Two Types of Parasitic Assimilation*

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Abstract

This paper shows that consonant harmony and parasitic vowel harmony are more similar than previously assumed. I provide a unified and restrictive analysis of parasitic assimilation using feature spreading constraints. In particular, I attribute the differences between the attested and unattested patterns to two types of markedness constraints—alignment and agreement.

1. Introduction

The phonological literature standardly recognizes two complementing forces in assimilation. First, assimilation affects segments in specific positions. For example, vowel harmony targets syllable nuclei (vowels), umlaut and metaphony often target stressed syllables, whereas voicing assimilation targets codas. Second, assimilation involves similar segments. For instance, parasitic vowel harmony applies only if the trigger and the target display an additional similarity not shared by all vowels; consonant harmony applies to a subset of consonants that are in some respect like the trigger; voicing assimilation in some languages is observed as long as the trigger and target are either both stops or both fricatives.

These two forces limit the extent of the attested cross-linguistic variation. Their effects in parasitic vowel harmony and consonant harmony are the focus of this paper. The empirical insight is that the two patterns are more alike than previously assumed. The proposed analysis mirrors this similarity: all kinds of assimilation involve feature spreading governed by constraints in Optimality Theory (OT). The differences between the two patterns stem from an asymmetry between vocalic and consonantal targets.

This paper is organized as follows. Section 2 offers a short overview of two parasitic patterns: parasitic vowel harmony in Yowlumne and retroflex (consonant) harmony in Kalasha. Section 3 looks at the properties of non-parasitic assimilation. The main point is to show that targets of assimilation display an asymmetry: some positions are generally preferred compared to others. This effect is attributed to alignment constraints. Section 4 looks at parasitic vowel harmony in Yowlumne, whereas section 5 provides an analysis of Kalasha retroflex harmony. Both patterns are analyzed as spreading resulting from the interaction of alignment and agreement constraints. Section 6 compares the current analysis with one alternative. Section 7 concludes the paper.

The contribution of this paper is two-fold. First, I show that parasitic vowel harmony and consonant harmony are two variations of the same pattern—parasitic assimilation. Second, I provide a unified analysis of both phenomena based on feature spreading and two classes of OT constraints. This approach predicts parasitism in vowel and consonant harmony, but limits non-parasitic assimilation to vowel harmony.

2. Parasitic assimilation

Assimilation targets a natural class of segments. Vowel harmony, for example, typically targets all vowels in a word or some other prosodic domain. Vowels may act as targets even if the trigger is a consonant. What this suggests is that the phonological properties of the trigger most commonly play little role, what matters are the targets (Nevins 2010). Once we consider the phonological properties of the trigger, however, we get several additional patterns. In some cases, only a subset of segments with a particular underlying feature

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triggers assimilation (McCarthy 2009, Mullin 2011, Jurgec 2011b). In other cases, assimilation depends on an additional similarity between a trigger and a target. This is the case in parasitic assimilation.

To illustrate, let us look at a classic example of parasitic vowel harmony (Steriade 1981, Archangeli 1985, Cole 1987, Cole and Trigo 1988, Kaun 1995; 2004, Krämer 2003) found in the Yowlumne dialect of Yokuts (formerly known as Yawelmani). Yowlumne has rounding harmony. Often, rounding harmony affects all vowels indiscriminately, as in Kyrgyz (Wurm 1949, Herbert and Poppe 1963, Johnson 1980, Comrie 1981, Kaun 1995). In Yowlumne, however, this is not the case. Instead, assimilation depends on the similarity between the trigger and target. Rounding applies only if both the trigger and target have the same vowel height. That is, round *high* vowels are followed by round high vowels, but by unrounded low vowels. Likewise, round *low* vowels are followed by round low vowels, but by unrounded high vowels. In (1), the forms with rounding harmony are marked with the symbol '☑'.

(1) Yowlumne rounding harmony (Kuroda 1967:10,14)

<table>
<tr><td colspan="2">1ST VOWEL IS ROUNDED</td><td></td><td></td></tr>
<tr><td>HIGH</td><td>LOW</td><td></td><td></td></tr>
<tr><td>muʈ-hu̱n ☑
'swear.AORIST'</td><td>gop-hin ☐
'take care.AORIST'</td><td>HIGH</td><td rowspan="2">2ND VOWEL</td></tr>
<tr><td>muʈ-taw ☐
'swear.NDIR.GER'</td><td>gop-to̱w ☑
'take care.NDIR.GER'</td><td>LOW</td></tr>
</table>

The main characteristic of parasitic harmony is the mutual dependence of two features. This property is not limited to vowel harmony, but appears frequently in consonant harmony (Shaw 1991, Odden 1994, Gafos 1996/1999, Hansson 2001, Rose and Walker 2004, Mackenzie 2009). An example comes from Kalasha. Kalasha has retroflex harmony which is triggered by the leftmost coronal. Harmony applies if both the trigger and target have the same continuancy (2). That is, retroflex fricatives are followed by retroflex fricatives, but by non-retroflex stops. Similarly, retroflex stops are followed by retroflex stops, but by non-retroflex fricatives.

(2) Kalasha retroflex harmony (Arsenault and Kochetov to appear: ex. 7–12)

<table>
<tr><td colspan="2">1ST CORONAL IS RETROFLEX</td><td></td><td></td></tr>
<tr><td>FRICATIVE</td><td>STOP</td><td></td><td></td></tr>
<tr><td>ʂuʂ̱ik ☑
'to dry'</td><td>ʈusu djek ☐
'to peck'</td><td>FRICATIVE</td><td rowspan="2">2ND CORONAL</td></tr>
<tr><td>ʂit ☐
'tight-fitting'</td><td>ʈʰeʈ̱ karik ☑
'to scatter'</td><td>STOP</td></tr>
</table>

This short presentation of the data alone strongly suggests that parasitic vowel harmony and consonant harmony can be integrated under a larger heading of parasitic assimilation. An assimilation pattern is parasitic if it depends on the similarity between a trigger and its targets. That is to say, parasitic assimilation occurs only when a trigger–target pair agrees in an otherwise independent feature, as in (3).

(3) Parasitic assimilation

<table>
<tr><td colspan="2">TRIGGER</td><td></td><td></td></tr>
<tr><td>GROUP A</td><td>GROUP B</td><td></td><td></td></tr>
<tr><td>☑
harmony</td><td>☐
no harmony</td><td>GROUP A</td><td rowspan="2">TARGET</td></tr>
<tr><td>☐
no harmony</td><td>☑
harmony</td><td>GROUP B</td></tr>
</table>

Given these empirical similarities, one would expect the analyses of parasitic vowel harmony and consonant harmony to be formally similar. This was the case in the analyses based on feature geometry (Odden 1994). More recently, however, the two phenomena have received radically different treatment (Hansson 2001, Rose and Walker 2004).[1] The reason for such a wide theoretical gap lies in locality. In particular, most standard approaches to assimilation maintain strict locality (Ní Chiosáin and Padgett 2001, Gafos 1996/1999). The idea is that a particular feature can be realized over multiple targets only if such targets are adjacent to one another; no skipping is allowed.

There are at least two reasons why the locality facts of vowel and consonant harmony have been treated differently. The first lies in phonetics: vowel harmony has been shown to affect the articulation of transparent consonants and vowels (Boyce 1990, Benus 2005, Benus and Gafos 2007). The assumption was that consonant harmony has no such effects (Walker 2000, Rose 2004, Rose and Walker 2004). As it turns out, the coarticulatory effect has been since found in consonant harmony as well. In Kinyarwanda, for example, retroflex consonant harmony affects the articulation of intervening transparent consonants and vowels (Walker et al. 2008). The acoustic and articulatory data thus suggest that there is no phonetic basis for treating the two types of assimilation differently. If strict locality is observed, it must hold for vowel and consonant harmony alike.

The second reason to assume different mechanisms for vowel and consonant harmony has to do with the phonological facts. There are many cases of vowel harmony affecting all vowels, whereas consonant harmony invariantly affects a subset of consonants. This fact alone creates an illusion in which vowel harmony appears to be more local than consonant harmony. In particular, vowel harmony typically affects vowels in neighboring syllables, whereas consonant harmony affects consonants that may be several syllables away from one another.

In this paper, I argue that these different locality facts do not rule out a spreading account of consonant harmony. Since there is no a priori representational distinction between vowel and consonant harmony, I will argue that what sets them apart is an asymmetry within a class of OT constraints. This approach predicts that vowel harmony can be parasitic or not, whereas consonant harmony is always parasitic.

