. See Stanton (2018a) for discussion of the other two cases.

- (39) N–NC<sub>1</sub> more distinct in NC<sub>1</sub> VN<sub>2</sub> V
- a. NC<sub>1</sub>

V	Ṽ
---	----

 N<sub>2</sub> V
- b. N<sub>1</sub>

Ṽ
----

 NC<sub>2</sub>

If the constraint that disfavors NC<sub>1</sub> VN<sub>2</sub> (C) sequences is a constraint on the distinctiveness of the N–NC<sub>1</sub> contrast (as discussed above; also Stanton 2018a), then we might expect for any distinctiveness constraint that penalizes N–NC<sub>1</sub> in NC<sub>1</sub> VN<sub>2</sub> V (where it is more distinct) to also penalize N–NC<sub>1</sub> in NC<sub>1</sub> VNC<sub>2</sub> (where it is less distinct). Framed this way, the generalization that repair of NC<sub>1</sub> VN<sub>2</sub> V implies repair of NC<sub>1</sub> VNC<sub>2</sub> 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 (Steriade 1997).

In addition, the dispreference for NC...N relative to 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 NC<sub>1</sub> VN<sub>2</sub> V implies repair of NC<sub>1</sub> VNC<sub>2</sub> is only one fact about the typology of nasal cluster dissimilation that a contrast-based analysis predicts, but an co-occurrence-based analysis has trouble accounting for. Others exist; see Stanton (2018a) for discussion and analysis.

#### 4.1.2 Constraints on interveners

Recall that whether or not nasal cluster dissimilation is attested in Gurindji depends on the nature, and not the amount, of intervening material. If the intervening material contains only continuants, NC<sub>1</sub> VNC<sub>2</sub> is banned (40). If it contains one or more non-continuants, NC<sub>1</sub> VNC<sub>2</sub> is licit (41).

$$(40) \quad NC_1 \dots [+cont] \dots NC_2 \rightarrow NC_1 \dots [+cont] \dots (C)C_2$$

$$(41) \quad NC_1 \dots [-cont] \dots NC_2 \rightarrow NC_1 \dots [-cont] \dots NC_2$$

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 co-occurrence 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 N<sub>2</sub> modification in Gurindji displays the opposite preference.

#### 4.1.3 Constraints on interveners, II

So far, the arguments in this section have amounted to the following: if nasal cluster dissimilation in Gurindji is driven by a co-occurrence constraint, it is a typologically unusual kind of co-occurrence restriction. But the argument can be made stronger by showing that the co-occurrence-based analysis fails on its own terms.

Up to this point, we have focused only on repairs to NC<sub>1</sub>...NC<sub>2</sub>. But as predicted by the analysis in Section 3.1, the more accurate description of the pattern is that Gurindji disfavors NC<sub>1</sub>...N<sub>2</sub>

in all contexts where  $N_2$  is in coda position, including when  $N_2$  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  $N_2$  in an  $NC_1 \dots [+cont] \dots N_2$  sequence, it denasalizes. (Note that the analysis of  $N_2$  deletion vs.  $N_2$  denasalization outlined in Section 2.2 correctly predicts that  $N_2$  denasalization is the preferred repair to  $NC_1 VN_2$ , since deletion of the nasal would result in the deletion of its place features.) This instance of  $N_2$  denasalization can also be non-local, and it obeys the familiar constraints on interveners (42).

(42)  $N_2$  modification affects the suffix /-jin/ (McConvell 1988: 148)

- a. /kanka+jin/ → [kanka-jit]  
‘from upstream’
- b. /kaɲɲuli-jin/ → [kaɲɲuli-jit]  
‘from below’
- c. /ku[a-ŋku]a-jin/ → [ku[a-ŋku]a-jit]  
‘from the south side of the river’
- d. /ka:ra-ŋkara-jin/ → [kaara-ŋkara-jit]  
‘from the east side of the river’

If a constraint of the form  $*X \dots X$  motivates nasal cluster dissimilation in Gurindji,  $*NC \dots NC$  cannot be the correct constraint, as it will not penalize  $NC_1 \dots N_2$  (42). The examples of  $N_2$  modification in (42) diagnose a restriction on multiple coda nasals within the same word, as in (43).

