CHAPTER 5

Postlexical Noniterativity: NonFinality and Markedness Suppression

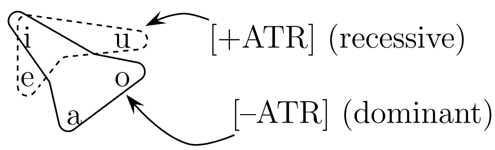
5.1 Introduction

So far this dissertation has focused on word-level noniterativity. This chapter examines noniterative postlexical phenomena, processes that extend beyond the word. Constraints such as NonFinality make demands of word edges, and it would not be surprising to find that neighboring words are called on to help satisfy these demands through (noniterative) spreading across the word boundary.

For example, it has been suggested that harmonic domains are headed (Cassimjee & Kisseberth 1998, McCarthy 2004, Smolensky 1993, 1995, 2006). In a language with right-headed domains, NonFinality can discourage word-final domain heads. Harmony will be disrupted minimally so that the rightmost syllable in the word's harmonic domain is the penultimate syllable rather than the final syllable, which joins the harmonic domain of the following word. Such a configuration avoids harmonic domains that end on word-final syllables. To put it differently, NonFinality can motivate spreading leftward across word boundaries by just one syllable so that the word-final syllable is not the rightmost member of a harmonic domain.

This is exactly what we find in Nez Perce, which has a dominant/recessive vowel harmony system with the vowel inventory in (1).[1] Dominant vowels are enclosed by the solid line, and recessive vowels are enclosed by the dashed line. Data and discussion follow Aoki (1966, 1994), although I interpret the harmonizing feature as ATR following Hall & Hall (1980), with [–ATR] being the dominant feature.

(1)



Notice that *i* belongs to both harmonic sets. Aoki (1966) argues that this designation is necessary. For reasons we will see below, it is insufficient to say that this vowel is simply neutral.

If any vowel in a word is underlyingly dominant (i.e. [–ATR]), the other vowels harmonize with it. Thus the only way a [+ATR] vowel can surface is if all the vowels in a word are underlyingly [+ATR]. The pair in (2) illustrates this.

(2)	cé·qet	'raspberry'
	ca·qát'ayn	'for a raspberry'

The noun *cé·qet* 'raspberry' has recessive vowels, and the suffix *-'ayn* 'for,' which contains a dominant vowel, triggers the change /e/ → *a* in the root.

Of interest for the present chapter is that postlexically, both [+ATR] and [–ATR] can spread leftward across a word boundary to the final vowel of a pre-

[1] It should be kept in mind that what is transcribed as *e* is closer to [æ] (Aoki (1970) describes *e* as a low vowel), and *u* can be realized as [ɯ].

ceding word. Aoki (1966) states that this only occurs in rapid speech. In (3), the first example in each pair is identified by Aoki as a normal-speech form, and the second example is a fast-speech form. (According to Aoki (1994:xii), x̣ is a “voiceless dorso-postvelar spirant”; in other words, something close to IPA χ.)

(3) a. ʔitam’yá·t’as ʔewsí·x. ‘They are for sale.’
ʔitam’yá·t’es ʔewsí·x.

b. míniku·ne pá·kciqa. ‘Which one did they see?’
míniku·na pá·kciqa.

c. yox̣ma lepúʔ papá·ynoʔ. ‘Those two people will come here.’
yox̣me lepóʔ papá·ynoʔ.

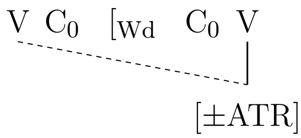
In each fast-speech example, the last vowel of one word harmonizes with the following word. That this phenomenon is not an extension of the word-level harmony process is indicated by two facts. First, the postlexical harmony is ostensibly noniterative while the lexical harmony is obviously iterative. Second, the first and third examples in (3) show spreading of the recessive feature onto an otherwise dominant vowel, a situation that never occurs lexically.

From a rule-based point of view it appears that Nez Perce has the postlexical rule in (4).

(4) V C_0 V Iterativity Parameter: OFF
[±ATR]

Framed this way, it appears that Nez Perce has truly noniterative postlexical harmony. However, an alternative rule is available:

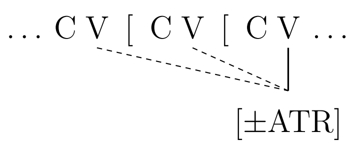
(5)



The rule in (5), generally speaking, produces emergent noniterativity. After the first iteration, this rule cannot apply again because the new trigger (a word-final vowel) is not word-initial. The setting of the iterativity parameter is therefore inconsequential, and this phenomenon might fall into the class of emergent noniterativity discussed in Chapter 1.

What prevents (5) from always producing emergent noniterativity is monosyllabic words. If the first iteration of this rule targets a monosyllabic word, then the target vowel is word-initial. This means (5) can apply a second time, as shown schematically in (6), where square brackets mark word boundaries. (This is exactly what happens in Vata, as we will see in §5.3.2.)

(6)



Each iteration satisfies the structural description of (5). But as a noniterative rule, (4) would only produce spreading to the rightmost of the two target vowels. Thus while (4) and (5) predict the same thing for polysyllabic targets, we can use monosyllabic words to distinguish the rules. If the situation shown in (6) is attested, then the postlexical spreading is iterative, and it is not a challenge to the Emergent Noniterativity Hypothesis. If the prediction of (4) is correct, on the other hand, Nez Perce presents a strong challenge to the hypothesis.

Unfortunately, I am aware of no data that bear on this question. I therefore assume that Nez Perce does challenge the ENH, and the bulk of this chapter is devoted to developing an OT analysis of this phenomenon that does not rely on noniterativity and follows the reasoning sketched above. Under the assumption that harmonic domains in Nez Perce are right-headed, we can invoke a NON-FINALITY constraint to prevent heads from appearing in the last syllable of a word. To satisfy NON-FINALITY, harmonic domains are minimally adjusted so that word-final syllables are not rightmost in their harmonic domains.

Other sandhi phenomena similar to Nez Perce's postlexical harmony are also considered in this chapter. Within Lexical Phonology (Kiparsky 1982, 1985), spreading across a word boundary is traditionally taken to be diagnostic of a postlexical rule (e.g. Pulleyblank 1986) because it is only at the postlexical stratum that the phonology ceases to consider words in isolation and permits words to interact with each other. We will see that NONFINALITY-induced effects are attested in many languages.

These phenomena are relevant to larger goals of this dissertation because they often appear to be noniterative: an element spreads from one word to the first or last syllable, segment, etc., of an adjacent word and no farther. Examples are found at all levels of phonology. For example, Pulleyblank (1986) gives many examples of postlexical tone rules in which a tone spreads minimally across a word boundary. Many (if not all) of the examples he gives show cases in which a rule is simply not restricted to word-internal (that is, lexical) application, so when the trigger and target span a word boundary, a rule that normally spreads tones within words spreads across words. I assume that these postlexical processes are amenable to the analyses discussed in Chapter 4 since they are just special instances of more general "noniterative" tone spread. Non-tonal processes with similar properties (applying both within and across words) likewise submit to analyses of emergent noniterativity mentioned elsewhere in this dissertation. The focus here is on exclusively postlexical processes.

An interesting kind of phenomenon called iterative optionality by Vaux (2003b) is revealed by this investigation. "Iterative optionality" is a label for a special kind of optional process: In forms with multiple loci at which the process may apply, whether or not each loci undergoes the process is independent of whether or not the other loci undergo it. In a single form, the process may apply at some positions but not others. Iterative optionality contrasts with all-or-nothing optionality, where either every locus undergoes the process or none of them do.

An example of iterative optionality is encountered in Vata, where postlexical spreading of the sort schematized in (6) is possible, but the extent of leftward spreading may vary. Vaux argues that iterative optionality is incompatible with OT, but I propose a new addition to OT called Markedness Suppression that predicts iterative optionality.

The chapter is structured as follows: The analysis of Nez Perce is developed in §5.2. An analysis of the language's lexical harmony is presented in §5.2.1, and it is extended to account for postlexical harmony in §5.2.2. The detailed analysis of this language shows how apparently noniterative postlexical phenomena can be generated without invoking noniterativity, although it is probably unrealistic to expect the particular analysis proposed here to account for every relevant case.

Other languages with apparently noniterative postlexical phenomena similar to Nez Perce are discussed in §5.3: Somali (§5.3.1), Vata (§5.3.2), and Akan (§5.3.3). A different sort of postlexical process, Irish palatalization, is discussed in §5.4, and §5.5 summarizes the chapter.