3. Non-parasitic assimilation

The different theoretical approaches to parasitic vowel harmony and consonant harmony appear to originate from some general property of assimilation. Thus, it seems reasonable to first look at the locality in non-parasitic assimilation and then compare it with parasitic assimilation. In particular, non-parasitic assimilation turns out to be the general pattern and parasitic assimilation a specific one. In OT terms, all kinds of assimilation are driven by some markedness constraint, whereas parasitic assimilation shows evidence for an additional constraint.

This section starts off with a typological overview of prominence and directionality in non-parasitic assimilation (section 3.1). These typological generalizations are attributed to a single class of markedness constraints—Licensed Alignment (section 3.2). The section concludes with a factorial typology of patterns predicted by Licensed Alignment constraints (section 3.3).

3.1. Prominence and directionality in non-parasitic assimilation

Phonological literature has attributed assimilation to several mechanisms. One idea is that features favor prominent positions. Another idea is that features prefer domain edges. This section reviews these two properties and focuses on the markedness constraints that underlie them.

Assimilation is often sensitive to particular positions. On the one hand, segments in prominent positions may act as triggers of assimilation. Such trigger prominence has been modeled with positional

[1]Notable exceptions are Wayment 2009 and Nevins 2010.

faithfulness (Beckman 1997; 1998) in combination with a markedness constraint that drives assimilation (Baković 2000, Krämer 2003, Finley 2008, Mahanta 2008, Blaho 2008). On the other hand, prominent positions are often targets of assimilation. The most common approach that captures this second tendency is Positional Licensing (Steriade 1995, Zoll 1998a;b, Walker 2001; 2004; 2005; 2011, Kaplan 2008). The reasoning behind positional licensing is that a feature realized in prominent position has a different status than that feature realized in a non-prominent position. In terms of constraints, positional markedness constraints may require a feature to be associated with a morphologically, prosodically or psycholinguistically prominent position. One way to satisfy this condition is that the relevant feature is limited to a prominent position. Alternatively, a feature may target a prominent position. Consider the constraint in (4).

(4) LICENSE([high], σ́)
An output [high] must be associated with the stressed syllable.

The constraint LICENSE([high], σ́) (4) can be satisfied by spreading the feature [high] from the a post-tonic segment to the stressed vowel.[2] Such a pattern is attested in Ascrea dialect of Italy (5).

(5) Ascrea metaphony (Fanti 1938; 1939; 1940, Maiden 1991, Walker 2005; 2011)

a.	aésse	'have.1SG.IMPF.SUBJ'	aíʃʃi	'2SG.IMPF.SUBJ'
	véʃte	'this.F.PL'	víʃtu	'M.SG'
	sórda	'deaf.F.SG'	súrdi	'M.PL'
	fjóre	'flower.M.SG'	fjúri	'M.PL'
b.	tóreu̯a	'cloudy.F.SG'	túreu̯u	'M.SG'
	fósse	'be.3SG.IMPERF.SUBJ'	fússeru	'3PL.IMPERF.SUBJ'

In Ascrea, stressed mid vowels are raised when followed by a high suffix vowel (5a). This happens even at a distance, and any intervening post-tonic vowels remain transparent (b).[3] The licensing constraint in (4) is satisfied by spreading to the stressed syllable (6b).

(6) Licensing in Ascrea

/sórdi/	LICENSE([high], σ́)	FAITH
a. sórdi	*!	
b. ☞ súrdi		*

Yet the same licensing constraint is also satisfied by spreading from a pre-tonic segment (7a) or a segment in another word (7b). The challenge is that neither Ascrea nor any other language display such a pattern (Walker 2011).

(7) Licensing in Ascrea fails (hypothetical)

a. Pre-tonic positions trigger metaphony

/isórda/	LICENSE([high], σ́)	FAITH
a. ☹ isórda	*!	
b. ☞ isúrda		*

[2]Throughout this paper, I assume privative features, but the current approach is entirely consistent with binary features (see Jurgec 2011b).

[3]For expositional reasons, I abstract away from the patterns involving lax mid and low vowels. Additional constraints are required to capture these segments.

b. High vowels outside the word trigger metaphony

/sórda siné/	LICENSE([high], σ́)	FAITH
a. ☹ sórda siné	*!	
b. ☞ súrda siné		*

Positional licensing is generally not directional, predicting only bidirectional patterns. This clashes with the empirical data. While there are cases of vowel harmony triggered by stressed vowels and targeting pre- and post-tonic vowels (e.g. Pasiego height harmony), there are no reverse patterns, in which both pre- and post-tonic vowels target stressed vowels. Similarly, many cases of vowel harmony are triggered by a root vowel, targeting prefixes and suffixes (Baković 2000). However, the reverse pattern—in which both prefixes and suffixes affect roots—is unattested. Moreover, positional licensing does not refer to a domain, so there is no way to exclude distant triggers (even several words away). Such patterns have not been reported. In response, one way to proceed would be a redefinition of positional licensing to accommodate these pathologies. For example, the constraint could refer to particular non-prominent positions (e.g. post-tonic syllables in the case of Ascrea), but such a solution is not always available (e.g. the distinction between prefixes and suffixes). In short, the licensing constraint cannot be straightforwardly redefined to exclude these pathologies.

In contrast, the fact that assimilation is directional and domain-specific can be easily explained by another approach—Generalized Alignment (McCarthy and Prince 1993) that refers to segmental features.[4] Consider the constraint in (8).

(8) ALIGN([back], R; PWd, R; V) (Kirchner 1993, McCarthy 2003:78)
∀[back] if ∃PWd, assign one violation-mark ∀V that intervenes between Rightmost segment associated with [back] and the nearest Right Edge of some PWd.

In a word with multiple vocalic targets, the constraint ALIGN([back], R; PWd, R; V) (8) is satisfied as long as the final vowel within the word is [back]. To see the effect of this constraint, let us look at an example: Eastern Meadow Mari back harmony (9).

(9) Eastern Meadow Mari back harmony (Vaysman 2009, Walker 2011)

a.	ə́ʃkəl-ʃke̲	'step-ILLAT.SG.NOM.POSS'
	wástər-ʃke̲	'maple-ILLAT.SG.NOM.POSS'
	køgørtʃén-əʃke̲	'dove-ILLAT.SG.NOM.POSS'
b.	kórno-ʃko̲	'bread-ILLAT.SG.NOM.POSS'
	ojləmáʃ-əʃko̲	'story-ILLAT.SG.NOM.POSS'
	kuguʒán-əʃko̲	'princess-ILLAT.SG.NOM.POSS'
	kaβún-əʃko̲	'pumpkin-ILLAT.SG.NOM.POSS'

In Eastern Meadow Mari, words consisting of only front and central vowels may end on a front mid vowel (9a). A back vowel appearing anywhere in the root affects the final vowel (9b). This happens even at a distance, and the intervening central vowels remain unaffected.[5] The alignment constraint ALIGN([back], R; PWd, R; V) (8) is satisfied by spreading (10b).

[4] Alignment is used by Kirchner (1993), Smolensky (1993), Cole and Kisseberth (1995), Itô and Mester (1995), Akinlabi (1996), Pulleyblank (1996), Golston (1996), McCarthy (1997), Ringen and Vago (1998), Archangeli and Pulleyblank (2002).

[5] For expositional reasons, I abstract away from the patterns involving rounding harmony and high vowels, which need additional constraints.

(10) Alignment in Eastern Meadow Mari

/korno-ʃke/	ALIGN([back],R;PWd,R;V)	FAITH
a. korno-ʃke	e!	
b. ☞ korno-ʃko		*

As it turns out, the constraint ALIGN([back],R ; PWd, R; V) is satisfied by spreading to the very final vocalic target, whereas the intervening vowels do not matter. A low ranked faithfulness constraint prefers transparent non-final vowels (11b) over targets (11c).