(43)  $*N]_{\sigma} \dots N]_{\sigma}$ : one \* for each pair of coda nasals in a word.

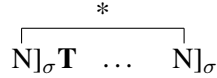
Appealing to structural position when assessing similarity is not an unprecedented move. For example: to explain some complexities that arise in the analysis of Kikongo nasal harmony, Rose & Walker (2004:510–512) argue that nasals sharing a syllabic role (or, alternatively, a vocalic context) are more similar than nasals that don’t. But while redefining the co-occurrence 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  $N_2$  denasalization: the stop that immediately follows  $N_1$  does not prevent denasalization from occurring. Elsewhere, however, we have seen that stops *do* block  $N_2$  modification; relevant data from Table 2 is summarized in Table 4.

Table 4: Segments that block  $N_2$  modification (data from McConvell 1988)

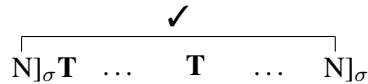
<i>Blocker</i>	<i>Form Gloss</i>	<i>Page</i>
... <b>p</b> ...	[ɲu-ɲantipa-ŋkulu ɲa-ɲa] ‘they saw us’	141
... <b>t</b> ...	[nampijita-wupɲa] ‘(animal) lacking a female’	141
... <b>k</b> ...	[wɔɲɲi-kura-n-jina ka-ɲa] ‘where did you take them?’	145

The contrast between the data in (42) and Table 3 is diagrammed schematically below: a post- $N_1$  stop does not block  $N_2$  modification (44a), but a stop in any other position does (44b).

- (44) a. Post- $N_1$  stop does not block  $N_2$  modification



- b. Other stops block  $N_2$  modification

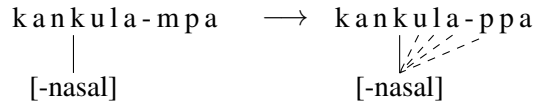


To explain the situation in (44), we could propose one of two modifications: (i) only intervocalic stops block  $N_2$  modification, or (ii) two stops block  $N_2$  modification (one on its own is transparent). In both cases, it is necessary to claim that stops sometimes, but not always, block  $N_2$  modification; in neither case is it clear what the analysis of this fact would be. Under an analysis in which the dispreference for  $NC_1 \dots N_2$  in Gurindji is driven by a co-occurrence constraint, it is difficult if not impossible to state a coherent generalization regarding the set of interveners.

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

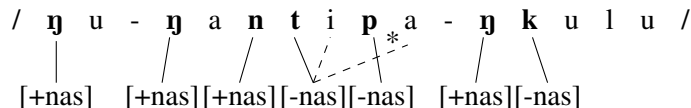
A second alternative analysis of the Gurindji facts, proposed by McConvell (1993), claims that  $[\pm\text{nasal}]$  is a bivalent feature, and that  $N_2$  deletion and denasalization arise as a consequence of progressive [-nasal] spreading. In /kankula-mpa/, for example, [-nasal] spreads from the second /k/ and denasalizes /m/, resulting in a geminate [pp] (that is later simplified to singleton [p]) (45).

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



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  $[\pm\text{nasal}]$ .) Thus in /ɲu-ɲantipa-ɲkulu/ (from [ɲu-ɲantipa-ɲkulu ɲa-ɲa] ‘they saw us’, Table 2), the [-nasal] feature that spreads from /t/ is blocked by [-nasal] [p] (46); in /ɲanta-ɲa-ɲku/ (from [ɲanta-ɲa-ɲku ɲa-n-ku] ‘I want to go to you’, Table 2), [-nasal] does not reach /ɲ/ because its propagation is blocked by [+nasal] /ɲ/.<sup>17</sup>

- (46) Oral stops block [-nasal] spreading



<sup>17</sup>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.