5.2 Nez Perce Vowel Harmony

5.2.1 Lexical Harmony

Before we can address Nez Perce's postlexical harmony, we need an analysis of the lexical harmony. More examples of lexical harmony are given in (7) and (8).

(7)	a.	tí́sqeʔ	'skunk'
		tí́sqaʔlaykin	'near a skunk'
	b.	cé·qet	'raspberry'
		ca·qát'ayn	'for a raspberry'
	c.	/méq/	'paternal uncle' (noun stem)
		neʔméx̣	'my paternal uncle'
		méqeʔ	'paternal uncle!'

(8)	/ʔá·t/		'go out' (verb stem)
	/wé·yik/		'go across' (verb stem)
	a.	/-se/	'sing. subject, indicative present, s-class marker'
		ʔá·tsa	'(I) am going out'[2]

[2] Aoki (1966:760 fn. 6) notes that "[t]he form is without an overt subject pronominal prefix and may mean either 'I am going out' or 'you (sg.) are going out.'" I follow Aoki in representing the ambiguity with '(I).'

	wé·yikse	'(I) am going across'
b.	/-ne/	'remote past'
	ʔá·tsana	'(I) went out long ago'
	wé·yiksene	'(I) went across long ago'
c.	/-qa/	'recent past'
	ʔá·tsaqa	'(I) went out recently'
	wá·yiksaqa	'(I) went across recently'
d.	/weye-/	'hurry'
	weyewé·yikse	'(I) am hurrying across'
	weyewé·yiksene	'(I) hurried across long ago'
	wayawá·yiksaqa	'(I) hurried across recently'
e.	/wat-/	'wade'
	watwá·yiksa	'(I) am wading across'
	watwá·yiksana	'(I) waded across long ago'
	watwá·yiksaqa	'(I) waded across recently'

As shown in (7a) and (7b), roots can harmonize with suffixes. (7c) shows that when all the morphemes in a word have recessive vowels, these vowels surface faithfully. In (8), the behaviors of two verb stems are contrasted. The first root has a dominant vowel and the second has recessive vowels. As (8a)–(8c) show, /ʔá·t/ is invariant and triggers alternations in recessive-voweled suffixes. /wé·yik/, on the other hand, only surfaces faithfully if the suffixes also have recessive vowels. Finally, (8d) and (8e) show that prefixes participate in and trigger harmony.

The *a* ∼ *e* alternation is illustrated in above; examples with the *o* ∼ *u* alternation are given in (9).

(9) a. /luʔuqí/ 'to get warm'

luʔuqíce. 'I am getting warm'

hiluʔuqíce. 'It is getting warm'

hiluʔúqin. 'It just turned warm'

hiloʔx̣nóʔqa. 'It could get warm./The warm weather might come.'

b. /kúˑ/ 'to do'

kúˑse. '(I) am doing'

kusíˑx. 'we are doing'

kosáˑqa. 'I did recently'

kosíˑqa. 'we did recently'

kóˑt'ax̣ 'I would do'

c. /-un/ 'agentive suffix'

ʔiméˑc'inpun 'prophet'

hayáytamon 'a person who gives a war cry'

d. /-(n)uʔ/ 'future suffix'

hiˑpúˑ. 'he will eat'

hipeˑpúʔ. 'they will eat'

hipáynoʔ. 'he will come'

hipapáynoʔ 'they will come'

As (7), (8) and (9) show, harmony is neither root- nor affix-controlled, nor is it unidirectional. The determining factor is vowel quality. If any morpheme contains a dominant vowel, the other vowels harmonize with it. Under the assumption that the harmonizing feature is ATR, this means that [–ATR] vowels are dominant, and [+ATR] vowels are recessive.

Aoki (1966) provides evidence that *i* can be either dominant or recessive. As shown in (10a), when affixed to the stem /ʔí·c/ 'mother,' the first-person possessive and vocative morphemes surface with recessive vowels. This shows that the affixes have recessive vowels underlyingly, and at this point we might say that *i* is simply neutral and doesn't participate in harmony at all.

(10)	a.	neʔì·c	'my mother'
		ʔìceʔ	'mother!'
	b.	naʔcí·c	'my paternal aunt'
		cí·caʔ	'paternal aunt!'

But in (10b), the same affixes surface with dominant vowels. Some dominant vowel must appear in these forms to trigger the affixes' alternations. But the only other vowel in (10b) is the *i* of the stem *cí·c* 'paternal aunt,' so we must conclude that this vowel is in the dominant category. If *i* is dominant (i.e. [–ATR]), then why don't we see [–ATR] harmony in (10a)? The simplest conclusion is that *i* can have membership in either the dominant or recessive classes.

Hall & Hall (1980) argue that the dual membership of *i* reflects a surface neutralization of an underlying ATR distinction. The morpheme meaning 'mother' has a [+ATR] vowel, while the morpheme meaning 'paternal aunt' has a [–ATR] vowel. I will continue to use Aoki's transcriptions, but I adopt Hall & Hall's ATR-based characterization of harmony. Nothing crucial hinges on these choices. If Hall & Hall's position is correct, it only means that some of the transcriptions used here are either imprecise or reflect the neutralization mentioned above. If

Hall & Hall are incorrect, it is simple enough to replace [±ATR] with a more appropriate feature.

To summarize, Nez Perce has a dominant/recessive vowel harmony system, with [–ATR] (*o, a*) as the dominant feature and [+ATR] (*u, e*) as the recessive feature. The vowel *i* can be either dominant or recessive.

Each Nez Perce word is fully harmonic. How are we to produce this in OT? Chapter 2 gives a short overview of attempts to produce harmony in OT, and I arbitrarily select an analysis based on Agree-[±ATR] (Baković 2000, Lombardi 1996, 1999) here:

(11) Agree-[±ATR]: Vowels in adjacent syllables within a word must have identical ATR specifications.

Nothing crucial hinges on the choice of Agree over Align, Spread, etc. All that is needed here is something to trigger the word-level harmony that is altered postlexically.

To produce the dominant/recessive character of Nez Perce's harmony, Ident[ATR] can be decomposed into Ident[–ATR] and Ident[+ATR] (Hall 2006, McCarthy & Prince 1995, Pater 1999). With Ident[–ATR] outranking Ident[+ATR], it will always be better to change [+ATR] (i.e. recessive) vowels rather than [–ATR] (dominant) vowels in case of a mismatch. This is illustrated in (12) for *ca·qát'ayn* 'for a raspberry.'

(12)

/cé·qet-'ayn/	AGREE-[±ATR]	IDENT[–ATR]	IDENT[+ATR]
a. cé·qet'ayn	*!		
☞ b. ca·qát'ayn			**
c. cé·qet'eyn		*!	

The fully faithful candidate (a) fatally violates AGREE because the vowels in the last two syllables do not have the same ATR features. We're then faced with a choice: Either the two [+ATR] vowels should change (candidate (b)) or the one [–ATR] vowel should change (candidate (c)). The latter violates the higher-ranked IDENT constraint, so it is ruled out, and candidate (b) wins, with the recessive vowels changing to match the dominant vowel.

Of course, if all the vowels in a word match underlyingly, no change is necessary because AGREE is already satisfied. (13) shows this with *neʔméx̣* 'my paternal uncle.'

(13)

/neʔ-méq/	AGREE-[±ATR]	IDENT[–ATR]	IDENT[+ATR]
☞ a. neʔméx̣			
b. naʔmáx̣			*!*
c. neʔmáx̣	*!		

(As for the consonant mutation in this form, Aoki (1966) states that *q* appears in onsets and becomes *x̣* in codas.)

We now have a simple constraint system that produces Nez Perce's lexical vowel harmony. Since AGREE is the harmony-driving constraint of choice here, the sour-grapes problem (McCarthy 2003, 2004, Padgett 1995) can arise. I will not attempt to resolve this issue since the primary concern of this chapter is postlexical harmony. A more general solution for vowel harmony that does not encounter the sour-grapes problem and the defects of alternatives to AGREE is the subject of ongoing research in phonology, and whatever that replacement theory turns out to be can replace AGREE without affecting the analysis of postlexical spreading, to which I turn now.

5.2.2 Postlexical Harmony

Recall that in fast speech, the last vowel of one word can harmonize with the following word:

(14) a. ʔitam'yá·t'as ʔewsí·x. 'They are for sale.'
ʔitam'yá·t'es ʔewsí·x.

b. míniku·ne pá·kciqa. 'Which one did they see?'
míniku·na pá·kciqa.

c. yox̣ma lepúʔ papá·ynoʔ. 'Those two people will come here.'
yox̣me lepóʔ papá·ynoʔ.