(11) Alignment prefers transparency

/ojləmáʃə-ʃke/	ALIGN-R([back],R;PWd,R;V)	FAITH
a. ojləmáʃə-ʃke	*!***	
b. ☞ ojləmáʃə-ʃko		*
c. ojlomóʃo-ʃko		**!**

In a word with multiple available vocalic targets, the alignment constraint is satisfied as long as the final vowel within the word is [back], whereas additional spreading to other vowels has no effect. Such a pattern is attested in Eastern Meadow Mari back harmony. However, back harmony without transparent vowels is much more common (e.g. Turkish). A low ranked faithfulness constraint will always prefer Mari to Turkish. The winning candidate in Turkish would be similar to (11c), which is harmonically bounded given the two constraints (Samek-Lodovici and Prince 1999; 2002). In short, the first problem of alignment is that it prefers transparency over targets (in combination with faithfulness). This is clearly a pathology, since transparent segments are generally more marked than targets. While it is possible to redefine alignment such that transparency would no longer be favored, the modified constraint would rule out the pattern found in Eastern Meadow Mari. The second challenge to alignment has to do with non-final targets when the final vowel is not subject to assimilation for other reasons (e.g. blocking). Assimilation often fails to reach the edge of the relevant domain. The definition of alignment in (8) solves this problem through gradience, assigning one violation mark for each non-target vowel. However, gradient constraints produce other pathologies (McCarthy 2003).

This section provided an overview of prominence and directionality in assimilation. The prominence effects can be captured by positional licensing, and directionality is predicted by alignment, but both approaches produce several pathologies.[6]

3.2. Licensed Alignment

In this section, I propose a new constraint—Licensed Alignment (henceforth, LA)—that can capture positional prominence and directionality in assimilation. At the same time, LA lacks the pathologies of positional licensing and alignment. Like licensing, LA refers to a particular (prominent) position within a larger domain. Yet LA is also sensitive to every instance of such a position. Like alignment, LA is directional, which means that it matters whether a potential target precedes or is preceded by a feature.

LA has been first proposed for stress by Hyde (2012), and this paper extends it to segmental features. LA constraints penalize triplets of a domain, a feature (F) and a third category (γ), whenever F precedes γ within the domain (12).

[6]The argument set forth in this section builds on Jurgec (2012b).

(12) *domain[F, γ]

a. *$\langle$domain, F, $\gamma\rangle$ / domain
F γ

b. Assign a violation for every triplet $\langle domain$, F, $\gamma\rangle$, when F precedes γ within the $domain$.

To illustrate how licensed alignment works, consider the constraint driving progressive nasal harmony (13). This constraint is violated once for each triplet $\langle$PWd, [nas], $\times\rangle$ as long as the feature [nasal] precedes the root node ($\times$), within the Prosodic Word.

(13) *ω[nas,×]
*$\langle$PWd, [nas], $\times\rangle$ / PWd
[nas] $\times$

Notice that LA refers to precedence among features and segments. The precedence relations can be made clear within an autosegmental view of assimilation (Goldsmith 1976; 1990, Clements 1976/1980; 1985a, Kiparsky 1981). In Autosegmental Phonology, assimilation is feature spreading, which involves adding association lines between a feature and a target root node. While precedence is typically defined for each tier (op. cit.) or at the segmental level (Raimy 2000), Hyde (2012) has shown that a definition spanning these levels is also possible. In particular, the constraint *ω[nas,×] (13) is satisfied by spreading because the target segment is associated with [nasal]. Two elements that are associated with one another are synchronous and do not precede each other. Let us examine these precedence relationships on an example.

Sundanese nasal harmony is triggered by a nasal sonorant {m, n, ɲ, ŋ} and applies rightwards until it encounters a consonant (Robins 1957).[7] The data is shown in (14). I follow the literature in that laryngeals also undergo nasal harmony (Cohn 1990). Other consonants never become nasal and block further assimilation, but this fact will not be analyzed here (see Walker 1998/2000 for a standard OT account based on feature co-occurrence constraints).

(14) Nasal harmony in Sundanese (Robins 1957:91,95)

mãro	'to halve'
ɲĩãr	'to seek'
ŋũliat	'to stretch (INTR.)'
kumãh̃ã	'how'
ŋãjak	'to sift'
mãwur	'to spread'

Nasal harmony in Sundanese can be attributed to the LA constraint *ω[nas,×] (13). This constraint outranks the relevant faithfulness constraint. In what follows, I propose an autosegmental model of assimilation, hence the faithfulness constraint DEPLINK[F] will be used. In Sundanese, DEPLINK[nas] is active (15). This constraint is violated once for each segment linked to [nasal] in the output but not in the input.

(15) DEPLINK[nas] (cf. Itô et al. 1995, Myers 1997, Lombardi 1998, Morén 1999/2001, Blaho 2008)
Let $\times_i \Re \times_o$.
Assign a violation mark, iff $\times_o$ is associated with [nas] and $\times_i$ is not.

Tableau (16) shows a ranking in which the LA constraint *ω[nas,×] outranks the faithfulness constraint DEPLINK[nas]. The faithful candidate (a) incurs three violation marks of the LA constraint. This has to do with the fact that each of the segments following a [nasal] segment forms an offending triplet. LA constraints are categorical, because the locus of violation is a triplet, and each triplet can incur at most one violation mark. Spreading [nasal] to a target segment means that the feature [nasal] is synchronous with the

[7] Sundanese is analyzed in Langendoen (1968), van der Hulst and Smith (1982), Cohn (1990; 1993), Piggott (1992), Piggott and van der Hulst (1997), Benua (1997), Walker and Pullum (1999), Walker (1998/2000).

segment. Hence, [nasal] no longer precedes that segment, and the relevant triplet no longer violates the LA constraint. Put differently, only oral segments following a nasal segment can violate the LA constraint, and the winning candidate (d) has no such segments.

(16) kumãh̃ã 'how'

[nas] /ku m aha/	*ω[nas,×]	DEPLINK[nas]
a. [nas] k u m a h a	⟨ω,[nas],a⟩!⟨ω,[nas],h⟩,⟨ω,[nas],a⟩	
b. [nas] k u m ã h a	⟨ω,[nas],h⟩!⟨ω,[nas],a⟩	*
c. [nas] k u m ã h̃ a	⟨ω,[nas],a⟩!	**
d. ☞ [nas] k u m ã h̃ ã		***
e. [nas] k u m a h ã	⟨ω,[nas],a⟩!⟨ω,[nas],h⟩	*
f. [nas] k ũ m ã h̃ ã		****!

Note that candidate (e) has two transparent segments. A transparent segment is preceded by a [nasal] segment, and this situation violates the LA constraint. At the same time, *ω[nasal,×] does not care that the transparent segment also *precedes* another [nasal] segment.

More generally speaking, triggers and targets are associated with the spreading feature, which is a way to express that the two segments are synchronous with the feature. Hence, triggers and targets will never be in a precedence relation with the spreading feature, satisfying the LA constraint. In contrast, all transparent segments will incur a violation mark of the relevant LA constraint. Put differently, transparent segments are inherently more marked than targets. This situation rules out the pathology seen in classical alignment constraints (11).

Recall that licensing constraints create two further pathologies (7). The first pathology is spreading from any direction. A closer look at candidate (16f) reveals that the rightward LA constraint cannot be satisfied by spreading in the leftward direction (and the low ranked faithfulness constraint inhibits such spreading). LA is intrinsically directional and will never prefer spreading in both directions. The second pathology of positional licensing is spreading outside of the domain. Because LA refers to a domain, spreading outside of that domain will never satisfy the constraint (but may create additional violation marks).

I have now shown that LA is successful at modeling assimilation, while lacking the pathologies of its predecessors. I now turn to some further predictions of LA.

3.3. Factorial Typology

As we have seen, LA avoids many of the pathologies generated by the previous approaches. In this section, I show that LA can also distinguish between vocalic and consonantal targets. This ability is crucial in teasing apart the locality relationships in vowel and consonant harmony. More specifically, I show that the factorial typology of LA constraints excludes assimilation that prefers distant consonantal targets over closer vocalic targets. This prediction is in line with the empirical findings.

The LA constraint template refers to three categories: a feature, a domain and another category. This last category can be a root node, as we have seen in *ω[nas,×] (13). Root nodes are targets in Sundanese, yet one can easily imagine other kinds of targets. For example, the target could be a vowel (Turkish) or a stressed syllable (Ascrea). However, not all segments or their combinations are possible/attested targets in assimilation. For example, no case of rounding assimilation targets only coronals, voiced obstruents, or tense vowels. These patterns should be excluded by any restrictive theory of assimilation.

As it turns out, there is a principled way to restrict the last category of LA constraints. This is where the licensing part of LA comes into play. In section 3.1, I have already shown that assimilation may target prosodic/morphological domains rather than segments (Piggott and van der Hulst 1997, Hualde 1998, Piggott 2003, Walker 2011). That is to say, assimilation targets syllable nuclei, stressed syllables, or roots. This idea is central to Positional Licensing and LA.