- (47) Nasal stops block [-nasal] spreading
- |   |        |        |        |        |        |   |        |        |   |        |        |   |   |
|---|--------|--------|--------|--------|--------|---|--------|--------|---|--------|--------|---|---|
| / | ŋ      | a      | n      | t      | a      | - | ŋ      | a      | - | ŋ      | k      | u | / |
|   |        |        |        |        |        |   |        |        |   |        |        |   |   |
|   | [+nas] | [+nas] | [-nas] | [-nas] | [+nas] |   | [+nas] | [+nas] |   | [-nas] | [-nas] |   |   |

This analysis is in some ways preferable to the analysis proposed above, as we do not have to posit the existence of a [nasal] spreading process for which there is only partial phonetic evidence. But even taking this consideration into account, there are reasons why the trigger deletion analysis proposed in this paper is preferable to the analysis schematized in (46–47). One of these is the fact that McConvell’s (1993) analysis, in its present form, does not generate the observed data. For example, there is no component of the analysis mandating that an onset nasal stop block [-nasal] spreading, but that a coda nasal consonant undergo. Nor is there a reason provided as to why post-nasal stops – but not word-initial or intervocalic ones – trigger [-nasal] harmony. In other words, the analysis does not capture the fact that 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.

While an elaboration of McConvell’s (1993) analysis could potentially fix these problems, 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.

- (48) Unattested nasal spreading pattern
- a. Stressed oral vowel must be followed by oral segments  
✓'badaga, but \*'banaŋa
  - b. Stressed nasal vowel can be followed by oral or nasal segments  
✓'bādaŋa, ✓'bānaŋa

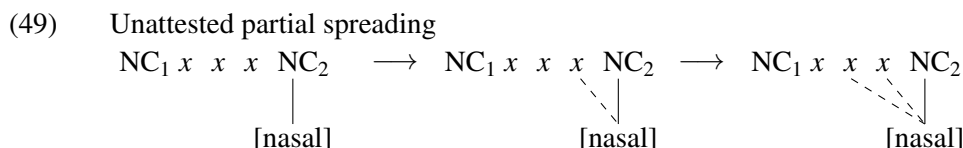
While (48) is unattested, the mirror-image situation – where [+nasal] but not [-nasal] spreads from stressed vowels – is relatively common, attested in Guaraní (e.g. Rivas 1975) and Urak Lawoi’ (Hogan 1988), among others. The broader fact that there are many patterns where [+nasal] must be realized over 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 languages take advantage of.

Thus if [-nasal] spreading is the correct analysis of N<sub>2</sub> 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 may be a desirable move. (A proponent of the [-nasal] spreading analysis could argue that this argument can be reversed, 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 other precedent.)

## 5 Discussion and conclusions

This paper has shown that nasal cluster dissimilation in Gurindji can be analyzed as an example of trigger deletion, a type of non-myopic pattern where a spreading trigger deletes when full application of spreading is impossible. Though phonetic evidence that NCs trigger regressive [nasal] spreading is only partial, I have argued that this is the best available interpretation of the data. Similar patterns attested in other Eastern Ngumpin languages (Mudburra and Ngarinyman: see McConvell 1988, 1993; Nichols 2016) make the same points as the Gurindji pattern discussed here.<sup>18</sup>

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 NC<sub>1</sub>...NC<sub>2</sub> 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.



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 dissimilation 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 [Λ]. The first, in (50): if a stem [a] loses primary stress under suffixation, that vowel is realized as [Λ] 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 [-i̯] in clitic-group final position) is added. The fact that

<sup>18</sup>The 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 dissimilation, 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).