The analysis is now faced with two tasks: (i) produce the minimal cross-word spreading, and (ii) account for the optionality. The former is accomplished here with the NONFINALITY constraint in (15):

(15) NONFINALITY-ATR: The head of an ATR domain cannot be in the word-final syllable.

NonFinality-ATR discourages placement of ATR domain heads in word-final syllables, just as Prince & Smolensky (1993[2004]) use NonFinality to ban prosodic heads from word-final syllables. As is obvious from this constraint, we must assume that ATR domains are headed. Domain headedness is not a novel proposal: Smolensky (1993, 1995, 2006), McCarthy (2004), and Cassimjee & Kisseberth (1998), among others, have proposed this. I follow Smolensky (2006) most closely—except for one point taken up immediately below—because his framework can be implemented without the theoretical apparatuses that accompany Headed Spans and Optimal Domains Theory. The premise is simple: In any consecutive string of [–ATR] vowels (i.e. an ATR domain), one of the vowels is a head. The same goes for a string of [+ATR] vowels. In Nez Perce, the rightmost vowel in the domain is the head.

Why the rightmost vowel? Clearly, if Nez Perce's harmony were of the right-to-left variety, it would be easy enough to say that the rightmost vowel is the head because it is the trigger. This is exactly the position Smolensky (2006) takes: headedness is correlated with the direction of spreading. Cassimjee & Kisseberth (1998) take the opposite approach and identify heads as the rightmost vowel in a rightward-spreading context and the leftmost vowel in a leftward-spreading context—the head is the last vowel targeted by spreading. But a vowel in any position can be the trigger in Nez Perce, so under the "head = trigger" approach, the head could in principle be any vowel in a domain. This approach also encounters indeterminacy. In a word with all recessive vowels or all dominant vowels, no spreading occurs, so the head would be impossible to identify. Likewise, the suffix /-laykin/ 'near' has two dominant vowels (see (7a))—which is the head when the suffix attaches to a recessive stem? The "head = last target" approach also fails to uniquely identify a head because spreading is bidirectional.

Because of these questions, if the research cited above is right and harmonic domains are headed, we cannot derive the location of the head from properties of the harmonic system itself, at least as far as Nez Perce is concerned.[3] We can, however, turn to headedness in other domains, such as foot- and word-level prominence. Binary feet can be left- or right-headed, as can words (i.e. primary stress can fall on the first or last foot). In these domains, although headedness can be correlated with other factors such as moraic vs. syllabic binarity (see Hayes 1995), it is essentially arbitrarily stipulated, either via a parameter setting or a constraint requiring prominence at one end of the domain or the other.

We can do the same for vowel harmony domains. An Alignment constraint requiring the head to be at the right edge of an ATR domain will, when undominated, effectively produce "iambic" ATR domains. I assume such a constraint here, and to streamline the discussion I will neither show the constraint in Tableaux nor consider candidates that violate it.

Harmonic domains may plausibly show a universal tendency for right-headedness. Hyman (to appear) identifies a crosslinguistic bias for right-to-left harmony, and it would not be surprising if headedness reflected this bias. (Or perhaps the directionality bias reflects a headedness universal.) Thus the claim that Nez Perce has right-headed domains may be the equivalent of claiming it has default

[3] Stress seems to be of no help either. Aoki (1970) lists stress as a phoneme, implying that its placement is unpredictable. His description of where stress appears in various morphological contexts, along with an inspection of his data, suggest that while perhaps not wholly unpredictable, stress does not consistently appear in any particular position in the language. A "head = stressed" approach would identify a unique head in each word, but the location of the head would vary across words.

headedness.

Despite the terminological distinction between lexical and postlexical harmony, it is not necessary to adopt Stratal OT (Kiparsky 2000, Rubach 1997, among others)—as was done in the analysis of Chamorro in Chapter 3—to account for (14). NonFinality-ATR can be added to the top of the existing constraint ranking to produce the correct result. Nonetheless, certain aspects of the analysis become simpler under Stratal OT, so I adopt that approach here. The constraint ranking from the previous section holds for the lexical stratum, and the addition (or promotion) of NonFinality happens postlexically. See Chapter 3 for more discussion of Stratal OT.

How does NonFinality-ATR produce Nez Perce's postlexical spreading? Consider {*ʔitam'yá·t'as*} {*ʔewsí·x.*} 'They are for sale.' Each word forms its own harmonic domain, indicated with curly braces. Since domains are right-headed, the final vowel in each word is the head of that word's domain, and NonFinality-ATR is therefore violated twice. But readjusting the domain boundaries to produce {*ʔitam'yá·*}{*t'es ʔewsí·x.*} eliminates one of these violations. The rightmost vowel in the first harmonic domain—the head—is no longer the word-final vowel. At a cost of minimal disharmony, NonFinality-ATR is better satisfied. The Tableau in (16) illustrates the point.[4]

[4]I assume that Agree remains concerned with word-level harmony even at the postlexical stage. As far as I can tell, the analysis would still hold up even if Agree penalized all disharmonic adjacent vowels regardless of word boundaries. Vowel harmony systems with harmonic domains that are larger than words are rare, so it seems likely that whatever drives harmony cares solely about word-level harmony.

(16)

/ʔitam'yá·t'as ʔewsí·x./	NonFin	Agree	Id[−ATR]	Id[+ATR]
a. {ʔitam'yá·t'as} {ʔewsí·x.}	**!			
☞ b. {ʔitam'yá·}{t'es ʔewsí·x.}	*	*	*	
c. {ʔitam'}{yé·t'es ʔewsí·x.}	*	*	**!	
d. {ʔitam'yá·}{t'es ʔew}{sí·x.}	*	**!	*	*

Aoki (1966) does not give underlying representations for these words, but that is not problematic here because the input for (16)—a postlexical Tableau—is the output of the lexical evaluation, where each word is fully harmonic.

Candidate (a) maintains full word-level harmony and therefore incurs two violations of NonFinality. Candidate (b) eliminates one of these violations by spreading the [+ATR] feature of the second word onto the last vowel of the first word. Since the last vowel of the second word is still the head of a harmonic domain, NonFinality is still violated once.

Candidate (c) shows that spreading beyond the last vowel of the first word is unmotivated. This doesn't eliminate violations of either NonFinality or Agree, and it incurs an unnecessary violation of Ident. As with the analyses of Lango and Chamorro from preceding chapters, spreading by one syllable is optimal because it satisfies the constraint that motivates spreading while minimally violating faithfulness.

Candidate (d) shows that this one violation of NonFinality is unavoidable. This candidate removes the final vowel from the second word's harmonic domain. Now the [+ATR] domain's head is not word-final. But the word-final vowel must be specified for [±ATR],[5] so its new [–ATR] domain incurs a violation of NonFinality. Simply put, one violation of NonFinality is inevitable because the last vowel of the last word must be in an ATR domain, and it will be the head of that domain. With respect to NonFinality, candidate (d) ties with candidate (b), but the former's new ATR domain incurs an extra violation of Agree, so the latter wins.

There are other candidates worth considering. For example, rather than spreading leftward, we could spread rightward and avoid a violation of NonFinality equally satisfactorily: *{*ʔitam'yá·t'as ʔaw*}{*sí·*x.}. We could also spread leftward all the way to the beginning of the first word and eliminate the Agree violation: *{*ʔitem'yé·t'es ʔewsí·*x.}. How do we rule out these candidates?

This is the point at which Stratal OT becomes helpful. The first candidate from the previous paragraph is ruled out because it alters the ATR specification of a word-initial vowel. Although initial vowels can undergo lexical harmony, as many of the examples above show, they never change after leaving the lexical stratum. Therefore, we can adopt the Positional Faithfulness (Beckman 1999) constraint in (17). (Word-initial vowels are singled out for their prominence, just as NonFinality singles out final syllables for their non-prominence.)

(17) Ident[ATR]-$[_{\mathrm{Wd}}\sigma$: Corresponding vowels in word-initial syllables have identical ATR specifications.[6]

[5]Underspecification seems untenable since both [+ATR] and [–ATR] are active postlexically.

[6]Decomposing this constraint into Ident[–ATR]-$[_{\mathrm{Wd}}\sigma$ and Ident[+ATR]-$[_{\mathrm{Wd}}\sigma$ is a possibility, but since no ranking between the "atomic" constraints can be determined, I will not make that move here.

The Positional Faithfulness constraint can also rule out *{ʔitem’yé·t’es ʔewsí·x.}—despite the same *i* appearing in the transcription of the initial syllable, we’ve changed the ATR specification of this vowel. But what if we stop short of the initial vowel, as in *{ʔi}{tem’yé·t’es ʔewsí·x.}? The general Faithfulness constraints that are already part of the analysis rule this candidate out, just as they eliminated candidate (c) from (16).