I propose that the inventory of possible last categories/targets of LA constraints is restricted to prominent positions. One way to formalize this situation is through headedness: heads of prosodic or morphological domains are more prominent than other positions. Targets can be *prosodic heads* of syllables (Itô 1986/1988, Zec 1988/1994; 1995, Prince and Smolensky 1993/2004, Broselow et al. 1997, Morén 2000; 1999/2001, Gouskova 2004) or words (Kenstowicz 1997, de Lacy 2001; 2002; 2004; 2006; 2007, Gouskova 2010). When the domain is empty, all root nodes will be targeted, as in *ω[nas,×] (13). Another option is that targets are *morphological heads* of words, which includes morphological heads of empty domains, that is all morphemes. The licensing restriction is stated in (17).

(17) Licensing
For every Licensed Alignment constraint $*Cat1[Cat2, Cat3]$, if $Cat1$ is a domain and $Cat2$ is some [F], then $Cat3$ must be a head of some domain.

Let us look at these targets more closely. Prosodic targets can be used to capture many cases of assimilation. Consider that the targeted category of LA could be a syllable head (effectively, a vowel). The constraint *ω[vowel,ATR] favors spreading of [ATR] to all preceding vowels, as found in Turkana (Dimmendaal 1983, Vago and Leder 1987, Noske 1990; 1996; 2000). Targets can also be heads of prosodic words (stressed vowels). The constraint *ω[σ́,high] prefers spreading of [high] from post-tonic to stressed vowels, as found in Ascrea metaphony (5).

Another option are morphological heads. For example, the target can be a root or any morpheme (i.e. a head of an empty morphological domain). Jurgec (2012a) builds on this idea and shows how LA constraints with morphological targets restrict assimilation only across morpheme boundaries.

Licensing (17) appears to be a significant, but independently grounded restriction on LA constraints. Furthermore, licensing has a direct prediction regarding locality in assimilation. All other things being equal, LA constraints prefer spreading to syllable nuclei, but not specifically to other syllable constituents. Vowels are better syllable nuclei then consonants, which means that spreading to vowels will be generally preferred over consonants. Simply put, licensing somewhat restricts assimilation with consonantal targets.

The fact that LA constraints favor vocalic targets can be demonstrated with a factorial typology. For any given feature [F], there is a set of LA constraints with different domains. If we limit the discussion to progressive spreading within a word, at least the following two constraints are possible: *ω[F,×] (18a) has the head of an empty domain as the third, targeted category, whereas *ω[F,V] (18b) has the head of the syllable. Henceforth, 'vowel' will serve as a shorthand notation for the syllable head.[8]

(18) a. *ω[F,×]
*⟨PWd, F, ×⟩ / PWd
[F] ×

b. *ω[F,V]
*⟨PWd, F, V⟩ / PWd
[F] V

These constraints exclude languages with only consonantal targets, regardless of the ranking. This is

[8]There is a small difference between saying that targets are vowels or syllable heads. Consonants can be syllable heads, too, so the current approach predicts a language that has vowels and syllabic heads as targets. To the best of my knowledge, such a language has not been found. At the same time, there is no reported case of syllabic consonants behaving transparent just as regular consonants. Note that Positional Licensing makes identical predictions as LA with respect to syllabic consonants.

shown in (19), where we see spreading from the initial segment. Note that blocking is not considered here, as it needs separate constraints, and would distract from the main topic of this paper.

Let us first look at the evaluation of $*\omega[F,\times]$. This constraint is violated by triplets $\langle\omega,[F],\times\rangle$. Since all the candidates in (19) contain one prosodic word, one instance of [F], and four root nodes, this results in four different triplets. Each triplet differs from the others only in the final element, namely the root node. However, not all of these triplets violate the constraint. Consider candidate (d). We see that the LA constraint is violated only twice. Two of the triplets—$\langle\omega,[F],V_i\rangle$ and $\langle\omega,[F],C\rangle$—satisfy all the conditions in the constraint definition (18a): the root node must be preceded by [F], within a prosodic word. For example, the second root node is preceded by [F], because that root node is preceded by the initial root node, which is associated with [F]. The initial root node does not violate this constraint, since it is not preceded by [F]. This situation seems to be slightly different for the final root node, which appears to be preceded by the initial root node, which is itself associated with [F]. However, as we have already seen in Sundanese nasal harmony (16), association lines express synchrony between a root node and a feature, which then excludes any precedence relations. That is, the final root node is associated with [F], hence not preceded by [F]; the final root node is not part of a violating triplet. The same reasoning can be applied to the constraint $*\omega[F,V]$ and all other candidates. Note that the two LA constraints are stringent. Any triplet that violates $*\omega[F,V]$ also violates $*\omega[F,\times]$, but not vice versa.

(19) Spreading to consonants across vowels ruled out

[F] / × V_i C V_j/	$*\omega[F,V]$	$*\omega[F,\times]$	DEPLINK[F]
a. [F] × V_i C V_j	$\langle\omega,[F],V_i\rangle,\langle\omega,[F],V_j\rangle$	$\langle\omega,[F],V_i\rangle,\langle\omega,[F],C\rangle,\langle\omega,[F],V_j\rangle$	
b. [F] × V_i C V_j	$\langle\omega,[F],V_j\rangle$	$\langle\omega,[F],C\rangle,\langle\omega,[F],V_j\rangle$	*
c. ☜ [F] × V_i C V_j	$\langle\omega,[F],V_i\rangle,\langle\omega,[F],V_j\rangle$!	$\langle\omega,[F],V_i\rangle,\langle\omega,[F],V_j\rangle$	*
d. [F] × V_i C V_j	$\langle\omega,[F],V_i\rangle$	$\langle\omega,[F],V_i\rangle,\langle\omega,[F],C\rangle$	*
e. [F] × V_i C V_j		$\langle\omega,[F],C\rangle$	**
f. ☜ [F] × V_i C V_j	$\langle\omega,[F],V_j\rangle$!	$\langle\omega,[F],V_j\rangle$	**
g. ☜ [F] × V_i C V_j	$\langle\omega,[F],V_i\rangle$!	$\langle\omega,[F],V_i\rangle$	**
h. [F] × V_i C V_j			***

Returning to the factorial typology, what (19) shows is that some candidates (marked with '☜') are harmonically bounded. First, candidate (c) has spreading to the consonant, while the intervening vowel is transparent. This candidate incurs one more violation mark of $*\omega[F,V]$ compared to candidates (b) and (d) in which only vowels are targeted, without faring better on any other constraint. Candidates (f) and (g) have spreading to the consonant and one vowel, but not to the other vowel. The candidates should be understood as both having transparent vowels but no transparent consonants. Such patterns are not attested, and are ruled out by the factorial typology based on LA and faithfulness constraints. All other candidates are winners under some ranking.[9]

We have now seen that the LA constraints rule out all patterns in which vowels are transparent but consonants are not. This is exactly what is required in an analysis of non-parasitic assimilation. In other words, two types of assimilation are possible: one that targets vowels and the other that targets all segments.

The asymmetry between consonantal and vocalic targets has been observed in the literature (Howard 1972, Jensen 1974, Clements 1985b; 1991, Sagey 1990, Steriade 1995, Morén 2003). However, this generalization is typically couched in terms of blocking, not transparency. The two main observations are: (i) vowel place features often spread from one vowel to another across the intervening consonants, and (ii) consonant major place features never spread from one consonant to another (Hansson 2001). The problem with this generalization is that both types of place features do spread among vowels and consonants, as long as they are adjacent (Odden 1994). An alternative view of this situation is that transparency is implicational: vowels can be transparent only if consonants are also transparent. Thus, spreading of a feature across vowels is restricted. In contrast, spreading of any feature to adjacent segments is possible, because transparency is not involved.

The crucial comparison is between vowel and consonant harmony. Vowel harmony is a common pattern which typically affects only vowels, with consonants being transparent. Consonant harmony is another common pattern, which often affects only consonants. However, no known case of consonant harmony affects all consonants without also affecting vowels, and all known cases of consonant harmony affect only a subset of consonants.[10]

To summarize, the patterns with transparent segments reveal an asymmetry between vocalic and consonantal targets. Vocalic targets are generally preferred to consonantal targets. This means that a consonant will generally assimilate only if intervening vowels do, too. The remaining question is how we can capture the attested consonant harmony cases. My proposal is that consonant harmony is directly parallel to parasitic vowel harmony: both involve assimilation within a small subset of segments. As I will show, parasitic vowel harmony affects only a subset of vowels, whereas consonant harmony affects only a subset of consonants. This effect will be attributed to a high ranked constraint that prefers similarity between triggers and targets.