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)
- |    |          |                     |            |                    |     |
|----|----------|---------------------|------------|--------------------|-----|
| a. | sáni-e   | 'sled'              | sáni-úts-Λ | 'sled-DIM'         | (D) |
| b. | pákost-e | 'trouble, disaster' | pákost-áf  | 'trouble-maker'    | (D) |
| c. | bárb-Λ   | 'beard'             | bárb-ós    | 'bearded-MASC'     | (D) |
| d. | ispráv-Λ | 'deed'              | ispráv-nik | (nobleman's title) | (D) |
| e. | maşín-Λ  | 'car'               | maşín-útsΛ | 'car-DIM'          | (D) |
- (51) Romanian [a]-raising due to addition of feminine plural suffix (Steriade 2016)
- |    |         |         |         |            |     |
|----|---------|---------|---------|------------|-----|
| a. | sáni-e  | 'sled'  | sáni-î  | 'sled-PL'  | (D) |
| b. | bárb-Λ  | 'beard' | bárb-î  | 'beard-PL' | (D) |
| c. | maşín-Λ | 'car'   | maşín-î | 'car-PL'   | (D) |

Both [a]-raising processes are 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-uí | 'to seal with pitch'    | (D) |
| b. | taráb-Λ   | 'market stall' | tarab-ói    | 'noise, as in a market' | (D) |
| c. | pitpalák  | 'quail'        | pitpalak-ói | 'male quail'            | (D) |
| d. | matahál-Λ | 'giant'        | matahal-î   | 'giant-PL'              | (D) |
| e. | katarám-Λ | 'buckle'       | katarám-î   | 'buckle-PL'             | (D) |
| f. | salát-Λ   | 'salad'        | saláts-î    | '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-él  | 'orangutan-DIM' | (G; *urangutan-él)  |
| b. | kapital-Λ  | 'capital city' | kapital-úts-Λ | 'capital-DIM'   | (D; *kapital-úts-Λ) |
| c. | fakultát-e | 'faculty'      | fakultáts-î   | 'faculty-PL'    | (D; *fakultáts-î)   |
| d. | katedrál-Λ | 'cathedral'    | katedrál-î    | 'cathedral-PL'  | (G; *katedrál-î)    |

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 on the distribution of [Λ]. Here I focus on a prohibition on [Λ] in onsetless syllables, abbreviated as \*#Λ.<sup>19</sup> As shown in (54), the ban on onsetless [Λ] prevents [a]-raising from occurring when the targeted vowel is in an onsetless syllable. As shown in (55), this same ban prevents across-the-board raising of an initial onsetless [a] adjacent to the targeted [a].

(54) [a]-raising blocked by \*#Λ (Steriade 2016)

- |    |              |               |          |                  |               |
|----|--------------|---------------|----------|------------------|---------------|
| a. | álb          | ‘white’       | alb-úts  | ‘white-DIM’      | (D; *Λlbúts)  |
|    | cf. kál      | ‘horse’       | kΛl-úts  | ‘horse-DIM’      |               |
| b. | áp-Λ         | ‘water’       | ap-ík-Λ  | ‘water-DIM’      | (D; *Λp-ík-Λ) |
|    | cf. páp-Λ    | ‘food’        | pΛp-ík-Λ | ‘food-DIM’       |               |
| c. | álbi-e       | ‘washtub-FEM’ | álbi-ḱ   | ‘washtub-FEM.PL’ | (D; *Λlbi-ḱ)  |
|    | cf. sáltfi-e | ‘willow-FEM’  | sÁltfi-ḱ | ‘willow-FEM.PL’  |               |

(55) Across-the-board [a]-raising blocked by \*#Λ (Steriade 2016)

- |    |        |              |            |                 |                               |
|----|--------|--------------|------------|-----------------|-------------------------------|
| a. | aráb   | ‘Arab’       | arΛb-ésk   | ‘Arabic’        | (D; *ΛrΛb-ésk, *arab-ésk)     |
| b. | albátʃ | (place name) | albatʃ-εán | ‘man of Albac’  | (G; *Λlbátʃ-εán, *albatʃ-εán) |
| c. | amár   | ‘bitter’     | amar-úi    | ‘bitterish’     | (D; *Λmar-úi, *amar-úi)       |
| d. | alám-Λ | ‘bronze-FEM’ | alám-uri   | ‘bronze-FEM.PL’ | (D; *Λlám-uri, *alám-uri)     |

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 initiated: only the morphologically-motivated [a]-raising occurs.