With the new Positional Faithfulness constraint, these alternative candidates are now accounted for:

(18)

/ʔitam’yá·t’as ʔewsí·x./	Id-[$_{\text{Wd}}\sigma$	NonFin	Agree	Id[−ATR]	Id[+ATR]
a. {ʔitam’yá·t’as} {ʔewsí·x.}		**!			
☞ b. {ʔitam’yá·}{t’es ʔewsí·x.}		*	*	*	
c. {ʔitam’yá·}{t’es ʔew}{sí·x.}		*	**!	*	*
d. {ʔitam’yá·t’as ʔaw}{sí·x.}	*!	*	*		*
e. {ʔitem’yé·t’es ʔewsí·x.}	*!	*		****	
f. {ʔi}{tem’yé·t’es ʔewsí·x.}		*	*	**!*	

Candidate (a)—the fully faithful candidate—is eliminated by NonFinality as before, and candidate (c) has the same fatal Agree violation that we saw in (16). Candidate (d) is the rightward-spreading candidate, and it fatally violates Ident[ATR]-[$_{\text{Wd}}\sigma$. Candidate (e), which posits a single domain for the entire construction, loses for the same reason. Candidate (f) avoids violating the Positional Faithfulness constraint by placing the initial syllable in its own domain and assigning the rest of the form to a second domain. Because the second domain does not include the initial vowel, this candidate incurs the same AGREE violation that the winning candidate incurs, and the decision is passed on to the IDENT constraints. Since candidate (b) changes just one ATR specification, it fares better in terms of faithfulness than candidate (f).

The upshot is this: Minimal violations of AGREE and IDENT are tolerated if it means avoiding word-final domain heads. Directionality is determined by Positional Faithfulness. The apparent noniterativity results from the markedness constraint that motivates spreading being satisfied after the first "iteration." Faithfulness preventing subsequent spreading.

One might be concerned by the ranking IDENT[–ATR] ≫ IDENT[+ATR]: Doesn't this mean that it's always better to spread [–ATR] postlexically, as was the case lexically? No: The Positional Faithfulness constraint determines the direction of spreading, so the only way to satisfy NONFINALITY is to spread leftward, even if—as we saw in (18)—that means spreading [+ATR].

A few issues remain. First as I understand the facts, words always appear fully harmonic in isolation. Since words in isolation must pass through the postlexical grammar, NONFINALITY might be expected to disrupt this harmony. (19), which takes up the form from (13) again, shows that this is not the case.

(19)

/neʔméx̣/ 'my paternal uncle'	ID-[Wdσ	NONFIN	AGREE	ID[–ATR]	ID[+ATR]
☞ a. {neʔméx̣}		*			
b. {neʔ}{máx̣}		*	*!		*

The input is the output of the lexical Tableau. This form, as candidate (a) shows, violates NonFinality. But just as we saw above, positing a new ATR domain on the word-final syllable is no help. This new domain incurs a violation of NonFinality plus a new violation of Agree. NonFinality only produces a disharmonic word when there's a following word that can contribute an ATR feature.

Second, postlexical harmony is optional. To derive this property, it is necessary to impose a non-crucial ranking between NonFinality and Agree (Anttila 2006, 2007). As with the non-crucial ranking used to produce Chamorro umlaut in Chapter 3, I assume that a crucial ranking between these constraints is chosen for each evaluation. When NonFinality outranks Agree, postlexical spreading occurs, as we saw above. Under the opposite ranking, the words surface with their lexical harmonic patterns:

(20)

/ʔitam'yá·t'as ʔewsí·x./	Id-[Wdσ	Agree	NonFin	Id[−ATR]	Id[+ATR]
☞ a. {ʔitam'yá·t'as} {ʔewsí·x.}			**		
b. {ʔitam'yá·}{t'es ʔewsí·x.}		*!	*	*	
c. {ʔitam'yá·}{t'es ʔew}{sí·x.}		*!*	*	*	*
d. {ʔitam'yá·t'as ʔaw}{sí·x.}	*!	*!	*		*
e. {ʔitem'yé·t'es ʔewsí·x.}	*!		*	****	
f. {ʔi}{tem'yé·t'es ʔewsí·x.}		*!	*	***	

Finally, postlexical spreading happens only under fast speech, so NonFinality must hold only in this condition. A similar move was made in the analysis of

Lango in Chapter 2, where it was suggested that under fast speech, ATR features must be linked to stressed vowels.

From the point of view of the analysis presented here, the apparent noniterativity of Nez Perce's postlexical harmony is driven by the need to displace the head of a harmonic domain from the last syllable of the word. This only requires minimal displacement, so spreading by more than one syllable is unwarranted. No mention of noniterativity is needed.

The NonFinality-based analysis reveals a principled justification for what looks like an arbitrary postlexical process that serves only to disrupt the language's otherwise systematic, whole-word harmony. This disruption turns out to be motivated by pressure against placing domain heads in non-prominent positions, not by an "extra" spreading rule.

The NonFinality analysis uses nothing more than pieces of existing proposals. Lexical harmony is driven by Agree, but any analysis of dominant/recessive harmony will do. NonFinality effects are attested in many languages. To pick one example, as discussed in Chapter 4, phrase-final high tones in Chichewa are displaced to the penultimate mora. Splitting Ident constraints into plus- and minus-specific constraints has been suggested by researchers such as McCarthy & Prince (1995), Pater (1999), and Hall (2006), and the use of faithfulness constraints to keep spreading at a minimum comes from the analyses of Lango and Chamorro elsewhere in this dissertation. Similarly, Stratal OT is found in the analysis of Chamorro in Chapter 3 and has been argued to be necessary by Rubach (1997) and Kiparsky (2000). Moreover, the postlexical ranking adopted here is remarkably similar to the lexical ranking, requiring only two additional constraints and no reranking of the lexically relevant constraints. The use of non-crucial rankings (which is just the multiple-grammars theory of variation) also comes from the Chamorro analysis with predecessors in Anttila (2006, 2007). Postlexical harmony in Nez Perce simply results from the confluence of these well-substantiated factors.

The following sections discuss other cases of postlexical spreading.

5.3 Other Postlexical Harmony Phenomena

Nez Perce is far from alone in the way its harmony system behaves postlexically. This section discusses three languages with similar processes, Somali, Vata, and Akan.

5.3.1 Iterative Postlexical Harmony in Somali

Somali also has a dominant/recessive vowel harmony system that Saeed (1999) characterizes as ATR harmony with [+ATR] dominance. Note that this is the opposite of Nez Perce. The vowel inventory is shown in (21).

(21)

	a. *[+ATR] Vowels*			b. *[–ATR] Vowels*	
	i	ʉ		ɪ	u
	e	ö		ɛ	ɔ
	æ			ɑ	

Word-internally, "[i]ndividual members of the major lexical categories, for example nouns, verbs, and adjectives," (Saeed 1999:12) exhibit harmony:

(22) ɪdɑn ‘permission’

idæn ‘incense burner’

bɑːrɔ ‘inspect’

bærö ‘writhe, roll about’

dɪjɑːrsɔ ‘prepare for oneself’

köfijæd ‘hat’

Transcriptions follow Saeed (1999). Postlexical harmony occurs, too, but in this language it is iterative. As (23b) shows, a word with dominant vowels triggers harmony in the preceding words. (Cf. (23a), which shows that the first two words have recessive vowels underlyingly.)

(23) a. waː[7] sɑːn fɑrɑs
DM hide horse.GEN
‘It is a horse’s hide.’

b. wæː sæːn dibi
DM hide bull.GEN
‘It is a bull’s hide.’

It is unclear from these examples whether the postlexical spreading must cross a morpheme or word boundary along the lines of Shona’s tone spread illustrated in (58) from Chapter 4 above. But what (23) shows clearly is that postlexical harmony is iterative—this is the kind of data that was pointed out as missing for Nez Perce in §5.2.1. Were Somali’s harmony noniterative, we would expect to find **waː sæːn dibi*. In fact, it seems likely that Somali’s postlexical harmony is driven

[7] Saeed (1999:11) gives [ɑ] rather than [a] in the language’s vowel inventory, and it is not clear whether this instance of [a] is a typographical error.

by the same mechanisms that produce its lexical harmony, whereas I argued above that this cannot be true of Nez Perce. Evidence for this position comes from the fact that in Somali, postlexical spreading obeys the dominant/recessive nature of the harmonic system, but in Nez Perce's postlexical harmony, both the dominant and the recessive features can spread.