With this in mind, we can now proceed to the analysis of parasitic assimilation in Yowlumne and Kalasha. It will be shown that Yowlumne requires an LA constraint targeting vowels, while Kalasha requires an LA constraint targeting all segments. At the same time, both patterns require an additional markedness constraint.

4. Yowlumne

I now proceed to the analysis of parasitic vowel harmony in Yowlumne. I first show that the constraints proposed for non-parasitic assimilation are not sufficient to account for parasitic assimilation (section 4.1). Next, I propose an additional agreement constraint required for parasitic assimilation (section 4.2). Finally, I give an analysis of Yowlumne based on alignment and agreement (section 4.3).

[9] A reviewer notes that additional constraints could produce the unattested pattern with only consonantal targets (19c). Consider a high ranked feature co-occurrence constraint against the combination of the spreading feature and a vowel. This constraint would prefer spreading to consonants alone in combination with a lower ranked LA constraint $*\omega[\mathrm{F},\times]$. The challenge at hand is that feature co-occurrence constraints favor transparent segments over targets. This is clearly a pathology, since transparent segments are intrinsically more marked than targets. Put differently, feature co-occurrence constraints themselves make pathological predictions, which need to be addressed independently of the current account based on LA constraints. In Jurgec (2011a), I propose that transparent segments violate feature co-occurrence constraints just as targets do. Hence, feature co-occurrence constraints cannot prefer some targets over others (e.g. consonants over vowels).

[10] To the best of my knowledge, only one pattern comes close to such an unattested pattern: Karaim palatalization consonant harmony (Kowalski 1929, Hamp 1976, Nevins and Vaux 2004, Hansson 2007b, Nevins 2010). All consonants are affected, with two exceptions. First, the glide [j] is not affected and can appear in non-palatalized environments. Second, this process also targets the high back vowel. Hence, Karaim does not constitute a clear counter-example.

4.1. Licensed Alignment is not enough

The Yowlumne dialect of Yokuts is likely the most widely discussed case of parasitic vowel harmony.[11] As we have seen in (1), Yowlumne has rounding harmony which targets {i, a}, which turn into {u, o}. However, rounding is found only when the trigger and the targets agree in vowel height. More data are provided in (20).[12]

(20) Yowlumne vowel harmony (Kuroda 1967:10,14)

gij'-hin	gij'-taw	'touch'
muţ-hun ☑	muţ-taw	'swear'
xat-hin	xat-taw	'eat'
gop-hin	gop-tow ☑	'take care of an infant'
'AORIST'	'NDIR.GER'	

Parasitic vowel harmony is much less frequent than non-parastic vowel harmony, and not all types are attested. Rounding harmony, for example, can be parasitic on height and backness, but not on other features (Kaun 1995). Given these gaps, it seems reasonable to ask if the current approach restricts parasitism in any way. While it is in principle possible to restrict the parasitic feature, this task nevertheless falls outside this paper. In no way is this challenge specific to the current approach; the alternatives make no or few principled restrictions. The aim here is to demonstrate that parasitic assimilation can be analyzed as spreading and OT constraints.

(21) Inconsistency in Yowlumne

Winner ∼ Loser	*[rd high]	*[rd low]	*ω[rd,V]	*ω[rd,×]	DEPLINK[rd]
[rd] m u ţ'hun ∼ [rd] m u ţ'hin	L		W	W	L
[rd] m u ţ'taw ∼ [rd] m u ţ'tow		W	L	L	W
[rd] g o ptow ∼ [rd] g o ptaw		L	W	W	L
[rd] g o phin ∼ [rd] g o phun	W		L	L	W

In line with the previous analyses, I take [round] as the spreading feature. Licensing (17) predicts at least two LA constraints with [round]: *ω[round,V] and *ω[round,×]. Another potentially relevant constraint is the faithfulness constraint DEPLINK[round]. However, since spreading to vowels is restricted depending on vowel height, we can easily imagine other potentially active constraints. In particular, feature co-occurrence constraints have been shown to be required for assimilation (Archangeli and Pulleyblank 1994, Walker 1998/2000), and in Yowlumne, two such constraints may be involved: *[round high] and *[round low] (Kaun 1995; 2004). The feature constraints may block assimilation depending on the target vowel

[11] The original data come from Newman (1944). Subsequent treatments include Kuroda (1967), Kisseberth (1969), Gamble (1978), Jensen and Stong-Jensen (1979), Archangeli (1984; 1985; 1988), Archangeli and Pulleyblank (1994), Noske (1985), Steriade (1986), Cole (1987), Cole and Trigo (1988), Zoll (1993), Goldsmith (1993), Noske (1993), Kaun (1995), Sprouse (1997), Archangeli and Suzuki (1997), McCarthy (1999; 2007b), Orgun and Sprouse (2007), Dresher (2009), Nevins (2010).

[12] Note that vowel harmony applies rightwards and iteratively (cf. [ţ'it't'-ijin] 'raccoon' ∼ [tuk'-ujun] 'jackrabbit'). Some suffixes are underlyingly rounded themselves (cf. [ţ'aw-hatin-xoo-hin] 'was trying to win'), which is enforced by high ranked MAXLINK[round].

height. As we can see in comparative tableau (21), all these constraints are unable to capture Yowlumne. In particular, since no constraint prefers only winners, there is no consistent ranking possible to capture the Yowlumne pattern.

The alignment, faithfulness and feature co-occurrence constraints fail to capture parasitic assimilation. In response, I propose another class of markedness constraints.

4.2. Agreement

In this section, I argue that the constraint required for parasitic assimilation is agreement. I first show that the classic definition of AGREE faces several formal and typological challenges. As a solution, I propose a new kind of agreement constraint. In a nutshell, the idea is that agreement works in combination with licensed alignment.

Classic agreement constraints prefer similar segments. Let us look at one such constraint, AGREE[voice] in (22).

(22) AGREE[voice]

a. Adjacent segments must have the same value of the feature [voice]. (Baković 2000:4)
b. Obstruent clusters must agree in voicing. (Lombardi 1999:272)
c. A segment has [voice] iff its neighboring segments have [voice]. (Blaho 2008:64,139)

The constraint AGREE[voice] has several definitions. However, all the definitions in (22) include reference to three variables: one feature and two segments at some distance from one another. More specifically, the constraint AGREE[voice] is violated when two segments are adjacent to one another and only one is associated with [voice]. This seems to be ideal to capture voicing assimilation, since two adjacent obstruents with the same voicing satisfy AGREE[voice], whereas two obstruents with different voicing violate the constraint. Thus, it seems that classic agreement constraints correctly predict at least some types of assimilation.

Another potential advantage is in the adjacency requirement that is ingrained in the constraint definition (22). No known language has voicing assimilation of a word-initial obstruent targeted by a word-final one. Agreement constraints cannot generate such a pattern, since any two non-adjacent segments vacuously satisfy the constraint. That is to say, no pair of non-adjacent obstruents can violate AGREE[voice]. However, while adjacency is undoubtedly an important concept in phonology (Howard 1972, Jensen 1974, Odden 1994, Halle 1995), its reference in a constraint that prefers assimilation creates pathologies. For example, agreement constraints are equally satisfied by assimilation or epenthesis. The choice between the two can be determined by other constraints. Tableau (23) shows a ranking that prefers epenthesis, as in candidate (c).

(23) Agreement drives epenthesis (unattested)

apga	AGREE[voice]	DEPLINK[voice]	DEP
a. apga	*!		
b. abga		*!	
c. ☞ apiga			*

The grammar in (23) has epenthesis only when obstruents disagree in voicing, but not otherwise. No such cases have been reported, and their existence would be surprising. This kind of pathology is an instantiation of the too-many-solutions problem (Pater 1999, Wilson 2000; 2001, Steriade 2001, 2001/2008; Blumenfeld 2006, Baković 2007). One way to solve this challenge is a modification of agreement constraints.

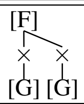
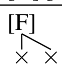
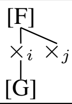
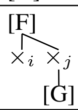
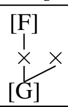
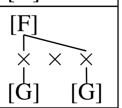
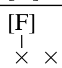
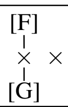
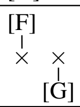
The question is how to amend agreement in such a way that it would no longer produce pathologies. To start with, let us look at the definitions of agreement constraints in (22). All these definitions refer to one feature and adjacent segments. Upon closer examination, however, it becomes clear that reference to two features is required. In particular, only obstruents can potentially violate the constraint, while other segments are ignored.