(56) Across-the-board [a]-raising blocked by \*#Λ (Steriade 2016)

- |    |            |             |                                 |                      |
|----|------------|-------------|---------------------------------|----------------------|
| a. | aragáz     | ‘gas stove’ | aragΛz-él                       | ‘gas stove-DIM’      |
|    |            |             | (G; *arΛgΛz-él, *ΛrΛgΛz-él)     |                      |
| b. | atanáse    | (name)      | atanΛs-ésku                     | ‘Atanase-PATRONYMIC’ |
|    |            |             | (G; *atΛnΛs-ésku, *ΛtΛnΛs-ésku) |                      |
| c. | avangárd-Λ | ‘vanguard’  | avangÁrz-ḱ                      | ‘vanguard-FEM.PL’    |
|    |            |             | (G; *avΛngÁrz-ḱ, *ΛvΛngÁrz-ḱ)   |                      |

When framed in derivational terms, this pattern is clearly non-myopic: in words that contain multiple [a]s ([a<sub>1</sub>a<sub>2</sub>á<sub>3</sub>], where á<sub>3</sub> is the vowel targeted for morphological [a]-raising), whether or not a<sub>2</sub> raises is crucially dependent on whether or not a<sub>1</sub> is able to raise. If a<sub>1</sub> is able to raise, then a<sub>2</sub> raises, as in (52); if however a local phonotactic prevents a<sub>1</sub> from raising, then a<sub>2</sub> 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 [Λ] (e.g. \*#Λ). Like the proposed Gurindji pattern, the Romanian pattern cannot be analyzed in any 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*.

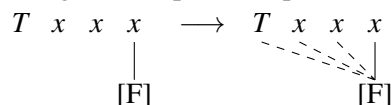
<sup>19</sup>The other phonotactic, a ban on [Λ] following palatal consonants, works equivalently for the current purposes.

## 5.2 Other apparent cases of non-myopia

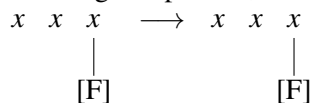
In addition to the Romanian pattern summarized above, there are several other cases that have a non-myopic character, in that full application of an unbounded spreading process depends on the satisfaction of other constraints. (For discussion of additional patterns that bear a less close relation to 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.<sup>20</sup>

(57) Spreading if target is present

- a. If target (*T*) is present, spread [F] all the way to target.



- b. If no target is present, don't spread [F].



One pattern of this kind comes from metaphony in two Italian dialects: Central Veneto and Grado (Walker 2010, though cf. Mascaró 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 [é<sub>1</sub>e<sub>2</sub>i<sub>3</sub>] string, both [é<sub>1</sub>] and [e<sub>2</sub>] raise, yielding [í<sub>1</sub>i<sub>2</sub>i<sub>3</sub>]. In [é<sub>1</sub>e<sub>2</sub>i<sub>3</sub>], however, neither raises, yielding [é<sub>1</sub>e<sub>2</sub>i<sub>3</sub>]. This process is non-myopic: whether or not [e<sub>2</sub>] 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 where a high tone spreads to the end of the word (/bá-ka-fík-a/ → [bá-ká-fíká] ‘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-lòndòlòl-à 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

<sup>20</sup>See also McCollum & Essegbey (2018) on non-myopic blocking in Tutrugbu: the low vowel [a] blocks regressive ATR harmony only if the word-initial vowel is [+high].

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

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