Crucial data are missing for both Nez Perce and Somali. For the former, we have no examples where the target of postlexical spreading is a monosyllabic word. As noted above, this means we can't tell whether the truly noniterative rule in (4) is viable. For Somali, we have no cases where the target is polysyllabic. We know that the rule for Somali's postlexical harmony must be iterative, but we can't tell whether or not the rule must mention a word boundary. Somali presents an interesting contrast to Nez Perce's harmony, but its iterativity means that it has no bearing on the Emergent Noniterativity Hypothesis.

5.3.2 Vata: Markedness Suppression

5.3.2.1 Harmony in Vata

Kiparsky (1985) discusses vowel harmony patterns from two languages that merit discussion here. The first language is Vata, which has an ATR harmony system that is very similar to Somali's, although the specific vowels in question are slightly different. (Kiparsky cites Kaye (1982), but I have been unable to locate that source, so I follow Kiparsky's description and data.) The vowel inventory is given in (24).[8] [+ATR] is dominant. Words are fully harmonic.

[8]Kiparsky lists ə as the recessive counterpart of ʌ, but his data include a instead.

(24) a. *[+ATR] Vowels*

i		u
e	ʌ	o

b. *[–ATR] Vowels*

ɪ		ω
ɛ		ɔ
	ə/a	

Postlexically, [+ATR] optionally spreads leftward across a word boundary:

(25) a. ɔ̍ nɪ sa̍ká pì ‘he didn’t cook rice’

b. ɔ̍ nɪ sa̍kʌ́ pì

c. *ɔ̍ nɪ sʌ̍kʌ́ pì

As in Somali, only the dominant feature spreads. As (25c) shows, only the last vowel of a word can be targeted, but despite that restriction, there is clear evidence that this is an iterative process: “[I]n a sequence of monosyllabic [–ATR] words the assimilation may propagate arbitrarily far to the left” (Kiparsky 1985:116). This is again similar to Somali, and it is illustrated in (26).[9]

(26) a. ɔ̍ ká zā pī ‘he will cook food’

b. ɔ̍ ká zʌ̄ pī

c. ɔ̍ kʌ́ zʌ̄ pī

d. o̍ kʌ́ zʌ̄ pī

Kiparsky suggests two different rules to account for this. The first is essentially a [+ATR]-specific and iterative version of (5): The postlexical rule spreads [+ATR] but is limited to application across a word boundary.

The second rule, which Kiparsky favors, involves extraprosodicity. Only

[9] For the sake of completeness, I should note that according to Kiparsky, postlexical harmony cannot spread [+ATR] from nonhigh vowels to high vowels. This is reminiscent of the restrictions on Lango’s harmony (see Chapter 2) and can probably be produced with constraints, from Smolensky (2006), of the sort that were used in that chapter.

[+ATR] is specified lexically, and [–ATR] is filled in by a default rule at the end of the lexical cycle. Word-final vowels are marked as extraprosodic before this rule applies, so they cannot receive [–ATR] by the default rule. Postlexically, extraprosodicity is removed, and the same rule that produced lexical harmony applies again. But now the only only available (i.e. unspecified) targets are the formerly extraprosodic word-final vowels. Thus, except for the cases of consecutive monosyllabic words, the harmony rule targets just a single vowel. Optionality is produced by declaring either extraprosodicity or the rule removing it postlexically to be optional.

It should be clear that the NONFINALITY-based analysis developed above for Nez Perce is applicable here, too. In fact, Kiparsky's extraprosodic analysis foreshadows the NONFINALITY approach. However, the data in (26) are problematic for OT. In the multiple-grammars theory of variation (Anttila 2006, 2007), ranking NONFINALITY over IDENT[ATR]-$[_{\mathrm{Wd}}\sigma$, (26d) can be produced (this form minimizes the number of vowels that are domain-final and word-final). The opposite ranking generates (26a) (the lexical outputs are preserved). But it is not at all clear how to produce the other two possibilities. Vaux (2003b) points out that this "iterative optionality" is very problematic for OT in general. (Cf. vowel reduction in Shimakonde, where stem vowels to the left of the antepenultimate syllable optionally reduce: *kú-pélév́éléléélá* ∼ *kú-pa̲lév́éléléélá* ∼ *kú-pa̲lpa̲v́éléléélá* ∼ *kú-pa̲lpa̲v́a̲léléélá* ∼ *kú-pa̲lpa̲v́a̲la̲léélá* 'to not reach a full size for' Liphola (2001:170). Reduction cannot target a vowel to the right of an unreduced vowel: **kú-pélév́éla̲léélá*.) Other typical approaches to optionality in OT have the same problem as the multiple-grammars theory. I turn now to possible solutions to the problem presented by (26).

5.3.2.2 Iterative Optionality and Markedness Suppression

The question of how to produce all the forms in (26) is a serious one. There are two extensions of OT that are designed to accommodate iterative optionality. The first is Markedness Suppression, which is currently under development (Kaplan in prep). The idea is that markedness constraints may be tagged as optional on a language-particular basis. A candidate that violates a tagged constraint may not actually receive a violation mark, and may thus emerge as optimal in a ranking that would normally rule it out. For example, in Vata, NONFINALITY outranks IDENT, so the evaluation of the form in (26) would normally proceed as in (27).

(27)

/ɔ̍₁ ká₂ zā₃ pi̅₄/	NONFIN	IDENT
a. ɔ̍₁ ká₂ zā₃ pi̅₄	*!***	
b. ɔ̍₁ ká₂ zʌ̄₃ pi̅₄	*!**	*
c. ɔ̍₁ kʌ́₂ zʌ̄₃ pi̅₄	*!*	**
☞ d. o̍₁ kʌ́₂ zʌ̄₃ pi̅₄	*	***

But under Markedness Suppression, NONFINALITY is tagged as optional (as indicated by '⊙NONFINALITY'), and some of the violations it assigns may be omitted (as indicated by '○'). (27) is still a possible evaluation—it's the one in which none of ⊙NONFINALITY's violations are suppressed. Another possible evaluation is given in (28).

(28)

/ɔ́₁ ká₂ zā₃ pī₄/	⊙NonFin	Ident
a. ɔ́₁ ká₂ zā₃ pī₄	*!***	
b. ɔ́₁ ká₂ zʌ̄₃ pī₄	*!**	*
☞ c. ɔ́₁ kʌ́₂ zʌ̄₃ pī₄	*○	**
d. ó₁ kʌ́₂ zʌ̄₃ pī₄	*	***!

This time, a violation mark for candidate (c) has been omitted. This means that as far as this Tableau is concerned, candidate (c) violates NonFinality just once. It ties with candidate (d) on this constraint now, and it wins because it incurs fewer violations of Ident than candidate (d).

Yet another possible evaluation is shown in (29).

(29)

/ɔ́₁ ká₂ zā₃ pī₄/	⊙NonFin	Ident
a. ɔ́₁ ká₂ zā₃ pī₄	*!○ ○ ○	
☞ b. ɔ́₁ ká₂ zʌ̄₃ pī₄	○ ○ ○	*
c. ɔ́₁ kʌ́₂ zʌ̄₃ pī₄	○○	**!
d. ó₁ kʌ́₂ zʌ̄₃ pī₄	○	***!

Now all violations of NonFinality are suppressed except for one of candidate (a)'s violations. In effect, candidates (b), (c), and (d) do not violate NonFinality, and candidate (a) violates it just once. That remaining violation eliminates candidate (a), and candidate (b) wins because it fares better with respect to Ident than the other remaining candidates.

To complete the analysis it is necessary to rule out [–ATR] spreading (**ɔ́ ká zā pī*). This can be done by placing *[–ATR] below Ident: Underlying [–ATR] specifications can be retained (within the requirements of NonFinality), but new ones are prohibited.

The advantage of Markedness Suppression is its simplicity. Optionality is generated within one grammar, and the theory differs from standard OT only in that any number of violations assessed by a particular constraint can be "erased." In this way an evaluation can yield candidates (like candidates (b) and (c) above) that are otherwise harmonically bounded.

Vaux (2003b) argues on the basis of phenomena like Vata's postlexical harmony that phonological grammars must be rule-based because standard OT cannot output candidates that are harmonically bounded, but iterative optionality produces just this kind of form. Rules, on the other hand, can be marked as optional. If Vata's postlexical harmony rule applies once, we get *ɔ́ ká zʌ̄ pī*. If it applies twice, we get *ɔ́ kʌ́ zʌ̄ pī*, etc. Markedness Suppression duplicates rule-based phonology's ease of analysis by rendering certain markedness constraints impotent to a variable degree. This means that the repair strategies that markedness constraints motivate—such as feature spreading—may apply to variable extents, just like in rule-based phonology.