I propose two modifications of agreement constraints. First, agreement should explicitly refer to two features rather than one. Second, adjacency should be dropped completely from the definition. The reason why this is possible in the current approach is that locality is already established by alignment constraints, which I intend to use together with agreement. By modifying Blaho's definition in (22c), the new agreement constraint template is in (24).

(24) AGREE[F,G]
A root node is associated with [F] and [G] iff all root nodes associated with [F] are also associated with some [G].

The constraint in (24) contains reference to two features, which are not equivalent with respect to their role in the definition. In particular, AGREE[F,G] is not identical to AGREE[G,F]. There are other ways in which the newly defined agreement constraint is very different from classic agreement. For example, the new agreement is vacuously satisfied by no spreading or by spreading within segments that lack one of the two features. To make the differences more explicit, let us look at evaluation of AGREE[F,G] in (25).

(25) AGREE[F,G] evaluations

	AGREE[F,G]
a. 	
b. 	(v.s.)
c. 	$\times_i$
d. 	$\times_j$
e. 	
f. 	
g. 	(v.s.)
h. 	
i. 	(v.s.)

Candidates (a–f) have spreading. In candidate (a), both root nodes are associated with [G]. Hence, the agreement constraint is satisfied. Candidate (b) vacuously satisfies the constraint since no root node is associated with [G]. In contrast, candidates (c) and (d) have only one root node associated with [G]. These two candidates violate AGREE[F,G], because they have two root nodes that are associated with the same instance of [F], yet only one of the two root nodes is associated with [G]. In other words, it is not the case that all root nodes associated with [F] are also associated with some [G]. Directionality has no effect here. So far then, the constraint seems to be doing its job, which is enforcing spreading of [F] within segments that are linked to some [G].

The candidates considered next reveal two further properties of agreement constraints. Candidate (e) has spreading of [G] rather than [F]. This candidate does not violate AGREE[F,G], because only one root node is linked to [F]. However, if we compare candidate (e) with candidate (i) without spreading, we see that they do not differ in terms of AGREE[F,G], which means that this constraint alone cannot enforce spreading of [G]. Candidate (f) contains a transparent segment. The constraint AGREE[F,G] is not violated by this candidate, because the constraint can see only segments associated with [F], while the rest are ignored. The initial and final root nodes are both associated with [F] and some [G], satisfying agreement.

Finally, candidates (g–i) have no spreading. Regardless of whether the segment associated with [F] is also associated with [G] or not, these candidates all satisfy the constraint AGREE[F,G]. At first, this seems a bit counterintuitive. In particular, what we see here is that AGREE[F,G] can only be violated by candidates with spreading. Furthermore, the faithfulness constraint DEPLINK[F] prefers no spreading, regardless of its ranking. However, we already have a constraint that prefers spreading—licensed alignment. A combination of an LA constraint and a higher ranked agreement constraint prefers spreading of [F] only if the target agrees with the trigger with respect to [G]. Put differently, the role of agreement constraints is to restrict spreading to a subset of targets of the LA constraint.

As we have now seen, the new definition of agreement differs substantially from its predecessors. First, the new agreement constraint does not refer to adjacency of segments, which rules out the pathologies generated by classical agreement. Second, the new agreement does not trigger spreading on its own, but rather restricts spreading to the targets similar to the trigger. In this sense, agreement somewhat resembles constraints in an alternative approach to consonant harmony (Agreement by Correspondence, see section 6 below).

The question is whether we see effects of agreement outside parasitic assimilation. As it turns out, similar constraints have been proposed for prosody. Myrberg (2010) uses a constraint *ADJUNCTION which penalizes sister nodes in the prosodic structure that are not instantiations of the same prosodic category. Selkirk (2011) and Elfner (2011) propose a directional variant of the same constraint. Although these constraints refer to prosodic structures, they embody the same idea, namely agreement between two constituents that are linked to another (higher) constituent.

To summarize, the new agreement constraint is violated solely by spreading to targets that differ from triggers. This is exactly what is required in an analysis of Yowlumne, in which rounding never spreads to the vowel which has different vowel height that the trigger. The following section gives an account of parasitic harmony in Yowlumne, which demonstrates that agreement and alignment work hand in hand.

4.3. Analysis

Yowlumne parasitic vowel harmony requires three constraints. As we have seen above, alignment alone is not sufficient to capture the parasitic pattern. A high ranked agreement constraint (26) is necessary in addition. The constraint AGREE[round,high] penalizes any instantiation of [round] linked to high and low segments at the same time.

(26) AGREE[rd,hi]
A root node is associated with [round] and [high] iff all root nodes associated with [round] are also associated with some [high].

I will show the effect of these constraints in three steps. First, I will consider a combination of two high vowels. Next is the input with two low vowels. In both cases, rounding harmony applies. The final input is one with a high trigger followed by a low target. As we will see, the agreement constraint can be violated only in this last case, preferring no harmony.

In (27), we see an input with two high vowels. When vowel height is preserved, AGREE[rd,hi] cannot be violated. Alignment is ranked next, and the spreading candidate (b) fares best on it, winning over the faithful candidate (a).

(27) AGREE satisfied, ALIGN prefers harmony

[rd] / m u ʈ’ - h i n / [hi] [hi]	AGREE[rd,hi]	*ω[rd,V]	DEPLINK[rd]
a. [rd] m u ʈ’ h i n [hi] [hi]		*!	
b. ☞ [rd] m u ʈ’ h u n [hi] [hi]			*

Tableau (28) shows an input with two low vowels. Agreement is vacuously satisfied by all outputs that lack high (or round) segments, as it is the case for both candidates. LA is ranked next, and it prefers the candidate with rounding harmony (b). In short, harmony is preferred whenever the targets are of the same height as the trigger.

(28) AGREE vacuously satisfied, ALIGN prefers harmony

[rd] / g o p - t a w / [lo] [lo]	AGREE[rd,hi]	*ω[rd,V]	DEPLINK[rd]
a. [rd] g o p t a w [lo] [lo]		*!	
b. ☞ [rd] g o p t o w [lo] [lo]			*

(29) AGREE violated by spreading

[rd] / m u ʈ’ - t a w / [hi] [lo]	AGREE[rd,hi]	*ω[rd,V]	DEPLINK[rd]
a. ☞ [rd] m u ʈ’ t a w [hi] [lo]		*	
b. [rd] m u ʈ’ t o w [hi] [lo]	*!		*

Finally, the input in (29) has two different vowel heights. It is only in this case that agreement becomes active. In particular, spreading violates AGREE[round,high] since [round] is associated to some segments that are [high] and some that are not. Hence, the faithful candidate (a) wins over the spreading candidate (b).

Yowlumne shows the joint effect of LA and agreement. LA prefers spreading to all segments or to vowels, whereas agreement prefers spreading to a subset of those targets. Put differently, LA targets some segments, while it remains agnostic about the triggers. Agreement, on the other hand, prefers spreading only when the trigger is identical to the target in terms of another feature.

5. Kalasha

In this section, I show that Kalasha retroflex harmony works very much like Yowlumne vowel harmony. The two patterns are much alike: both are parasitic. In terms of the analysis, the parasitic effect is attributed to agreement constraints. At the same time, there are two crucial differences in the analysis of Kalasha and Yowlumne. First, the LA constraint in Kalasha targets all root nodes rather than vowels as in Yowlumne. Second, Kalasha is multiply parasitic and shows evidence for several agreement constraints, whereas Yowlumne requires only one.

5.1. Coronal harmony

Kalasha (Morgenstierne 1973, Trail n.d., Mørch and Heegård 1997, Heegård and Mørch 2004, Bashir 2003, Arsenault and Kochetov to appear, Arsenault 2012) exhibits restrictions on retroflexion that strongly resemble the Yowlumne pattern. Retroflexion of coronals within roots is restricted, such that any two coronal stops are either both retroflex or neither is. This generalization is true for stops and fricatives, as seen in (2). In addition, affricates behave the same way, as shown below in (30). Kalasha consonant harmony turns out to be a three-way parasitic pattern, distinguishing between stops, fricatives, and affricates. One way to interpret the data in (30) is to say that the trigger is the initial coronal, whereas the target is the following consonant. This alternation is limited to roots, and there are no active alternations to support retroflex harmony. However, Richness of the Base allows for a combined treatment of alternations and static restrictions in OT. As we have seen in section 4, the current approach can deal with alternations, and in this section I will show that it can also model static restrictions within morphemes.