Riggle & Wilson (2005:9) argue against Markedness Suppression on the grounds that it invites "gratuitious violations of the optional constraint." This is only true if faithfulness constraints can be tagged as optional. For example, an optional Dep would allow epenthesis of an arbitrary number of segments. But by limiting optionality to markedness constraints, Markedness Suppression, as proposed here and in Kaplan (in prep), answers Riggle & Wilson's concern. Removing violations assessed by a markedness constraint essentially gives the upper hand to faithfulness temporarily, which is the equivalent of a rule failing to apply. Markedness Suppression therefore only allows variability in the direction of less change, and the out-of-control deviations that Riggle & Wilson (rightfully) object to are not an issue. Markedness constraints motivate processes, and an optional markedness constraint, like an optional rule, simply doesn't always invite a process to apply.

Of course, certain details of Markedness Suppression need to be worked out. Perhaps the most pressing is how the framework accounts for directionality facts in languages like Shimakonde. Recall that vowel reduction in Shimakonde starts at the left edge and proceeds rightward up to the penultimate vowel so that any number of vowels at the left edge of a word may be reduced. If a vowel is not reduced, no vowels to its right may be reduced. Perhaps this can be produced with Alignment constraints (a feature domain must be right-aligned in a word) or *Struc (a contiguous string of reduced vowels needs just one set of multiply linked features, but discontiguous strings would need multiple sets of features). More work is needed on this issue.

Also, while applying Markedness Suppression to NonFinality gets the correct result above, it may turn out that applying it to other constraints leads to bad predictions. Limiting Markedness Suppression to markedness constraints eliminates some undesirable predictions as described above, but letting Markedness Suppression to apply to any markedness constraint may still be too permissive. The consequences of eliminating other markedness constraints' violations needs further exploration.

Riggle & Wilson (2005) have their own theory of iterative optionality in which constraints evaluate candidates on a position-specific basis. For example, rather than adopting NonFinality and Ident as global constraints, we atomize them, creating one NonFinality and one Ident for each position in a form. NonFinality@i (indices are the same ones used to track input-output correspondence relationships) assesses violations of NonFinality incurred only at position i. By interleaving the NonFinality@i and Ident@i constraints, we can permit spreading in some locations but block it in others. If NonFinality@j outranks Ident@j but Ident@k outranks NonFinality@k, spreading to position j but not to position k is permitted.

For a concrete example, consider (30). In this ranking, the NonFinality constraints for positions 2 and 3 outrank the Ident constraints for those positions. This means that spreading to those vowels is required, and candidates (a) and (b) are eliminated. But Ident@1 outranks NonFinality@1, so the first vowel is not a valid target. Candidate (d), which spreads to this vowel, consequently loses. Candidate (c) wins. This form's spreading targets just the vowels whose NonFinality constraints are undominated. The other variants in (26) are produced with other permutations of the constraints.

(30)

/ɔ̍$_1$ ká$_2$ zā$_3$ pī̍$_4$/	Id@1	NF@2	NF@3	NF@1	Id@2	Id@3
a. ɔ̍$_1$ ká$_2$ zā$_3$ pī̍$_4$		*!	*!	*		
b. ɔ̍$_1$ ká$_2$ zʌ̄$_3$ pī̍$_4$		*!		*		*
☞ c. ɔ̍$_1$ kʌ́$_2$ zʌ̄$_3$ pī̍$_4$				*	*	*
d. o̍$_1$ kʌ́$_2$ zʌ̄$_3$ pī̍$_4$	*!				*	*

Position-specific evaluation is designed to account for phenomena such as French schwa deletion (Dell 1973), where any combination of schwas may be deleted as long as illicit consonant clusters are avoided. Like Markedness Suppression, it therefore needs an additional account of the directionality facts in Shimakonde.

Riggle & Wilson recognize the need to pin down the mechanisms behind indexation. Epenthetic segments pose an interesting problem, and Riggle & Wilson provisionally suggest that such a segment is given two indices, one that matches the index for the segment to its left and the other that matches the index for the segment to its right. A related question that they do not address is whether epenthetic segments in different candidates should receive the same index. Similarly, Riggle & Wilson note that a markedness constraint M may refer to multiple segments (S_i and S_j, for example), in which case it is not clear whether a violation of M is recorded by M@i or M@j.

It is also not clear how the position-specific constraints are projected: Does the set NonFinality@1, ... NonFinality@n exist universally, for an arbitrary value of n? In this case, are NonFinality@$_i$ and NonFinality@$_j$ independently rankable across languages? If so, the resulting factorial typology surely massively overgenerates. Or are constraints decomposed on the fly for each evaluation, in which case the number of NonFinality constraints is contingent upon the length of the input? Under this option the mechanism for decomposing constraints needs further elaboration.

To summarize, Vata vowel harmony has no impact on the Emergent Noniterativity Hypothesis because it is iterative, but its optionality presents an interesting challenge for OT. Both Markedness Suppression and position-specific evaluation can account for this optionality, and thus Vaux (2003b) is wrong to claim that rule-based phonology corners the marked on iterative optionality. The simplicity of Markedness Suppression compared to the enormous complexity of position-specific evaluation argues in favor of the former. It remains to be seen if Markedness Suppression can account for all cases of optionality in phonology.

5.3.3 Phonetic Effects in Akan

Kiparsky (1985) also discusses in Akan (Clements 1981). Of interest here is a vowel-raising process in the language, but a discussion of that phenomenon must begin with Akan's ATR harmony. The vowel inventory is given in (31).

(31) a. *[+ATR] Vowels*

i	u
e	o

b. *[–ATR] Vowels*

ɪ		ʊ
ɛ		ɔ
	a	

The vowel *a* is opaque, but it can initiate [–ATR] harmony. Words without *a* are either entirely [+ATR] or entirely [–ATR] (32a), but mismatched vowels can appear in a word as long as *a* intervenes (32b). There are also a few exceptionally disharmonic roots.

(32) a.

e-bu-o	'nest'
ɛ-bʊ-ɔ	'stone'
o-kusi-e	'rat'
ɔ-kɔdɪ-ɛ	'eagle'
o-be-tu-i	'he came and dug (it)'
ɔ-bɛ-tʊ-ɪ	'he came and threw (it)'

b. fuɲanɪ ‘to search’

pɪrạko ‘pig’

Harmony is root-controlled, so as Kiparsky notes, this harmony system is much like Vata’s except for the opacity of *a*. In the case of mismatched roots, affixes harmonize with the nearest root vowel:[10] *o-bisa-ɪ* ‘he asked (if).’ Harmony is complete (i.e. iterative) and doesn’t occur postlexically, so I will not analyze it here. See Clements (1981) and Kiparsky (1985) for analyses.

Turning to vowel raising, Clements (1981:154) notes that “/ɪ ʊ ɛ ɔ a/ have raised variants [ɪ̣ ʊ̣ ɛ̣ ɔ̣ ạ] when the first syllable of the next word begins with a [+high, +advanced] [i.e. [+high, +ATR]—AFK] vowel.” Clements gives the following examples.

(33) a. bayɪrɛ ‘yam’

bayɪrɛ nʊ ‘the yam’

bayɪrɛ̣ bi ‘a yam’

b. ɔwɔ ‘snake’

ɔwɔ nʊ ‘the snake’

ɔwɔ̣ bi ‘a snake’

c. kofi bisa sɪkaɲ ‘Kofi asks for a knife’

kofi bisạ sika ‘Kofi asks for money’

[10]This same example shows that *a*, though invariant, can initiate its own harmony domain. Root-initial consonants can interact with harmony and vowel raising, but this complication is irrelevant for present purposes.

Raising is not strictly postlexical. It occurs word-internally, too, where it is only visible with *a*. Because of vowel harmony, the other [–ATR] vowels cannot precede a [+ATR] vowel within a word. Examples of word-internal raising are given in (34).

(34)	kạri	'to weigh'
	ạ-furuma	'navel'
	wạ-tu	'he has dug it'
	pạtiri	'to slip'
	yạfunu	'belly'

Within nouns, raising is also triggered by non-high vowels: *pirạko* 'pig.'

Vowel raising "is not local to the syllable immediately preceding the conditioning syllable but influences the articulation of preceding syllables as well" (Clements 1981:157), but this influence is gradient.[11] Clements describes it as a "crescendo" whereby vowels become increasingly raised as the triggering [+ATR] vowel is approached. Both Clements and Kiparsky suggest on the basis of this fact that vowel raising is a phonetic rule that does not have a place in the phonological grammar of Akan.