(30) Kalasha retroflex harmony (Arsenault and Kochetov to appear: ex. 7–12)

1ST CORONAL			
FRICATIVE	AFFRICATE	STOP	2ND CORONAL
ʂuʂik ☑ ‘to dry’	(no data)	ʈusu djek ‘to peck’	FRIC
ʂatɕ ‘shelter’	ɖʐaʈʂ ☑ ‘spirit beings’	ʈõtɕuk ‘active’	AFFR
ʂit ‘tight-fitting’	ʈʂat ‘moment’	ʈʰeʈ karik ☑ ‘to scatter’	STOP

Kalasha is a case of retroflex harmony. One way to analyze this pattern is to say that it involves two binary features, [−anterior] and [−distributed] (e.g. Johnson 1972, Schein and Steriade 1986). A privative alternative is the feature [retroflex]. The feature [retroflex] may be a dependent on the feature [coronal], which is in line with most previous accounts (Schein and Steriade 1986, Sagey 1990, Hall 1997, Ní Chiosáin and Padgett 2001, Hansson 2001, Rose and Walker 2004), but the present analysis based on LA constraints does not require such a representational restriction. I use [retroflex] here for expositional reasons, and without precluding an analysis assuming other features.

The LA constraint active in Kalasha could require spreading of [retroflex] to either vowels or all root nodes, as required by licensing (17). Recall that in the analysis of Yowlumne, vowels are a possible third category of the relevant LA constraint. In contrast, Kalasha retroflex harmony targets only consonants, hence vowels cannot be the third category of the active LA constraint. Instead, the third category has to be the root node. This is further supported by the fact that vowels may also be retroflex as in Badaga (Ladefoged and Maddieson 1996) or some dialects of Kalasha (Mørch and Heegård 1997, Heegård and Mørch 2004).[13] The domain of the constraint is the root (31).

(31) *root[retroflex,×]
*⟨root, [rx], ×⟩ / root
[rx] ×

Several agreement constraints are required in Kalasha. The first agreement constraint requires that the trigger and targets agree in the feature [coronal] (32). Another assures that only obstruents are affected (33). Combined, retroflex harmony is limited to coronal obstruents.

(32) AGREE[rx,cor]
A root node is associated with [retroflex] and [coronal] iff all root nodes associated with [retroflex] are also associated with some [coronal].

(33) AGREE[rx,son]
A root node is associated with [retroflex] and [sonorant] iff all root nodes associated with [retroflex] are also associated with some [sonorant].

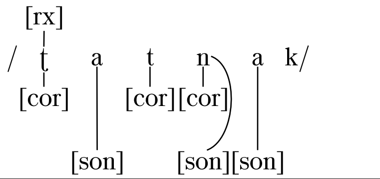
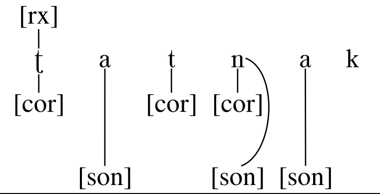
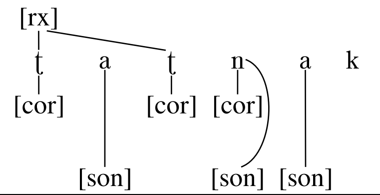
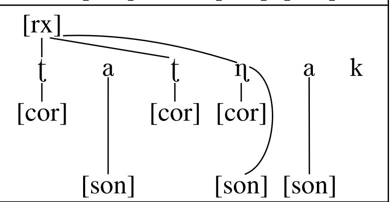
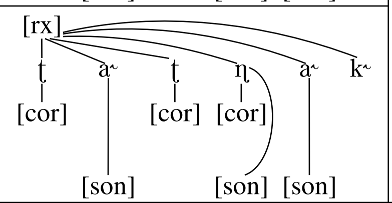
The last is a faithfulness constraint DEPLINK[retroflex]. This constraint is ranked below LA, parallel to the ranking in Yowlumne.

I first show the ranking that limits spreading to coronal obstruents. Tableau (34) illustrates the effect of high ranked agreement constraints in combination with LA. First, LA generally prefers spreading to all segments, as in candidate (d). Transparent segments violate the constraint since they satisfy the requirement, which is that a [retroflex] segment precedes them, while they are not associated to that instance of [retroflex]. However, candidate (d) with total harmony violates agreement constraints. Only candidates (a) and (b) do not. Of these, spreading to a single coronal obstruent as in candidate (a) fares best on alignment. In short, agreement constraints restrict spreading to a subset of targets determined by the LA constraint.

Many cases of consonant harmony are similar to the hypothetical example in (34). That is, consonant harmony applies within a class of coronals, and there is no additional parasitic requirement. For example, Aari has sibilant harmony which applies to fricatives *and* affricates, even if in the same word (Hayward 1988; 1990). Other similar examples can be found in Koyra (Hayward 1982; 1988), Chumash (Applegate 1972, Beeler 1970, Harrington 1974, Poser 1982; 1993; 2004, Lieber 1987, Gafos 1996, Hansson 2001, McCarthy 2007a), and Slovenian (Jurgec 2011a) sibilant harmony. This shows that all kinds of coronal harmony can be captured using this approach, namely by using a combination of agreement and alignment constraints. For an extension to other types of consonant harmony see Jurgec (2011a).

[13] Mørch and Heegård (1997), Heegård and Mørch (2004) describe the language as having retroflex vowels, which variantly spread to other segments. This fact is not specifically analyzed in Arsenault and Kochetov (to appear). From the existing literature, it is impossible to tell whether and how the two patterns interact. If they do, then Kalasha does not exhibit parasitic retroflex harmony, but simply local spreading. Henceforth, I will assume that the data of Arsenault and Kochetov (to appear) is correct and that vowel retroflexion is a separate process, which possibly interacts with consonant retroflexion.

(34) /ʈatnak/ → [ʈaʈnak] (hypothetical)

	AGREE[rx,cor]	AGREE[rx,son]	*rt[rx,×]	DEPLINK[rx]
a. 			*****!	
b. ☞ 			****	*
c. 		ɳ!	***	**
d. 	ʈ(!)tɳ	a˞(!)ɳi˞		*****

5.2. *Multiple parasitism*

Kalasha retroflex harmony is multiply parasitic. First, it applies only to coronal obstruents. Second, it applies only if the trigger and the target are both stops, both fricatives, or both affricates. This second type of parasitism will be analyzed now.

There are several ways to distinguish between stops, fricatives, and affricates in terms of features and consequently constraints that refer to them. In addition to the machinery developed in the previous section, I propose two other features and their agreement constraints. The first feature is [continuant], which captures the difference between fricatives and the other two groups. The second feature is [delayed release], and this feature singles out affricates. (Other analysis are also possible, for example a feature that refers to stops exclusively.) The two features are referred to by two agreement constraints: AGREE[retroflex, continuant] and AGREE[retroflex, delayed release]. I follow Arsenault and Kochetov (to appear) in assuming that Kalasha has progressive spreading determined by the coronal in the initial syllable.[14]

Tableau (35) shows a root with two fricatives. In this case, the winning candidate (b) has spreading

[14]This can be captured by using positional faithfulness to leftmost coronal (Beckman 1997; 1998, Barnes 2006, Jurgec 2011a), which will not be analyzed further. In this sense, the current analysis is directly parallel to the alternatives to be discussed in section 6.

to the second fricative, as opposed to the faithful candidate (a). While spreading to all root nodes (c) would perfectly satisfy alignment, such a candidate incurs several violation marks of AGREE[retroflex, sonorant] and AGREE[retroflex, continuant]. This situation is directly parallel to what we have seen in tableau (34). Furthermore, the current analysis resembles Yowlumne in that harmony within coronal fricatives is preferred by LA constraints, while agreement constraints are not violated by such candidates.

(35) ALIGN prefers harmony

/ʂ u s i k/ [rx] [son] [son] [cont] [cont] [cont] [cont]	AGREE [rx,son]	AGREE [rx,cont]	AGREE [rx,d.r]	*rt[rx,×]	DEPLINK[rx]
a. ʂ u s i k				****!	
b. ☞ ʂ u ʂ i k				***	*
c. ʂ u˞ ʂ i˞ k˞	*!*	*!***			****

Next, let us consider inputs containing two kinds of coronal obstruents. Tableau (36) shows an input with a retroflex fricative followed by a stop. In this case, alignment would prefer spreading, as in candidate (b). Spreading, however, violates agreement, and the faithful candidate (a) is preferred instead.