As I argued in Chapter 4, being phonetic doesn't necessarily place a phenomenon outside the grammar. But if Clements and Kiparsky are correct (and there is a principled reason to account for peak delay but not vowel raising in the phonological grammar), they raise an interesting possibility. Kiparsky contrasts Vata's postlexical harmony with Akan's vowel raising and concludes that the for-

[11]It also shows that vowel raising is iterative, so I do not offer an analysis here. Perhaps Markedness Suppression can account for the gradience.

mer is genuinely phonological while the latter is phonetic. He notes, though, that "[i]t is of course possible that closer phonetic investigation of Vata will reveal unsuspected gradience there too" (Kiparsky 1985:124). In other words, Kiparsky suggests that other postlexical phenomena may be phonetic and therefore not relevant to phonological analyses. If so, many potentially noniterative postlexical phenomena can simply be dismissed. In fact, Pulleyblank (1986) entertains (but eventually rejects) the possibility that *all* postlexical phenomena are phonetic. But if Peak Delay Theory is correct, these phonetic processes may be controlled by the grammar. In this case, the analytical tools developed for PDT in Chapter 4 become available for these postlexical processes as well.

Nez Perce's postlexical harmony may be a prime candidate for this sort of analysis, pending the right kind of phonetic evidence. Recall that this spreading happens only under fast speech, and that both the dominant and recessive features spread. Both facts hint at an explanation grounded in phonetic implementation rather than phonological spreading. Coarticulation is greater in fast speech (e.g. Bell-Berti & Krakow 1991) and would not be expected to obey an abstract dominant/recessive asymmetry.

In a similar vein, Willis (2008) discusses assimilation in examples such as the following, from English:

(35)	Did Gary leave?	[dɪg.gɛ.ɹi]
	John's being a bad boy.	[bæːb.bɔɪ]
	John and Ann burn candles in church.	[æːm.bɝŋ.kʰændɫz]

This assimilation is potentially noniterative in that just the last consonant of a word is targeted. But, as Willis points out, we're clearly dealing with phonetic gestural overlap rather than the phonological replacement of coronal features with labial or velar features. The coronal gesture is still present, but it is masked by the labial and velaric gestures. If, as Willis argues, this phenomenon is not an automatic product of the physiological implementation of a (non-assimilated) phonological structure, it can be analyzed within a PDT-like framework, and the apparent noniterativity can be captured with a constraint similar to PEAK DELAY which promotes extending the domains of the phonetic counterpart of a labial or velar feature.

As this discussion shows, there are a number of ways to frame postlexical phenomena. Kiparsky and Pulleyblank are surely correct to think that some of these phenomena fall squarely within phonology, and in this chapter I have suggested ways to account for this variety. But is is also clear that phonetic postlexical processes exist, and they either are irrelevant to the question of noniterativity's place in phonology or fall within the purview of PDT.

5.4 Irish Palatalization

Palatalization in Irish (Bennett 2008, De Bhaldraithe 1975, Ní Chiosáin 1991, 1994, Ó Siadhail 1988, 1989) presents a particularly striking case of an apparently noniterative postlexical process. A word-final consonant palatalizes before a word-initial *i*:[12]

[12]Note that s^j is equivalent to ʃ—I use the former to emphasize that this is a palatalized version of *s*. Data in this section come chiefly from Bennett (2008), but wherever possible I have checked his data against other sources cited in this section. Additional data come from these sources as well, and I am grateful to James McCloskey for his generous guidance in helping me understand the facts better.

(36)	a.	ən oːr^{j}	‘the gold (masc. sg. gen. def.)’
		ən aːhis^{j}	‘the joy (masc. sg. gen. def.)’
		ən^{j} iːntis^{j}	‘the wonder (masc. sg. gen. def.)’
		ən^{j} in^{j}il^{j}	‘the machine (masc. sg. gen. def.)’
	b.	bɑːd	‘boat’
		bɑːd^{j} iəskəx	‘fishing boat’

However, it does not occur morpheme-internally:

(37)	tirsə	‘tiredness’
	siːr^{j}ə	‘holiday’
	bid^{j}al	‘bottle’
	b^{j}ali	‘way (gen.)’
	gil^{j}p^{j}in^{j}axt	‘wolfing’

Palatalization can occur across morpheme boundaries. Ní Chiosáin (1991) states that just two suffixes trigger palatalization in this context, the diminutive suffix *-iːn^{j}* and the agentive suffix *eːrə*:

(38)	a.	bɑːd	‘a boat’	bɑːd^{j}iːn^{j}	‘a little boat’
		eːn	‘a bird’	eːn^{j}iːn^{j}	‘a little bird’
	b.	sɑːw	‘a saw’	saːv^{j}eːrə	‘a sawyer’

Ní Chiosáin (1991) argues that the palatalization in (38) isn’t assimilation, but rather results from a process of “Final Palatalization” in which the palatalization of a root-final consonant marks a morphosyntactic distinction. If this is right, these data are irrelevant to palatalization as assimilation, and I won’t consider them further.

According to De Bhaldraithe (1975) and Ó Cuív (1975), both *i* and *e* trigger palatalization. I restrict the discussion here to *i*, but the analysis below is easily extendable to (and in fact predicts) palatalization triggered by *e* as well.

Palatalization appears noniterative in that just one segment in each word in (36) palatalizes. But this noniterativity is emergent because only *i* triggers palatalization and therefore, like Nati (see Chapter 1), palatalization cannot proceed from one target to the next. (There is a separate process discussed below by which adjacent consonants harmonize with each other, so the mapping CC#i → CC^{j}#i → C^{j}C^{j}#i is expected, but the last step follows from the separate consonant harmony.) Irish palatalization therefore does not challenge the Emergent Noniterativity Hypothesis, but as the phenomenon is amenable to the NonFinality-based style of analysis developed in this chapter, it deserves more discussion.

Accounting for these facts is, as we will see below, far from trivial. But first, the data shown above should be placed in their larger context. In the discussion below, I largely follow the analysis of Bennett (2008), although my account of the above facts differs from his significantly.

Palatalization is a contrastive feature for consonants in Irish. Every nonpalatalized consonant (except perhaps [h], and [r] in initial position) contrasts with a palatalized but otherwise identical consonant. Some minimal pairs are given in (39).

(39)	a.	piːn^{j}	‘not much’
		p^{j}iːn^{j}	‘a penny’

b. boː ‘a cow’

bʲoː ‘alive’

c. misʲi ‘indeed’

mʲisʲi ‘me’

d. tiː ‘hay’

tʲiː ‘house’

e. suːlʲ ‘an eye’

sʲuːl ‘walk’

f. loːn ‘lunch’

lʲoːn ‘a lion’

g. ginʲ ‘a wound’

gʲinʲ ‘conceive’

However, adjacent consonants must agree in palatalization, i.e. [±back]. This, to my knowledge, is a universal generalization that holds within morphemes (both as a static generalization (40a) and in derived clusters (40b)), across morpheme boundaries (41), and across word boundaries (42). I will call this palatalization “C-palatalization.” Bennett abstracts away from some details of C-palatalization (see Ní Chiosáin 1991), and I follow him in this regard, too.

(40) a. gʲlʲan ‘valley’

tasʲmʲə ‘accident’

boxt ‘poor’

gʲiːskaːn ‘squeaking’

	b.	obirʲ	‘work (nom)’	aibʲrʲi	‘work (gen)’
		pobəl	‘people’	paibʲlʲiː	‘public (adj)’
(41)	a.	sʲæːn-	‘old’		
		pʲiːnʲ	‘penny’	sʲæːnʲ-fʲiːnʲ	‘old penny’
		potə	‘pot’	sʲæːn-fotə	‘old pot’
		gʲæːtə	‘gate’	sʲæːnʲ-ɣʲætə	‘old gate’
	b.	tʲə/tə	(adjectivalizing morpheme)		
		klosʲ	‘(to) hear’	klosʲ-tʲə	‘heard (adj.)’
		sɑːwɑːlʲ	‘(to) save’	sɑːwɑːlʲ-tʲə	‘saved (adj.)’
		dʲiːn	‘(to) make’	dʲiːn-tə	‘made (adj.)’
	c.	inʲ-	‘-able’		
		klosʲtʲə	‘heard (adj.)’	in-xloʃtʲə	‘audible’
(42)	a.	pailʲ	‘pools’		
		lɑːn	‘full’		
		pail lɑːn	‘full pools’		
	b.	kut	‘cat’		
		dʲæːs	‘nice’		
		kutʲ dʲæːs	‘nice cat’		

It is always the affix that changes to match the stem in the case of morphologically complex words. Across a word boundary, the word-final consonant changes to match the word-initial consonant.