(36) AGREE prefers similarity

/ʂ i t/ [rx] [son] [cont] [cont]	AGREE [rx,son]	AGREE [rx,cont]	AGREE [rx,d.r]	*rt[rx,×]	DEPLINK[rx]
a. ☞ ʂ i t				**	
b. ʂ i ʈ		*!		*	*

Tableau (37) has an input containing an affricate and a stop. Directly parallel to the situation in (36), agreement constraints inhibit spreading in such cases. The faithful candidate (a) wins regardless of its violations of alignment.

(37) AGREE prefers similarity

[rx] / t̪s a t / [d.r] [cont]	AGREE [rx,cont]	AGREE [rx,d.r]	*rt[rx,×]	DEPLINK[rx]
a. ☞ [rx] t̪s a t [d.r] [cont]			**	
b. [rx] t̪s a t̪ [d.r] [cont]		*!	*	*

We have now seen that the current approach based on LA and high ranked agreement can successfully account for both types of parasitic assimilation. The two analyzed languages serve as case studies. This approach can be extended to other cases of consonant and parasitic vowel harmony. Furthermore, LA takes care of non-parasitic assimilation and its preference for vocalic rather than consonantal targets. This reveals a crucial difference between the two patterns. Since LA never prefers spreading to consonants alone, vowel harmony can be parasitic or not, whereas consonant harmony is always parasitic.

6. Alternatives

The main contribution of this paper is to show that parasitic vowel harmony and consonant harmony are alike and have a similar spreading analysis enforced by OT constraints. Crucially, a spreading account of consonant harmony is entirely possible (contra Walker 2000, Hansson 2001, Rose 2004, Rose and Walker 2004, Arsenault and Kochetov to appear, Hansson 2010, Nevins 2010). Now I shortly discuss one prominent recent alternative—Agreement by Correspondence (Hansson 2001, Rose and Walker 2004, et seq.; henceforth, ABC).

ABC is an approach to assimilation that has been developed specifically for consonant harmony. The main idea is that consonant harmony is due to long-distance consonant agreement, not spreading. This is formalized in terms of output correspondence relations between triggers and targets. ABC can certainly deal with all kinds of consonant harmony and has even been extended to model parasitic vowel harmony (Rhodes 2011). My argument here is not that ABC fails to capture parasitic assimilation. Instead, I claim that ABC says nothing about non-parasitic assimilation, which is problematic per se. To model non-parasitic assimilation, ABC relies on constraints and representations that are traditionally employed in such cases. The current proposal unifies both phenomena under a single analysis without any reference to correspondence. In short, ABC is less parsimonious.

Occam's Razor is sufficient to make ABC suspect. However, there are several other arguments why it is less capable of capturing assimilation than the current proposal. First, ABC restricts blocking. Blocking is arguably rare in consonant harmony (Hansson 2001:213,214; Rose and Walker 2004:486,487), but it is attested. Examples include Sanskrit (Johnson 1972, Selkirk 1980, Kiparsky 1985, Schein and Steriade 1986, Cho 1991, Hall 1997, Ní Chiosáin and Padgett 1997, Gafos 1996/1999, Hansson 2001, Rose and Walker 2004, Kaplan 2008), Kinyarwanda (Walker et al. 2008), Berber (Hansson 2010), and Slovenian (Jurgec 2011a). Hansson (2007a) shows that correspondence constraints can model blocking in an ABC-based approach. The idea is that when a high ranked constraint (e.g. a faithfulness or feature co-occurrence constraint) prohibits the blocker from undergoing assimilation. Since correspondence looks at all segments of a particular kind, this can include the blocker, which in turn could violate identity constraints that apply among the corresponding consonants. As a result, blocking is preferred over transparency. However, the predictions are less clear when non-parasitic assimilation is concerned. In particular, ABC excludes blockers that are different from the trigger–target pair. For example, ABC excludes blocking of vowel harmony by a subset of consonants. The problem is that such blocking is found in many unrelated languages, including Turkish (Clements and Sezer 1982), Finnish (Kiparsky 1981), Shona (Uffmann 2006), Nawuri (Casali 1995), Buchan Scots (Paster 2004), Akan (Clements 1976/1980; 1985a), Turkana (Dimmendaal 1983, Noske 1990; 2000), Assamese (Mahanta 2008), Ainu (Itô 1984), and Yucatec Maya (Krämer 2001).[15]

The second argument concerns the trigger–target disparities. Assimilation is sometimes triggered by a segment that is *different* from its targets. For example, a consonant may affect a vowel but not other consonants—as in Serbo-Croatian palatalization (Morén 2003). This can happen even if a trigger and its targets are not adjacent. For example, faucal harmony in Snchitsuʔumshtsn is triggered by a set of consonants that target vowels (Bessell 1998). Similarly, progressive emphasis spread in Northern Palestinian Arabic (Davis 1995) is triggered by consonants and targets the low vowel across other consonants. Chilcotin flattening is triggered by consonants that target vowels, whether adjacent or not (Cook 1976; 1983; 1987; 1993). In ABC, such patterns would be treated as long-distance rather than locally applying. The challenge is that ABC assumes that all long-distance assimilations must be parasitic, which is clearly not the case in the patterns just mentioned. In other words, ABC specifically rules these patterns out, because they are long-distance and non-parasitic. The current approach based on feature spreading can account for these patterns, since LA constraints can refer to vowels or root nodes. That is, the distinction between local and long-distance has nothing to do with parasitism.

The third argument refers to some specific properties of ABC. The principal driving force of ABC are two types of markedness constraints: correspondence constraints demand that certain output consonants are in correspondence, whereas the CC identity constraints are satisfied if the said correspondents are identical in terms of a particular feature. These two families of constraints are satisfied equally by spreading/copying the feature or delinking/removing it, as long as all relevant segments are affected. This means that lower ranked faithfulness constraints will always prefer the minimal repair. Imagine an input with three coronals. Both types of markedness constraints will be satisfied by outputs without any retroflexes or with all retroflex coronals. The problem is that the low ranked faithfulness constraint will prefer least changes. This makes the approach susceptible to the 'majority rules'. When most input coronals are retroflex, the output with only retroflex coronals will win. When most input coronals are non-retroflex, the output without retroflexion will win. Such patterns are unattested in assimilation (Baković 2000, Finley 2008). The current approach, on the other hand, cannot generate this pathology.

The final argument comes from trigger–target disparities. In some languages, sets of triggers and targets are disjunctive. Nati in Sankrit (see references above), for example, is triggered by retroflex coronals and targets the coronal nasal. At the same time, coronal nasals cannot be (derived) triggers. This latter phenomenon is known as *icy targets* in the literature (Jurgec 2011a;b, Kimper 2011, Walker 2012). One possible response is to argue that Nati is not a case of consonant harmony (as advocated by Hansson 2001). However, the question whether Nati constitutes consonant harmony (or not) is irrelevant, what matters is that ABC has no way of accounting for trigger–target disparities. There is no doubt that Nati is a case of assimilation, and as such it can also be captured in the current, autosegmental approach (see Jurgec 2011b for further discussion).

We have just seen that ABC can capture only a subset of all assimilation patterns, which means it still

[15] In many of these cases, blocking is limited to consonants in a particular prosodic position. This, however, has nothing to do with the inability of ABC to capture blocking in the first place.

requires a spreading account. The current approach, on the other hand, has a broader empirical range and is based on spreading alone.

7. Conclusions

This paper has two main contributions. The empirical contribution is to show that parasitic vowel harmony and consonant harmony are alike. The theoretical contribution is a unified analysis of both phenomena based on feature spreading and two well-established, but somewhat modified constraints—(licensed) alignment and agreement.

The two constraints have very different effects. Alignment constraints prefer spreading to all segments or vowels. This is independently grounded in the general preference of features to be aligned with domain edges and that these features appear in prosodically prominent positions. Agreement constraints, on the other hand, restrict spreading to those targets that are similar to triggers. When the trigger is a vowel, agreement constraints prefer spreading only to those vowels that are similar to the trigger. On the other hand, when the trigger is a consonant, agreement constraints enforce spreading to those consonants that are like the trigger.

The two constraints reveal the common property of all types of parasitic assimilation, which is the additional similarity among the trigger–target pairs. At the same time, the constraints also reveal the difference between vowel and consonant harmony. Since alignment can target vowels, that predicts non-parasitic vowel harmony. In contrast, consonants cannot be targeted by alignment exclusively, hence consonant harmony can only be parasitic. This is in line with the cross-linguistic observations: vowel harmony can be parasitic or not, whereas all reported cases of consonant harmony are parasitic.

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