The data in (36) and (37) illustrate palatalization triggered by *i*, which only occurs across word boundaries. I will call this "*i*-palatalization." To further illustrate, the forms in (43) show that palatalization and vowel quality do not interact morpheme-internally.[13]

(43) a. *Front Vowels*

siːrʲə	'holiday'
ʃiːlʲəmʲ	'I think'
fʲæːdiːlʲ	'whistling'
dʲiːrʲəx	'straight, honest'
tiː	'house (gen.)'
tʲiː	'straw'

b. *Back Vowels*

suːlʲ	'eye'
kʲlʲuː	'fame'
dorəs	'door'
dʲox	'drink'

Bennett accounts for C-palatalization with Agree-[±back], which requires adjacent consonants to match in backness:

[13]This holds only for long vowels. Short vowels are front before palatalized consonants and back before non-palatalized consonants (Ní Chiosáin 1991).

(44)

/g^jlan/	AGREE-[±back]	IDENT[back]
a. g^jlan	*!	
☞ b. $g^j l^j$an		*

To account for the root-controlled nature of C-palatalization, Bennett adopts IDENT[back]$_{\text{stem}}$, a Positional Faithfulness constraint that requires faithfulness of stem segments.

(45)

/d^jiːn-t^jə/	AGREE-[±back]	IDENT[back]$_{\text{stem}}$	IDENT[back]
a. d^jiːn-t^jə	*!		
☞ b. d^jiːn-tə			*
c. d^jiːn^j-t^jə		*!	*

To account for the sandhi facts in which word-final consonants match the backness of the following word-initial consonant, Bennett adopts IDENT[back]/[$_{\text{stem}}$___. This Positional Faithfulness constraint blocks changes in the stem-initial segment's backness feature. To comply with AGREE, the word-final consonant must change:

(46)

/pail^j lɑːn/	AGREE	IDENT/[$_{\text{stem}}$___	IDENT$_{\text{stem}}$	IDENT
a. pail^j lɑːn	*!			
☞ b. pail lɑːn			*	*
c. pail^j l^jɑːn		*!	*	*

Bennett adopts Stratal OT, and to resolve a ranking paradox that need not concern us here, he introduces IDENT[back]/[$_{\text{stem}}$___ only postlexically.

The postlexical stratum is also where Bennett accounts for *i*-palatalization. Since AGREE only militates against mismatched consonants, another constraint is needed to motivate palatalization with vowels. Bennett adopts PAL-[i] from Padgett (2003) and Gribanova (2007, 2008) (see also Rubach (2000) and Blumenfeld (2003)):

(47) PAL-[i]: A consonant and a following high vowel agree in backness.

This constraint correctly motivates palatalization across word boundaries, but it also triggers palatalization word-internally. Bennett notes this problem and speculates on some possible avenues for a solution. Ultimately, though, he concludes that this case of strict cyclicity poses a major problem for OT because there is no way to render word-internal Ci sequences invisible to PAL-[i].

A solution reveals itself once we realize that *i*-palatalization can be motivated by NONFINALITY. Just as postlexical harmony in Nez Perce targets word-final syllables, *i*-palatalization targets only word-final consonants. Under the assumption that backness domains in Irish are right-headed, we can use the constraint in (48):

(48) NONFINALITY-[±back]: The head of a backness domain may not be a word-final segment.

Like NONFINALITY-ATR, NONFINALITY-[±back] reflects the weakness of final positions. It motivates palatalization at word boundaries (49) but not morpheme-internally (50). Irrelevant constraints are omitted from these Tableaux.

(49)

/bɑːd iəskəx/ 'fishing boat'	NonFin	Id/[$_{stem}$___	Ident
a. bɑːd iəskəx	**!		
☞ b. bɑːdʲ iəskəx	*		*
c. bɑːd uəskəx	*	*!	*
d. bɑːdʲ iəskəxʲ[14]	*		**!

In (49), the [+back] feature of the word-final *d* violates NonFinality if it is left alone. Overwriting this feature with the following vowel's [–back] feature solves this problem: There is no longer a [–back] domain that ends on the final segment of the first word. Notice that Ident/[$_{stem}$___, which was already motivated by Bennett's analysis of C-palatalization, accounts for why [–back] spreads from the vowel to the consonant rather than [+back] spreading in the other direction. The word-final *x* must remain as it is. With no following word, its backness feature will necessarily violate NonFinality, and Ident prefers the faithful candidate.

However, NonFinality does not motivate palatalization of a word-internal consonant before *i*:

(50)

/fʲæːdiːlʲ/ 'whistling'	NonFin	Ident/[$_{morph}$___	Ident
☞ a. fʲæːdiːlʲ	*		
b. fʲæːdʲiːlʲ	*		*!

Furthermore, acquiring a backness feature from a segment to the word-final consonant's left does not solve the NonFinality problem. Only right-to-left

[14]In actuality, palatalization of the word-final x would be detectable through the presence of a mutation of the əx sequence: *igʲ* in southern dialects, ə in western dialects, or *i* in northern dialects (James McCloskey p.c.).

spreading occurs:

(51)

/d^jiːn/ '(to) make'	NonFin	Ident/[morph___	Ident
☞ a. d^jiːn	*		
b. d^jiːn^j	*		*!

Why don't we find depalatalization across word boundaries? For example, *$l^j es^j$ ə $v^j ar$* 'with the man' does not surface as **$l^j es$ ə $v^j ar$*. The analysis so far leads us to incorrectly predict spreading from ə in this case. We can fix this by splitting Ident[back] into Ident[+back] and Ident[–back] and ranking the former over NonFinality.

(52)

/l^jes^j ə f^jar/	Id/[morph___	Id[+bk]	NonFin	Id[–bk]
☞ a. l^jes^j ə v^jar			**	
b. l^jes ə v^jar		*!	*	

Furthermore, vowels do not undergo palatalization (i.e. fronting): /. . . u # i . . . / ↛ . . . *i* # *i* . . . . When a short vowel is involved, hiatus is often resolved through vowel deletion or *h*-insertion (Breatnach 1947), so in practice it may not be necessary to prevent vowel fronting. It is not clear to me whether hiatus involving only long vowels is similarly resolved, though. In case it is not, by ranking constraints on vowel faithfulness over NonFinality, we can prevent vowel mutations.

When a word-final consonant is followed by another consonant rather than a vowel, spreading is again predicted. But in this case we have C-palatalization, which we have seen to be active regardless of word boundaries.

Finally, only *i* triggers palatalization. Itô & Mester (in press) note that this vowel is crosslinguistically more likely to trigger palatalization than other vowels, and they suggest that this is reflected in a set of constraints that are in a stringency relationship (de Lacy 2002a) specifying acceptable backness domain heads. Smolensky (2006) shows how constraints on domain heads can be used to define possible sources of spreading, and his method can pick out *i* as the only legal palatalization trigger. Recall, however, that De Bhaldraithe (1975) and Ó Cuív (1975) claim that *e* also triggers palatalization. If they are right, this same method can single out both *i* and *e* as legal triggers.

To summarize, Irish palatalization presents another case in which NonFinality triggers postlexical spreading. Unlike the other cases examined in this chapter, palatalization is not an extension of a vowel harmony system. NonFinality's advantage over Pal-[i] is that it correctly restricts *i*-palatalization to word boundaries and attributes this property of *i*-palatalization to the weakness of word-final elements.

5.5 Conclusion

This chapter has examined some potentially truly noniterative postlexical processes. Some of these may exhibit emergent noniterativity from a rule-based point of view, and others are indisputably iterative. I argued that NonFinality has a significant role to play in these processes. It motivates minimal postlexical spreading so that domain heads may avoid word-final syllables and segments. Based on the gradient nature of vowel raising in Akan, the possibility of analyzing postlexical phenomena in a way similar to the peak delay approach to tone spread/shift was pointed out.

This chapter has obviously not exhausted the range of postlexical phenomena, and it would not be surprising to find that other specific cases require analyses that are not based on NonFinality. Rather, this chapter has shown that apparent noniterativity in the postlexical domain is amenable to analyses that do not invoke noniterativity and are more insightful than a simple noniterative rule. The noniterativity in these phenomena is emergent in that the observed spreading satisfies NonFinality and no further spreading is required. Crucially, we do not need to specify postlexical spreading as noniterative; that property comes for free. If the sample discussed here is representative, postlexical phenomena therefore do not challenge the Emergent Noniterativity Hypothesis.